МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ РОССИЙСКОЙ ФЕДЕРАЦИИ

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ПРАКТИЧЕСКИЙ КУРС АНГЛИЙСКОГО ЯЗЫКА ДЛЯ МАГИСТРАНТОВ, АСПИРАНТОВ И СОИСКАТЕЛЕЙ

Рекомендовано Редсоветом университета
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280700 «Техносферная безопасность», 221700 «Стандартизация
и метрология», 190600 «Эксплуатация технологических машин
и комплексов», аспирантов и соискателей

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Представлены тексты по профессиональной тематике с контрольными заданиями. Приведен краткий грамматический справочник, терминологический словарь. Структура пособия предусматривает преемственность вузовской программы и экзаменационных требований к уровню подготовки магистрантов, аспирантов и соискателей по иностранному языку.

Учебное пособие подготовлено на кафедре иностранных языков и предназначено для подготовки магистрантов, обучающихся по направлениям 270800 «Строительство», 280700 «Техносферная безопасность», 221700 «Стандартизация и метрология», 190600 «Эксплуатация технологических машин и комплексов», аспирантов и соискателей к сдаче вступительного и кандидатского экзаменов по английскому языку. Пособие представляет собой систематический курс обучения английскому языку учащихся различного профиля подготовки.

ПРЕДИСЛОВИЕ

Основной целью данного пособия является совершенствование и дальнейшее развитие полученных в высшей школе знаний, навыков и умений по английскому языку в различных видах речевой коммуникации, что даёт возможность:

1) свободно читать оригинальную литературу на английском языке в соответствующей отрасли знаний;

2) оформлять извлечённую из англоязычных источников информацию в виде перевода и резюме;

3) делать сообщения и доклады на английском языке на темы, связанные с научной работой аспиранта (соискателя);

4) вести беседу по специальности.

При работе над лексикой учитывается специфика лексических средств по специальности аспиранта (соискателя), многозначность служебных и общенаучных слов, механизмы словообразования (в том числе терминов и интернациональных слов), явления синонимии и омонимии.

Учебное пособие предназначено для работы с магистрантами, аспирантами и соискателями различного профиля обучения. Оно рекомендуется как для подготовки к сдаче вступительного экзамена в аспирантуру, так и непосредственно для подготовки к сдаче кандидатского экзамена.

ВВЕДЕНИЕ

Изучение иностранных языков является необходимой и неотъемлемой составной частью общеобразовательной профессиональной подготовки научных и научно-педагогических кадров. Это обусловлено интернационализацией научного общения, развитием сотрудничества специалистов и ученых на глобальном уровне и расширением сферы научного дискурса в современной коммуникации. Знание иностранного языка облегчает доступ к научной информации, использование ресурсов Интернета, помогает налаживанию международных научных контактов и расширяет возможности повышения профессионального уровня ученого.

В связи с процессами глобализации усиливаются интеграционные тенденции в науке, культуре и образовании, что повышает роль иностранного языка как посредника всех интеграционных процессов. Именно язык воплощает единство процессов общения, познания и становления личности. В этих условиях цели и задачи изучения языка сближаются с целями и задачами профессиональной подготовки и становления аспиранта (соискателя) как ученого, т.е. язык постигается одновременно и вместе с наукой как форма, в которую облекается научное знание в соответствии с условиями научного общения. Современное понимание науки как дискурсивной практики требует при изучении языка приоритетного знания структур и стратегий научного дискурса, форм и средств коммуникации, а также умения ими оперировать. Курс изучения иностранного языка носит, таким образом, профессионально-ориентированный и коммуникативный характер. Его целевая разработка обусловлена необходимостью модернизации отечественного образования и конкретизации его содержания на каждом уровне обучения иностранным языкам.

Целью данного пособия является обучение английскому языку как средству межкультурного, межличностного и профессионального общения в различных сферах научной деятельности.

В процессе достижения этой цели реализуются коммуникативные, когнитивные и развивающие задачи.

Коммуникативные задачи включают обучение следующим практическим умениям и навыкам:

• свободного чтения оригинальной литературы соответствующей отрасли знаний на иностранном языке;

• оформления извлеченной из иностранных источников информации в виде перевода, реферата, аннотации;

• устного общения в монологической и диалогической форме по специальности и общественно-политическим вопросам (доклад, сообщение, презентация, беседа за круглым столом, дискуссия, подведение итогов и т.п.);

• письменного научного общения на темы, связанные с научной работой аспиранта (научная статья, тезисы, перевод, реферирование и аннотирование);

• различения видов и жанров справочной и научной литературы;

• использования этикетных форм научного общения.

Когнитивные (познавательные) задачи включают приобретение следующих знаний и навыков:

• развития рациональных способов мышления: умения производить различные логические операции (анализ, синтез, установление причинно-следственных связей, аргументирование, обобщение и вывод, комментирование);

• формулирования цели, планирования и достижения результатов в научной деятельности на иностранном языке.

Развивающие задачи включают:

• способность четко и ясно излагать свою точку зрения по проблеме на иностранном языке;

• способность понимать и ценить чужую точку зрения по научной проблеме,

стремиться к сотрудничеству, достижению согласия, выработке общей позиции в условиях различия взглядов и убеждений;

• готовность к различным формам и видам международного сотрудничества (совместный проект, гранд, конференция, конгресс, симпозиум, семинар, совещание и др.), а также к освоению достижений науки в странах изучаемого языка;

• способность выявлять и сопоставлять социокультурные особенности подготовки аспирантов в стране и за рубежом, достижения и уровень исследований крупных научных центров по избранной специальности.

Формы контроля уровня знаний аспирантов и соискателей включают:

1. Текущий контроль осуществляется на каждом занятии проверкой выполнения домашних заданий (чтение, перевод, аннотирование и реферирование текстов, выполнение заданий);

2. Промежуточный контроль включает доклады на семинарах и проверку терминологических глоссариев;

3. Итоговый контроль состоит из двух этапов. Первый этап – подготовка письменного перевода текста по специальности в объеме 20000 п.з., второй этап – сдача кандидатского экзамена.

Кандидатский экзамен по иностранному языку включает в себя следующие три задания:

1. Письменный перевод научного текста по специальности. Объём текста – 2500-3000 печатных знаков. Время выполнения работы – 45-60 минут.

2. Беглое (просмотровое) чтение оригинального текста (газетной статьи) по специальности. Объём – 1000-1500 печатных знаков. Время выполнения – 2-3 минуты. Форма проверки – передача извлечённой информации на иностранном языке.

3. Беседа с экзаменаторами на иностранном языке по вопросам, связанным со специальностью и научной работой аспиранта (соискателя).

На кандидатском экзамене аспирант (соискатель) должен продемонстрировать умение пользоваться иностранным языком как средством профессионального общения в научной сфере.

PART I

TEXT 1
CIVIL ENGINEERING

Civil engineering is a professional engineering discipline that deals with the design, construction, and maintenance of the physical and naturally built environment, including works like roads, bridges, canals, dams, and buildings. Civil engineering is the oldest engineering discipline after military engineering, and it was defined to distinguish non-military engineering from military engineering. It is traditionally broken into several sub-disciplines including environmental engineering, geotechnical engineering, structural engineering, transportation engineering, municipal or urban engineering, water resources engineering, materials engineering, coastal engineering, surveying, and construction engineering. Civil engineering takes place on all levels: in the public sector from municipal through to national governments, and in the private sector from individual homeowners through to international companies.

1.1 History of the civil engineering profession.

Engineering has been an aspect of life since the beginning of human existence. The earliest practice of civil engineering may have commenced between 4000 and 2000 BC in Ancient Egypt and Mesopotamia (Ancient Iraq) when humans started to abandon a nomadic existence, creating a need for the construction of shelter. During this time, transportation became increasingly important leading to the development of the wheel and sailing.

Until modern times there was no clear distinction between civil engineering and architecture, and the term engineer and architect were mainly geographical variations referring to the same person, often used interchangeably. The construction of Pyramids in Egypt (2700–2500 BC) might be considered the first instances of large structure constructions. Other ancient historic civil engineering constructions include the Qanat water management system (the oldest older than 3000 years and longer than 71 km,), the Parthenon by Iktinos in Ancient Greece (447–438 BC), the Appian Way by Roman engineers (312 BC), the Great Wall of China by General Meng T'ien under orders from Emperor Shih Huang Ti (220 BC) and the stupas constructed in ancient Sri Lanka like the Jetavanaramaya and the extensive irrigation works in Anuradhapura. The Romans developed civil structures throughout their empire, including especially aqueducts, insulae, harbours, bridges, dams and roads.

In the 18th century, the term civil engineering was coined to incorporate all things civilian as opposed to military engineering. The first self-proclaimed civil engineer was John Smeaton who constructed the Eddystone Lighthouse. In 1771 Smeaton and some of his colleagues formed the Smeatonian Society of Civil Engineers, a group of leaders of the profession who met informally over dinner. Though there was evidence of some technical meetings, it was little more than a social society.

In 1818 the Institution of Civil Engineers was founded in London, and in 1820 the eminent engineer Thomas Telford became its first president. The institution received a Royal Charter in 1828, formally recognising civil engineering as a profession. Its charter defined civil engineering as:

the art of directing the great sources of power in nature for the use and convenience of man, as the means of production and of traffic in states, both for external and internal trade, as applied in the construction of roads, bridges, aqueducts, canals, river navigation and docks for internal intercourse and exchange, and in the construction of ports, harbours, moles, breakwaters and lighthouses, and in the art of navigation by artificial power for the purposes of commerce, and in the construction and application of machinery, and in the drainage of cities and towns.

The first private college to teach Civil Engineering in the United States was Norwich University founded in 1819 by Captain Alden Partridge. The first degree in Civil Engineering in the United States was awarded by Rensselaer Polytechnic Institute in 1835. The first such degree to be awarded to a woman was granted by Cornell University to Nora Stanton Blatch in 1905.

1.2 History of civil engineering

Civil engineering is the application of physical and scientific principles, and its history is intricately linked to advances in understanding of physics and mathematics throughout history. Because civil engineering is a wide ranging profession, including several separate specialized sub-disciplines, its history is linked to knowledge of structures, materials science, geography, geology, soils, hydrology, environment, mechanics and other fields.

Throughout ancient and medieval history most architectural design and construction was carried out by artisans, such as stonemasons and carpenters, rising to the role of master builder. Knowledge was retained in guilds and seldom supplanted by advances. Structures, roads and infrastructure that existed were repetitive, and increases in scale were incremental.

One of the earliest examples of a scientific approach to physical and mathematical problems applicable to civil engineering is the work of Archimedes in the 3rd century BC, including Archimedes Principle, which underpins our understanding of buoyancy, and practical solutions such as Archimedes' screw. Brahmagupta, an Indian mathematician, used arithmetic in the 7th century AD, based on Hindu-Arabic numerals, for excavation (volume) computations.

1.3 The civil engineer

Civil engineers typically possess an academic degree with a major in civil engineering. The length of study for such a degree is usually three to five years and the completed degree is usually designated as a Bachelor of Engineering, though some universities designate the degree as a Bachelor of Science. The degree generally includes units covering physics, mathematics, project management, design and specific topics in civil engineering. Initially such topics cover most, if not all, of the sub-disciplines of civil engineering. Students then choose to specialize in one or more sub-disciplines towards the end of the degree. While an Undergraduate (BEng/BSc) Degree will normally provide successful students with industry accredited qualification, some universities offer postgraduate engineering awards (MEng/MSc) which allow students to further specialize in their particular area of interest within engineering.

In most countries, a Bachelor's degree in engineering represents the first step towards professional certification and the degree program itself is certified by a professional body. After completing a certified degree program the engineer must satisfy a range of requirements (including work experience and exam requirements) before being certified. Once certified, the engineer is designated the title of Professional Engineer (in the United States, Canada and South Africa), Chartered Engineer (in most Commonwealth countries), Chartered Professional Engineer (in Australia and New Zealand), or European Engineer (in much of the European Union). There are international engineering agreements between relevant professional bodies which are designed to allow engineers to practice across international borders.

The advantages of certification vary depending upon location. For example, in the United States and Canada "only a licensed engineer may prepare, sign and seal, and submit engineering plans and drawings to a public authority for approval, or seal engineering work for public and private clients.". This requirement is enforced by state and provincial legislation such as Quebec's Engineers Act. In other countries, no such legislation exists. In Australia, state licensing of engineers is limited to the state of Queensland. Practically all certifying bodies maintain a code of ethics that they expect all members to abide by or risk expulsion. In this way, these organizations play an important role in maintaining ethical standards for the profession. Even in jurisdictions where certification has little or no legal bearing on work, engineers are subject to contract law. In cases where an engineer's work fails he or she may be subject to the tort of negligence and, in extreme cases, the charge of criminal negligence. An engineer's work must also comply with numerous other rules and regulations such as building codes and legislation pertaining to environmental law.

1.4 Careers

There is no one typical career path for civil engineers. Most people who graduate with civil engineering degrees start with jobs that require a low level of responsibility, and as the new engineers prove their competence, they are trusted with tasks that have larger consequences and require a higher level of responsibility. However, within each branch of civil engineering career path options vary. In some fields and firms, entry-level engineers are put to work primarily monitoring construction in the field, serving as the "eyes and ears" of senior design engineers; while in other areas, entry-level engineers perform the more routine tasks of analysis or design and interpretation. Experienced engineers generally do more complex analysis or design work, or management of more complex design projects, or management of other engineers, or into specialized consulting, including forensic engineering.

1.5 Sub-disciplines

In general, civil engineering is concerned with the overall interface of human created fixed projects with the greater world. General civil engineers work closely with surveyors and specialized civil engineers to fit and serve fixed projects within their given site, community and terrain by designing grading, drainage, pavement, water supply, sewer service, electric and communications supply, and land divisions. General engineers spend much of their time visiting project sites, developing community consensus, and preparing construction plans. General civil engineering is also referred to as site engineering, a branch of civil engineering that primarily focuses on converting a tract of land from one usage to another. Civil engineers typically apply the principles of geotechnical engineering, structural engineering, environmental engineering, transportation engineering and construction engineering to residential, commercial, industrial and public works projects of all sizes and levels of construction.

1.6 Coastal engineering

Coastal engineering is concerned with managing coastal areas. In some jurisdictions the terms sea defense and coastal protection are used to mean, respectively, defense against flooding and erosion. The term coastal defense is the more traditional term, but coastal management has become more popular as the field has expanded to include techniques that allow erosion to claim land.

1.7 Construction engineering

Construction engineering involves planning and execution of the designs from transportation, site development, hydraulic, environmental, structural and geotechnical engineers. As construction firms tend to have higher business risk than other types of civil engineering firms, many construction engineers tend to take on a role that is more business-like in nature: drafting and reviewing contracts, evaluating logistical operations, and closely monitoring prices of necessary supplies.

1.8 Earthquake engineering

Earthquake engineering covers ability of various structures to withstand hazardous earthquake exposures at the sites of their particular location.

Earthquake engineering is a sub discipline of the broader category of structural engineering. The main objectives of earthquake engineering are:

Understand interaction of structures with the shaky ground.

Foresee the consequences of possible earthquakes.

Design, construct and maintain structures to perform at earthquake exposure up to the expectations and in compliance with building codes.

1.9 Environmental engineering

Environmental engineering deals with the treatment of chemical, biological, and/or thermal waste, the purification of water and air, and the remediation of contaminated sites, due to prior waste disposal or accidental contamination. Among the topics covered by environmental engineering are pollutant transport, water purification, waste water treatment, air pollution, solid waste treatment and hazardous waste management. Environmental engineers can be involved with pollution reduction, green engineering, and industrial ecology. Environmental engineering also deals with the gathering of information on the environmental consequences of proposed actions and the assessment of effects of proposed actions for the purpose of assisting society and policy makers in the decision making process.

Environmental engineering is the contemporary term for sanitary engineering, though sanitary engineering traditionally had not included much of the hazardous waste management and environmental remediation work covered by the term environmental engineering. Some other terms in use are public health engineering and environmental health engineering.

1.10 Geotechnical engineering

Geotechnical engineering is an area of civil engineering concerned with the rock and soil that civil engineering systems are supported by. Knowledge from the fields of geology, material science and testing, mechanics, and hydraulics are applied by geotechnical engineers to safely and economically design foundations, retaining walls, and similar structures. Environmental concerns in relation to groundwater and waste disposal have spawned a new area of study called geoenvironmental engineering where biology and chemistry are important.

Some of the unique difficulties of geotechnical engineering are the result of the variability and properties of soil. Boundary conditions are often well defined in other branches of civil engineering, but with soil, clearly defining these conditions can be impossible. The material properties and behavior of soil are also difficult to predict due to the variability of soil and limited investigation. This contrasts with the relatively well defined material properties of steel and concrete used in other areas of civil engineering. Soil mechanics, which describes the behavior of soil, is also complicated because soils exhibit nonlinear (stress-dependent) strength, stiffness, and dilatancy (volume change associated with application of shear stress).

1.11 Water resources engineering

Water resources engineering is concerned with the collection and management of water (as a natural resource). As a discipline it therefore combines hydrology, environmental science, meteorology, geology, conservation, and resource management. This area of civil engineering relates to the prediction and management of both the quality and the quantity of water in both underground (aquifers) and above ground (lakes, rivers, and streams) resources. Water resource engineers analyze and model very small to very large areas of the earth to predict the amount and content of water as it flows into, through, or out of a facility. Although the actual design of the facility may be left to other engineers. Hydraulic engineering is concerned with the flow and conveyance of fluids, principally water. This area of civil engineering is intimately related to the design of pipelines, water supply network, drainage facilities (including bridges, dams, channels, culverts, levees, storm sewers), and canals. Hydraulic engineers design these facilities using the concepts of fluid pressure, fluid statics, fluid dynamics, and hydraulics, among others.

1.12 Materials engineering

Another aspect of Civil engineering is materials science. Materials engineering deals with ceramics such as concrete, mix asphalt concrete, metals. If focus around increased strength, metals such as aluminum and steel, and polymers such as polymethylmethacrylate (PMMA) and carbon fibers.

Materials engineering also consists of protection and prevention like paints and finishes. Alloying is another aspect of materials engineering, combining two different types of metals to produce a stronger metal.

1.13 Structural engineering.

Structural engineering is concerned with the structural design and structural analysis of buildings, bridges, towers, flyovers, tunnels, off shore structures like oil and gas fields in the sea, and other structures. This involves identifying the loads which act upon a structure and the forces and stresses which arise within that structure due to those loads, and then designing the structure to successfully support and resist those loads. The loads can be self weight of the structures, other dead load, live loads, moving (wheel) load, wind load, earthquake load, load from temperature change etc. The structural engineer must design structures to be safe for their users and to successfully fulfill the function they are designed for (to be serviceable). Due to the nature of some loading conditions, sub-disciplines within structural engineering have emerged, including wind engineering and earthquake engineering.

Design considerations will include strength, stiffness, and stability of the structure when subjected to loads which may be static, such as furniture or self-weight, or dynamic, such as wind, seismic, crowd or vehicle loads, or transitory, such as temporary construction loads or impact. Other considerations include cost, constructability, safety, aesthetics and sustainability.

1.14 Surveying.

Surveying is the process by which a surveyor measures certain dimensions that generally occur on the surface of the Earth. Surveying equipment, such as levels and theodolites, are used for accurate measurement of angular deviation, horizontal, vertical and slope distances. With computerisation, electronic distance measurement (EDM), total stations, GPS surveying and laser scanning have supplemented (and to a large extent supplanted) the traditional optical instruments. This information is crucial to convert the data into a graphical representation of the Earth's surface, in the form of a map. This information is then used by civil engineers, contractors and even realtors to design from, build on, and trade, respectively. Elements of a building or structure must be correctly sized and positioned in relation to each other and to site boundaries and adjacent structures. Although surveying is a distinct profession with separate qualifications and licensing arrangements, civil engineers are trained in the basics of surveying and mapping, as well as geographic information systems. Surveyors may also lay out the routes of railways, tramway tracks, highways, roads, pipelines and streets as well as position other infrastructures, such as harbors, before construction.

1.14.1 Land surveying.

In the United States, Canada, the United Kingdom and most Commonwealth countries land surveying is considered to be a distinct profession. Land surveyors are not considered to be engineers, and have their own professional associations and licencing requirements. The services of a licenced land surveyor are generally required for boundary surveys (to establish the boundaries of a parcel using its legal description) and subdivision plans (a plot or map based on a survey of a parcel of land, with boundary lines drawn inside the larger parcel to indicate the creation of new boundary lines and roads), both of which are generally referred to as cadastral surveying.

1.14.2 Construction surveying.

Construction surveying (otherwise "lay-out" or "setting-out") is generally performed by specialised technicians. Unlike land surveyors, the resulting plan does not have legal status. Construction surveyors perform the following tasks:

Survey existing conditions of the future work site, including topography, existing buildings and infrastructure, and even including underground infrastructure whenever possible;

Stake out reference points and markers that will guide the construction of new structures such as roads or buildings for subsequent construction;

Verify the location of structures during construction;

As-built surveying: a survey conducted at the end of the construction project to verify that the work authorized was completed to the specifications set on plans.

1.15 Transportation engineering.

Transportation engineering is concerned with moving people and goods efficiently, safely, and in a manner conducive to a vibrant community. This involves specifying, designing, constructing, and maintaining transportation infrastructure which includes streets, canals, highways, rail systems, airports, ports, and mass transit. It includes areas such as transportation design, transportation planning, traffic engineering, some aspects of urban engineering, queueing theory, pavement engineering, Intelligent Transportation System (ITS), and infrastructure management.

1.16 Municipal or urban engineering.

Municipal engineering is concerned with municipal infrastructure. This involves specifying, designing, constructing, and maintaining streets, sidewalks, water supply networks, sewers, street lighting, municipal solid waste management and disposal, storage depots for various bulk materials used for maintenance and public works (salt, sand, etc.), public parks and bicycle paths. In the case of underground utility networks, it may also include the civil portion (conduits and access chambers) of the local distribution networks of electrical and telecommunications services. It can also include the optimizing of waste collection and bus service networks. Some of these disciplines overlap with other civil engineering specialties, however municipal engineering focuses on the coordination of these infrastructure networks and services, as they are often built simultaneously, and managed by the same municipal authority.

COMPREHENSION

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TEXT 2
CIVIL ENGINEER

While all civil engineers tend to spend at least some time working "on site", much of the modern civil engineering work is done in offices, working with plans or computers.

A civil engineer is a person who practices civil engineering; the application of planning, designing, constructing, maintaining, and operating infrastructures while protecting the public and environmental health, as well as improving existing infrastructures that have been neglected.

Originally, a civil engineer worked on public works projects and was contrasted with the military engineer, who worked on armaments and defenses. Over time, various branches of engineering have become recognized as distinct from civil engineering, including chemical engineering, mechanical engineering, and electrical engineering, while much of military engineering has been absorbed by civil engineering.

In some places, a civil engineer may perform land surveying; in others, surveying is limited to construction surveying, unless an additional qualification is obtained. On some U.S. military bases, the personnel responsible for building and grounds maintenance, such as grass mowing, are called civil engineers and are not required to meet any minimum educational requirements

2.1 Specialization.

Civil engineers usually practice in a particular specialty, such as construction engineering, geotechnical engineering, structural engineering, land development, transportation engineering, hydraulic engineering, and environmental engineering.

Some civil engineers, particularly those working for government agencies, may practice across multiple specializations, particularly when involved in critical infrastructure development or maintenance.

2.2 Education and licensing.

In most countries, a civil engineer will have graduated from a post-secondary school with a degree in civil engineering, which requires a strong background in mathematics and the physical sciences; this degree is typically a bachelor's degree, though many civil engineers study further to obtain masters, doctoral and post doctoral degrees. In many countries, civil engineers are subject to licensure. In jurisdictions with mandatory licensing, people who do not obtain a license may not call themselves "civil engineers."

In Belgium, Civil Engineer (French: Ingénieur Civil, Dutch: Burgerlijk Ingenieur) is a legally protected title applicable to graduates of the five-year engineering course of one of the six universities and the Royal Military Academy. Their speciality can be all fields of engineering: civil, structural, electrical, mechanical, chemical, physics and even computer science. This use of the title may cause confusion to the English speaker as the Belgian "civil" engineer can have a speciality other than civil engineering. In fact, Belgians use the adjective "civil" as an opposition to military engineers.

The formation of the civil engineer has a strong mathematical and scientific base and is more theoretical in approach than the practical oriented industrial engineer educated in a five-year program at a polytechnic. Traditionally, students were required to pass an entrance exam on mathematics to start civil engineering studies. This exam was abolished in 2004 for the Flemish Community, but is still organised in the French Community.

In Scandinavian countries, a civil engineer (civilingenjör (Swedish), sivilingeniør (Norwegian), civilingeniør (Danish)) is a first professional degree, approximately equivalent to Master of Science in Engineering, and a protected title granted to students by selected institutes of technology. As in English the word has its origin in the distinction between civilian and military engineers, as in before the start of the 19th century only military engineers existed and the prefix "civil" was a way to separate those who had studied engineering in a regular University from their military counterparts. Today the degree spans over all fields within engineering, like civil engineering, computer science, electronics engineering, etc.

There is generally a slight difference between a Master of Science in Engineering degree and the Scandinavian civil engineer degree, the latter's programme having closer ties with the industry's demands. A civil engineer is the most well-known of the two; still, the area of expertise remains obfuscated for most of the public. A noteworthy difference is the mandatory courses in mathematics and physics, regardless of the equivalent master degree, e.g. computer science.

Although a 'college engineer' högskoleingenjör, diplomingenjör/mellaningenjör (Swedish), høgskoleingeniør (Norwegian), diplomingeniør (Danish)) is roughly equivalent to a Bachelor of Science in Scandinavia, to become a 'civil engineer' one often has had to do up to one extra year of overlapping studies compared to attaining a B.Sc./M.Sc. combination. This is because the higher educational system is not fully adopted to the international standard graduation system, since it is treated as a professional degree. Today (since 2009) this is starting to change due to the Bologna process.

A Scandinavian "civilingenjör" will in international contexts commonly call himself/herself "Master of Science in Engineering" and will occasionally wear an engineering class ring. At the Norwegian Institute of Technology (now the Norwegian University of Science and Technology), the tradition with a NTH Ring goes back to 1914, before the Canadian iron ring.

In Norway the title "Sivilingeniør" will no longer be issued after 2007, and have been replaced with "Master i teknologi". In the English translation of the diploma, the title will be "Master of Science", since "Master of Technology" is not an established title in the English-speaking world. The extra overlapping year of studies have also been abolished with this change to make Norwegian degrees more equal to their international counterparts.

In Spain, a civil engineering degree can be obtained after four years of study in the various branches of mathematics, physics, mechanics, etc. The earned degree is called Grado en Ingeniería Civil. Further studies at a Graduate school include master's and doctoral degrees.

Before the current situation, that is, before the implementation of Bologna Process in 2010, a Civil Engineering degree in Spain could be obtained after three or five years of study. In the first case, the earned degree was called Ingeniero Técnico de Obras Públicas (ITOP), literally translated as "Public Works Engineer"; at the second case, the academic earned degree was called Ingeniero de Caminos, Canales y Puertos (often shortened to Ingeniero de Caminos or ICCP), that literally means "Roads, Canals and Harbors Engineer", though civil engineers in Spain practice in the same fields as civil engineers do elsewhere.

The first Spanish Civil Engineering School was the Escuela Especial de Ingenieros de Caminos y Canales (now called Escuela Técnica Superior de Ingenieros de Caminos, Canales y Puertos), established in 1802 in Madrid, followed by the Escuela Especial de Ayudantes de Obras Públicas (now called Escuela Universitaria de Ingeniería Técnica de Obras Públicas de la Universidad Politécnica de Madrid), founded in 1854 in Madrid. Both schools now belong to the Technical University of Madrid.

In Spain, a Civil Engineer has the technical and legal ability to design projects of any branch, so any Spanish Civil Engineer can oversee projects about structures, buildings (except residencial structures which are reserved for architects), foundations, hydraulics, environment, transportation, urbanism, etc.

In Spain, Mechanical and Electrical engineering tasks are included under the Industrial engineering degree.

In the United Kingdom a chartered civil engineer (known as certified or professional engineer in other countries) is a member of the Institution of Civil Engineers, and has also passed chartership exams. However a non-chartered civil engineer may be a member of the Institution of Civil Engineers or the Institution of Civil Engineering Surveyors. The description "Civil Engineer" is not restricted to members of any particular professional organisation although "Chartered Civil Engineer" is.

In the United States, civil engineers are typically employed by municipalities, construction firms, consulting engineering firms, architect/engineer firms, state governments, and the federal government. Each state requires engineers who offer their services to the public to be licensed by the state. Licensure is obtained by meeting specified education, examination, and work experience requirements. Specific requirements vary by state. Typically licensed engineers must graduate from an ABET-accredited University or College engineering program, pass the Fundamentals of Engineering exam, obtain several years of engineering experience under the supervision of a licensed engineer, then pass the Principles and Practice of Engineering Exam. After completing these steps and granting of licensure by a State Board, engineers may use the title "Professional Engineer" or PE in advertising and documents.

2.3 Professional associations.

The ASCE (American Society of Civil Engineers) represents more than 140,000 members of the civil engineering profession worldwide. Official members of the ASCE must hold a bachelor's degree from an accredited civil engineering program and be a licensed professional engineer or have five years responsible charge of engineering experience. Most civil engineers join this organization to be updated of current news, projects, and methods (such as sustainability) related to civil engineering; as well as contribute their expertise and knowledge to other civil engineers and students obtaining their civil engineering degree.

The ICE (Institution of Civil Engineers) founded in 1818, represents, as of 2008, more than 80,000 members of the civil engineering profession worldwide. Its commercial arm, Thomas Telford Ltd, provides training, recruitment, publishing and contract services.

COMPREHENSION

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TEXT 3
BUILDING MATERIALS

A building material is any material which is used for a construction purpose. Many naturally occurring substances, such as clay, sand, wood and rocks, even twigs and leaves have been used to construct buildings. Apart from naturally occurring materials, many man-made products are in use, some more and some less synthetic. The manufacture of building materials is an established industry in many countries and the use of these materials is typically segmented into specific specialty trades, such as carpentry, plumbing, roofing and insulation work. They provide the make-up of habitats and structures including homes.

The tent is the home of choice among nomadic groups all over the world. Two well known types include the conical teepee and the circular yurt. It has been revived as a major construction technique with the development of tensile architecture and synthetic fabrics. Modern buildings can be made of flexible material such as fabric membranes, and supported by a system of steel cables, rigid or internal.

3.1 Mud and clay

The amount of each material used leads to different styles of buildings. The deciding factor is usually connected with the quality of the soil being used. Larger amounts of clay usually mean using the cob/adobe style, while a low clay soil is usually associated with a sod building. The other main ingredients include more or less sand/gravel and straw/grasses. Rammed earth is both an old and newer take on creating walls, once made by compacting clay soils between planks by hand, now forms and mechanical pneumatic compressors are used.

Soil and especially clay is good thermal mass; it is very good at keeping temperatures at a constant level. Homes built with earth tend to be naturally cool in the summer heat and warm in cold weather. Clay holds heat or cold, releasing it over a period of time like stone. Earthen walls change temperature slowly, so artificially raising or lowering the temperature can use more resources than in say a wood built house, but the heat/coolness stays longer.

Peoples building with mostly dirt and clay, such as cob, sod, and adobe, resulted in homes that have been built for centuries in western and northern Europe as well as the rest of the world, and continue to be built, though on a smaller scale. Some of these buildings have remained habitable for hundreds of years.

3.2 Wood

A natural material for building dwellings for thousands of years, wood was also used to make churches in the past. The main problems with wood structures are fire risk and durability. Wood is an aesthetically pleasing material that never goes out of trend completely, though the current popularity of plastic is taking its place in many construction sites.

3.3 Rock

Rock structures have existed for as long as history can recall. It is the longest lasting building material available, and is usually readily available. There are many types of rock throughout the world all with differing attributes that make them better or worse for particular uses. Rock is a very dense material so it gives a lot of protection too, its main draw-back as a material is its weight and awkwardness. Its energy density is also considered a big draw-back, as stone is hard to keep warm without using large amounts of heating resources.

Dry-stone walls have been built for as long as humans have put one stone on top of another. Eventually different forms of mortar were used to hold the stones together, cement being the most commonplace now.

The granite-strewn uplands of Dartmoor National Park, United Kingdom, for example, provided ample resources for early settlers. Circular huts were constructed from loose granite rocks throughout the Neolithic and early Bronze Age, and the remains of an estimated 5,000 can still be seen today. Granite continued to be used throughout the Medieval period (see Dartmoor longhouse) and into modern times. Slate is another stone type, commonly used as roofing material in the United Kingdom and other parts of the world where it is found.

Mostly stone buildings can be seen in most major cities, some civilizations built entirely with stone such as the Pyramids in Egypt, the Aztec pyramids and the remains of the Inca civilization.

3.4 Thatch

Thatch is one of the oldest of building materials known; grass is a good insulator and easily harvested. Many African tribes have lived in homes made completely of grasses year round. In Europe, thatch roofs on homes were once prevalent but the material fell out of favor as industrialization and improved transport increased the availability of other materials. Today, though, the practice is undergoing a revival. In the Netherlands, for instance, many new buildings have thatched roofs with special ridge tiles on top.

3.5 Brush

Brush structures are built entirely from plant parts and are generally found in tropical and sub-tropical areas, such as rainforests, where very large leaves can be used in the building. Native Americanes used them for resting and living in, too. These are built mostly with branches, twigs and leaves, and bark, similar to a beaver's lodge. These were variously named wikiups, lean-tos, and so forth.

3.6 Ice

Ice was used by the Inuit for igloos, but has also been used for ice hotels as a tourist attraction in northern areas that might not otherwise see many winter tourists.

3.7 Sand

Sand is used with cement and sometimes lime to make mortar for masonry work and plaster. Sand is used as a part of the concrete mix.

3.8 Concrete

Concrete is a composite building material made from the combination of aggregate and a binder such as cement. The most common form of concrete is Portland cement concrete, which consists of mineral aggregate (generally gravel and sand), portland cement and water. After mixing, the cement hydrates and eventually hardens into a stone-like material. When used in the generic sense, this is the material referred to by the term concrete.

For a concrete construction of any size, as concrete has a rather low tensile strength, it is generally strengthened using steel rods or bars (known as rebars). This strengthened concrete is then referred to as reinforced concrete. In order to minimise any air bubbles, that would weaken the structure, a vibrator is used to eliminate any air that has been entrained when the liquid concrete mix is poured around the ironwork. Concrete has been the predominant building material in this modern age due to its longevity, formability, and ease of transport. Recent advancements, such as insulating concrete forms, combine the concrete forming and other construction steps (installation of insulation). All materials must be taken in required proportions as described in standards.

3.9 Metal

Metal is used as structural framework for larger buildings such as skyscrapers, or as an external surface covering. There are many types of metals used for building. Steel is a metal alloy whose major component is iron, and is the usual choice for metal structural building materials. It is strong, flexible, and if refined well and/or treated lasts a long time. Corrosion is metal's prime enemy when it comes to longevity.

The lower density and better corrosion resistance of aluminium alloys and tin sometimes overcome their greater cost. Brass was more common in the past, but is usually restricted to specific uses or specialty items today.

Metal figures quite prominently in prefabricated structures such as the Quonset hut, and can be seen used in most cosmopolitan cities. It requires a great deal of human labor to produce metal, especially in the large amounts needed for the building industries.

Other metals used include titanium, chrome, gold, silver. Titanium can be used for structural purposes, but it is much more expensive than steel. Chrome, gold, and silver are used as decoration, because these materials are expensive and lack structural qualities such as tensile strength or hardness.

3.10 Glass

Glassmaking is considered an art form as well as an industrial process or material. Clear windows have been used since the invention of glass to cover small openings in a building. They provided humans with the ability to both let light into rooms while at the same time keeping inclement weather outside. Glass is generally made from mixtures of sand and silicates, in a very hot fire stove called a kiln and is very brittle. Very often additives are added to the mixture when making glass with shades of colors or various characteristics (such as bulletproof glass, or light emittance).

The use of glass in architectural buildings has become very popular in the modern culture. Glass "curtain walls" can be used to cover the entire facade of a building, or it can be used to span over a wide roof structure in a "space frame". These uses though require some sort of frame to hold sections of glass together, as glass by itself is too brittle and would require an overly large kiln to be used to span such large areas by itself.

3.11 Plastic

The term “plastics” covers a range of synthetic or semi-synthetic organic condensation or polymerization products that can be molded or extruded into objects or films or fibers. Their name is derived from the fact that in their semi-liquid state they are malleable, or have the property of plasticity. Plastics vary immensely in heat tolerance, hardness, and resiliency. Combined with this adaptability, the general uniformity of composition and lightness of plastics ensures their use in almost all industrial applications today.

3.12 Foam

More recently synthetic polystyrene or polyurethane foam has been used in combination with structural materials, such as concrete. It is light weight, easily shaped and an excellent insulator. It is usually used as part of a structural insulated panel where the foam is sandwiched between wood or cement or insulating concrete forms, where concrete is sandwiched between two layers of foam.

3.13 Cement composites

Cement bonded composites are made of hydrated cement paste that binds wood or alike particles or fibers to make pre-cast building components. Various fibrous materials including paper and fiberglass have been used as binders.

Wood and natural fibres are composed of various soluble organic compounds like carbohydrates, glycosides and phenolics. These compounds are known to retard cement setting. Therefore, before using a wood in making cement boned composites, its compatibility with cement is assessed.

Wood-cement compatibility is the ratio of a parameter related to the property of a wood-cement composite to that of a neat cement paste. The compatibility is often expressed as a percentage value. To determine wood-cement compatibility, methods based on different properties are used, such as, hydration characteristics, strength, interfacial bond and morphology. Various methods are used by researchers such as the measurement of hydration characteristics of a cement-aggregate mix; the comparison of the mechanical properties of cement-aggregate mixes and the visual assessment of microstructural properties of the wood-cement mixes. It has been found that the hydration test by measuring the change in hydration temperature with time is the most convenient method. Recently, Karade et al have reviewed these methods of compatibility assessment and suggested a method based on the 'maturity concept' i.e. taking in consideration both time and temperature of cement hydration reaction.

3.14 Modern industry

Modern building is a multibillion dollar industry, and the production and harvesting of raw materials for building purposes is on a world wide scale, often being a primary governmental and trade keypoint between nations. Environmental concerns are also becoming a major world topic concerning the availability and sustainability of certain materials, and the extraction of such large quantities needed for the human habitat.

3.15 Building products

In the market place the term building products often refers to the ready-made particles/sections, made from various materials, that are fitted in architectural hardware and decorative hardware parts of a building. The list of building products exclusively exclude the building materials, which are used to construct the building architecture and supporting fixtures like windows, doors, cabinets, etc. Building products do not make any part of building a rather they support and make them working in a modular fashion.

It also can refer to items used to put such hardware together such as glues, caulking, paint, and anything else bought for the purpose of constructing a building.

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TEXT 4
STRUCTURAL STEEL

4.1 Steel

Steel construction has so many advantages: the strength to weight ratio is excellent, metals join easily, efficient shapes are available, etc. With those advantages, though, come some challenges that are best solved by a good understanding of how the metals actually perform in a structure.

For most larger buildings, metals are a key element of the structural system. Steel beams and columns, steel joists, steel studs, aluminum framing are a few examples of metal construction. A wise superintendent understands not only how to erect the structure, but also the basics of how the structural system works and the ways in which it fails.

The Kansas City Hyatt Hotel structure spectacularly failed a few years ago, with a suspended walkway crashing to the ground. Many people were hurt and killed. The cause was traced to what seemed to be a minor change made during construction. This minor change, however, was structurally significant, increasing the shear stress well beyond design limits. The lesson learned from the Kansas City Hyatt Regency hotel collapse is that structural steel design, shop drawing review, fabrication and erection must be carefully done, with responsibilities clearly understood.

4.2 Brief History of Steel.

To understand metals, start with iron. As a basic chemical element Fe, iron is the most abundant metal on the earth. For many centuries, iron furnaces have heated limestone and iron ore that was excavated from the ground. The intense heat melts the both the rock and iron ore, along with several chemical reactions and the lighter liquid rock rises to the top and the heavier liquid iron sinks, creating pig iron. This pig iron is an intermediate step on the way to a final product.

Historically, wrought iron was a building product made from this pig iron. The wrought iron was mostly pure iron (with some slag and small amounts of carbon added). Wrought iron was actually "wrought" (i.e. worked or hammered) into bars and has been used as a construction material for thousands of years. Wrought iron is tough and ductile, easy to weld. Lacking the carbon content for tempering, wrought iron is not hard enough to hold a good edge for a tool or weapon.

Other final products from the pig iron are alloys. An alloy is a combination of two or more elements, in which at least one is a metal. Most metals used for construction purposes are alloys. For example, steel is an alloy with iron and carbon being the primary elements. Generally, iron-carbon alloys with up to 2.1% carbon by weight are considered steel and iron-carbon alloys, with greater amounts of carbon are cast iron.

Cast iron is made by re-melting pig iron in a blast furnace, removing undesirable elements like phosphorus and sulfur, adjusting carbon levels and adding other elements. The resulting alloy, commonly called grey cast iron, has a high corrosion resistance and strong compressive strength, but tends to be brittle and difficult to weld. Historically, cannons and cannon balls were made from grey cast iron, as well as some early bridges.

Steel is an alloy that finds tremendous number of uses in today's construction world. Hot rolled steel shapes, most commonly found as steel beams and columns on construction projects, are created in steel mills by rolling the heat steel between large rollers, deforming the steel into the typical shapes: W, S, C, angles, tube sections, pipes, etc. Most hot formed steel is either 36,000 psi or 50,000 psi yield strength.

4.3 Connections in Structural Steel.

Most structural steel failures happen at connections where a beam connects to a column, where a joist connects to a beam, where a hanging rod connects to a beam (the Kansas City Hyatt discussed above). The Structural Engineer must design the steel members and give guidelines for the connections. Many people in the Construction Industry don't understand, though, that the Structural Engineer rarely designs the connections.

Why is that? Historically, the Steel Fabricators developed many different ways to make connections. What one Fabricator did in his shop economically might have been quite an expensive way to do it in a competitor's Fabrication Shop. So the practice developed that the Structural Engineer would size the members, but the Steel Fabricators would design the connections, which the Structural Engineer should then review and approve. If you think that seems like a complicated system prone to error, you'd be correct.

But that is the system we generally have in American construction. So the Construction Supervisor should know something about steel connections and have an idea if they are being installed correctly. A bit of background in Basic Structural Design is helpful, but the main thing to understand is the concept of pin connections versus fixed connections.

A beam bolted to a column with clip angles along the beam web likely creates a pin connection. This means that the beam shouldn't be able to move up or down, nor in or out, but it can rotate a bit. A steel column bolted to a concrete pier with four anchor bolts also typically creates a pin connection. Again the steel column won't go up, down or sideways, but it may be able to rotate a bit.

The fixed connection must stop that ability to rotate. So for a beam to have a fixed connection to a column, along with clip angles, there may be a plate on the top and bottom flanges of the beam that gets welded to the column. With all that welding, the beam can no longer rotate. If a steel column is buried four feet deep in a concrete pier, it also would not be rotating at the point that it exits from the concrete. So those are a couple of ways to create fixed (or moment resisting) connections.

The Construction Supervisor should be aware if any fixed (or moment resisting) connections are required and understand how they are to be made. Just asking the questions increases the likelihood of a successful project.

4.4 Composite Design.

Composite design marries some of steel and concrete's best attributes together for an efficient structural system. Let's start by thinking about a structural system that isn't composite design. Structural steel beams placed at 4' on center with a steel deck spanning perpendicular which will have 4" of concrete placed on top of the steel deck is not a composite system. That means the steel beams will carry their own weight, the weight of the steel deck and concrete above and whatever live load gets applied. The steel deck and the concrete must carry their own weight and the live load spanning from steel beam to steel beam. Another way to state the proposition: the steel beam acts on its own structurally and the steel deck and concrete act on their own structurally.

A composite system ties together that steel beam and concrete floor and forces them to act as a single structural unit. Some connector on top of the steel beam makes the steel and concrete act as one unit. The steel beam can't slide independently of the concrete slab, the two are bonded together. Since the concrete is strong in compression, the composite system can be quite efficient structurally.

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TEXT 5
AUTOMATIVE ENGINEERING

Modern automotive engineering, along with aerospace engineering and marine engineering, is a branch of vehicle engineering, incorporating elements of mechanical, electrical, electronic, software and safety engineering as applied to the design, manufacture and operation of motorcycles, automobiles, buses and trucks and their respective engineering subsystems.

5.1 Product Engineering.

Some of the engineering attributes/disciplines that are of importance to the automotive engineer:

Safety Engineering: Safety Engineering is the assessment of various crash scenarios and their impact on the vehicle occupants. These are tested against very stringent governmental regulations. Some of these requirements include: Seat belt and air bag functionality, front and side impact testing, and resistance to rollover. Assessments are done with various methods and tools: Computer crash simulation (typically Finite element analysis), crash test dummies, partial system sled and full vehicle crashes.

Visualization of how a car deforms in an asymmetrical crash using finite element analysis.

Fuel Economy/Emissions: Fuel economy is the measured fuel efficiency of the vehicle in miles per gallon or litres per 100 kilometers. Emissions testing the measurement of the vehicles emissions: hydrocarbons, nitrogen oxides (NOx), carbon monoxide (CO), carbon dioxide (CO2), and evaporative emissions.

Vehicle Dynamics: Vehicle dynamics is the vehicle's response of the following attributes: ride, handling, steering, braking, and traction. Design of the chassis systems of suspension, steering, braking, structure (frame), wheels and tires, and traction control are highly leveraged by the Vehicle Dynamics engineer to deliver the Vehicle Dynamics qualities desired.

NVH Engineering (Noise, Vibration, and Harshness): NVH is the customer's feedback (both tactile (feel) and audible (hear)) from the vehicle. While sound can be interpreted as a rattle, squeal, or hoot; a tactile response can be seat vibration, or a buzz in the steering wheel. This feedback is generated by components either rubbing, vibrating or rotating. NVH response can be classified in various ways: powertrain NVH, road noise, wind noise, component noise, and squeak and rattle. Note, there are both good and bad NVH qualities. The NVH engineer works to either eliminate bad NVH, or change the “bad NVH” to good (i.e., exhaust tones).

Performance: Performance is a measurable and testable value of a vehicles ability to perform in various conditions. Performance can be considered in a wide variety of tasks, but it's generally associated with how quickly a car can accelerate (i.e. 0-60 mph, 1/4 mile, trap speed, top speed, etc), how short and quickly a car can come to a complete stop from a set distance (i.e. 70-0 mph), how much g-force a car can generate without losing grip, recorded trap lap times, cornering speed, brake fade, etc. Performance can also reflect the amount of control in inclement weather (snow, ice, rain).

Shift Quality: Shift Quality is the driver's perception of the vehicle to an automatic transmission shift event. This is influenced by the powertrain (engine, transmission), and the vehicle (driveline, suspension, engine and powetrain mounts, etc). Shift feel is both a tactile (feel) and audible (hear) response of the vehicle. Shift Quality is experienced as various events: Transmission shifts are felt as an upshift at acceleration (1-2), or a downshift maneuver in passing (4-2). Shift engagements of the vehicle are also evaluated, as in Park to Reverse, etc.

Durability / Corrosion engineering: Durability and Corrosion engineering is the evaluation testing of a vehicle for its useful life. This includes mileage accumulation, severe driving conditions, and corrosive salt baths.

Package / Ergonomics Engineering: Package Engineering is a discipline that designs/analyzes the occupant accommodations (seat roominess), ingress/egress to the vehicle, and the driver's field of vision (gauges and windows). The Package Engineer is also responsible for other areas of the vehicle like the engine compartment, and the component to component placement. Ergonomics is the discipline that assesses the occupant's access to the steering wheel, pedals, and other driver/passenger controls.

Climate Control: Climate Control is the customer's impression of the cabin environment and level of comfort related to the temperature and humidity. From the windshield defrosting to the heating and cooling capacity, all vehicle seating positions are evaluated to a certain level of comfort.

Drivability: Drivability is the vehicle's response to general driving conditions. Cold starts and stalls, RPM dips, idle response, launch hesitations and stumbles, and performance levels.

Cost: The cost of a vehicle program is typically split into the effect on the variable cost of the vehicle, and the up-front tooling and fixed costs associated with developing the vehicle. There are also costs associated with warranty reductions, and marketing.

Program timing: To some extent programs are timed with respect to the market, and also to the production schedules of the assembly plants. Any new part in the design must support the development and manufacturing schedule of the model.

Assembly Feasibility: It is easy to design a module that is hard to assemble, either resulting in damaged units, or poor tolerances. The skilled product development engineer works with the assembly/manufacturing engineers so that the resulting design is easy and cheap to make and assemble, as well as delivering appropriate functionality and appearance.

5.2 Development Engineer.

A Development Engineer is a job function within Automotive Engineering, in which the development engineer has the responsibility for coordinating delivery of the engineering attributes of a complete automobile (bus, car, truck, van, SUV, etc.) as dictated by the automobile manufacturer, governmentel regulations, and the customer who buys the product.

Much like the Systems Engineer, the Development Engineer is concerned with the interactions of all systems in the complete automobile. While there are multiple components and systems in an automobile that have to function as designed, they must also work in harmony with the complete automobile. As an example, the brake system's main function is to provide braking functionality to the automobile. Along with this, it must also provide an acceptable level of: pedal feel (spongy, stiff), brake system “noise” (squeal, shudder, etc), and interaction with the ABS (anti-lock braking system)

Another aspect of the development engineer's job is a trade-off process required to deliver all the automobile attributes at a certain acceptable level. An example of this is the trade-off between engine performance and fuel economy. While some customers are looking for maximum power from their engine, the automobile is still required to deliver an acceptable level of fuel economy. From the engine's perspective, these are opposing requirements. Engine performance is looking for maximum displacement (bigger, more power), while fuel economy is looking for a smaller displacement engine (ex: 1.4 L vs. 5.4 L). The engine size, though is not the only contributing factor to fuel economy and automobile performance. Other attributes include: automobile weight, aerodynamic drag, transmission gearing, emission control devices, and tires.

The Development Engineer is also responsible for organising automobile level testing, validation, and certification. Components and systems are designed and tested individually by the Product Engineer. The final evaluation though, has to be conducted at the automobile level to evaluate system to system interactions. As an example, the audio system (radio) needs to be evaluated at the automobile level. Interaction with other electronic components can cause interference. Heat dissipation of the system and ergonomic placement of the controls need to be evaluated. Sound quality in all seating positions needs to be provided at acceptable levels.

There are also other automotive engineers:

The aerodynamics engineers will often give guidance to the styling studio so that the shapes they design are aerodynamic, as well as attractive.

Body engineers will also let the studio know if it is feasible to make the panels for their designs.

COMPREHENSION

1. Read the text; as your read, note the topic dealt with in each paragraph, underline the topic sentence, key words, and important facts as your go along.

2. Analyze how the facts are connected, how the topic of a paragraph is connected with that of a preceding paragraph.

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TEXT 6
WATER RESOURCES

Water resources are sources of water that are useful or potentially useful. Uses of water include agricultural, industrial, household, recreational and environmental activities. Virtually all of these human uses require fresh water.

97% of the water on the Earth is salt water. Only three percent is fresh water; slightly over two thirds of this is frozen in glaciers and polar ice caps. The remaining unfrozen freshwater is found mainly as groundwater, with only a small fraction present above ground or in the air.

Fresh water is a renewable resource, yet the world's supply of clean, fresh water is steadily decreasing. Water demand already exceeds supply in many parts of the world and as the world population continues to rise, so too does the water demand. Awareness of the global importance of preserving water for ecosystem services has only recently emerged as, during the 20th century, more than half the world's wetlands have been lost along with their valuable environmental services for Water Education. The framework for allocating water resources to water users (where such a framework exists) is known as water rights

6.1 Sources of fresh water.

Surface water is water in a river, lake or fresh water wetland. Surface water is naturally replenished by precipitation and naturally lost through discharge to the oceans, evaporation, evapotranspiration and sub-surface seepage.

Although the only natural input to any surface water system is precipitation within its watershed, the total quantity of water in that system at any given time is also dependent on many other factors. These factors include storage capacity in lakes, wetlands and artificial reservoirs, the permeability of the soil beneath these storage bodies, the runoff characteristics of the land in the watershed, the timing of the precipitation and local evaporation rates. All of these factors also affect the proportions of water lost.

Human activities can have a large and sometimes devastating impact on these factors. Humans often increase storage capacity by constructing reservoirs and decrease it by draining wetlands. Humans often increase runoff quantities and velocities by paving areas and channelizing stream flow.

The total quantity of water available at any given time is an important consideration. Some human water users have an intermittent need for water. For example, many farms require large quantities of water in the spring, and no water at all in the winter. To supply such a farm with water, a surface water system may require a large storage capacity to collect water throughout the year and release it in a short period of time. Other users have a continuous need for water, such as a power plant that requires water for cooling. To supply such a power plant with water, a surface water system only needs enough storage capacity to fill in when average stream flow is below the power plant's need.

Nevertheless, over the long term the average rate of precipitation within a watershed is the upper bound for average consumption of natural surface water from that watershed.

Natural surface water can be augmented by importing surface water from another watershed through a canal or pipeline. It can also be artificially augmented from any of the other sources listed here, however in practice the quantities are negligible. Humans can also cause surface water to be "lost" (i.e. become unusable) through pollution.

Brazil is the country estimated to have the largest supply of fresh water in the world, followed by Russia and Canada.

6.2 Under river flow.

Throughout the course of a river, the total volume of water transported downstream will often be a combination of the visible free water flow together with a substantial contribution flowing through sub-surface rocks and gravels that underlie the river and its floodplain called the hyporheic zone. For many rivers in large valleys, this unseen component of flow may greatly exceed the visible flow. The hyporheic zone often forms a dynamic interface between surface water and true ground-water receiving water from the ground water when aquifers are fully charged and contributing water to ground-water when ground waters are depleted. This is especially significant in karst areas where pot-holes and underground river are common.

6.3 Ground water.

Sub-surface water, or groundwater, is fresh water located in the pore space of soil and rocks. It is also water that is flowing within aquifers below the water table. Sometimes it is useful to make a distinction between sub-surface water that is closely associated with surface water and deep sub-surface water in an aquifer (sometimes called "fossil water").

Sub-surface water can be thought of in the same terms as surface water: inputs, outputs and storage. The critical difference is that due to its slow rate of turnover, sub-surface water storage is generally much larger compared to inputs than it is for surface water. This difference makes it easy for humans to use sub-surface water unsustainably for a long time without severe consequences. Nevertheless, over the long term the average rate of seepage above a sub-surface water source is the upper bound for average consumption of water from that source.

The natural input to sub-surface water is seepage from surface water. The natural outputs from sub-surface water are springs and seepage to the oceans.

If the surface water source is also subject to substantial evaporation, a sub-surface water source may become saline. This situation can occur naturally under endorheic bodies of water, or artificially under irrigated farmland. In coastal areas, human use of a sub-surface water source may cause the direction of seepage to ocean to reverse which can also cause soil salinization. Humans can also cause sub-surface water to be "lost" (i.e. become unusable) through pollution. Humans can increase the input to a sub-surface water source by building reservoirs or detention ponds.

6.4 Desalination.

Desalination is an artificial process by which saline water (generally sea water) is converted to fresh water. The most common desalination processes are distillation and reverse osmosis. Desalination is currently expensive compared to most alternative sources of water, and only a very small fraction of total human use is satisfied by desalination. It is only economically practical for high-valued uses (such as household and industrial uses) in arid areas. The most extensive use is in the Persian Gulf.

6.5 Frozen water.

Several schemes have been proposed to make use of icebergs as a water source, however to date this has only been done for novelty purposes. Glacier runoff is considered to be surface water.

The Himalayas, which are often called "The Roof of the World", contain some of the most extensive and rough high altitude areas on Earth as well as the greatest area of glaciers and permafrost outside of the poles. Ten of Asia's largest rivers flow from there, and more than a billion people's livelihoods depend on them. To complicate matters, temperatures are rising more rapidly here than the global average. In Nepal the temperature has risen with 0.6 degree over the last decade, whereas the global warming has been around 0.7 over the last hundred years.

6.6 Uses of fresh water.

Uses of fresh water can be categorized as consumptive and non-consumptive (sometimes called "renewable"). A use of water is consumptive if that water is not immediately available for another use. Losses to sub-surface seepage and evaporation are considered consumptive, as is water incorporated into a product (such as farm produce). Water that can be treated and returned as surface water, such as sewage, is generally considered non-consumptive if that water can be put to additional use. Water use in power generation and industry is generally described using an alternate terminology, focusing on separate measurements of withdrawal and consumption. Withdrawal describes the removal of water from the environment, while consumption describes the conversion of fresh water into some other form, such as atmospheric water vapor or contaminated waste water.

6.7 Agricultural water use.

It is estimated that 69% of worldwide water use is for irrigation, with 15-35% of irrigation withdrawals being unsustainable. It takes around 3,000 litres of water, converted from liquid to vapour, to produce enough food to satisfy one person's daily dietary need. This is a considerable amount, when compared to that required for drinking, which is between two and five litres. To produce food for the now over 7 billion people who inhabit the planet today requires the water that would fill a canal ten metres deep, 100 metres wide and 7.1 million kilometres long – that's enough to circle the globe 180 times.

Fifty years ago, the common perception was that water was an infinite resource. At this time, there were fewer than half the current number of people on the planet. People were not as wealthy as today, consumed fewer calories and ate less meat, so less water was needed to produce their food. They required a third of the volume of water we presently take from rivers. Today, the competition for water resources is much more intense. This is because there are now seven billion people on the planet, their consumption of water-thirsty meat and vegetables is rising, and there is increasing competition for water from industry, urbanisation biofuel crops, and water reliant food items. In future, even more water will be needed to produce food because the Earth's population is forecast to rise to 9 billion by 2050. An additional 2.5 or 3 billion people, choosing to eat fewer cereals and more meat and vegetables could add an additional five million kilometres to the virtual canal mentioned above.

An assessment of water management in agriculture was conducted in 2007 by the International Water Management Institute in Sri Lanka to see if the world had sufficient water to provide food for its growing population. It assessed the current availability of water for agriculture on a global scale and mapped out locations suffering from water scarcity. It found that a fifth of the world's people, more than 1.2 billion, live in areas of physical water scarcity, where there is not enough water to meet all demands. One third of the worlds population does not have access to clean drinking water, which is more than 2.3 billion people. A further 1.6 billion people live in areas experiencing economic water scarcity, where the lack of investment in water or insufficient human capacity make it impossible for authorities to satisfy the demand for water. The report found that it would be possible to produce the food required in future, but that continuation of today's food production and environmental trends would lead to crises in many parts of the world. To avoid a global water crisis, farmers will have to strive to increase productivity to meet growing demands for food, while industry and cities find ways to use water more efficiently.

In some areas of the world irrigation is necessary to grow any crop at all, in other areas it permits more profitable crops to be grown or enhances crop yield. Various irrigation methods involve different trade-offs between crop yield, water consumption and capital cost of equipment and structures. Irrigation methods such as furrow and overhead sprinkler irrigation are usually less expensive but are also typically less efficient, because much of the water evaporates, runs off or drains below the root zone. Other irrigation methods considered to be more efficient include drip or trickle irrigation, surge irrigation, and some types of sprinkler systems where the sprinklers are operated near ground level. These types of systems, while more expensive, usually offer greater potential to minimize runoff, drainage and evaporation. Any system that is improperly managed can be wasteful, all methods have the potential for high efficiencies under suitable conditions, appropriate irrigation timing and management. Some issues that are often insufficiently considered are salinization of sub-surface water and contaminant accumulation leading to water quality declines.

As global populations grow, and as demand for food increases in a world with a fixed water supply, there are efforts under way to learn how to produce more food with less water, through improvements in irrigation methods and technologies, agricultural water management, crop types, and water monitoring. Aquaculture is a small but growing agricultural use of water. Freshwater commercial fisheries may also be considered as agricultural uses of water, but have generally been assigned a lower priority than irrigation.

6.8 Industrial water use.

It is estimated that 22% of worldwide water use is industrial. Major industrial users include hydroelectric dams, thermoelectric power plants, which use water for cooling, ore and oil refineries, which use water in chemical processes, and manufacturing plants, which use water as a solvent. Water withdrawal can be very high for certain industries, but consumption is generally much lower than that of agriculture.

Water is used in renewable power generation. Hydroelectric power derives energy from the force of water flowing downhill, driving a turbine connected to a generator. This hydroelectricity is a low-cost, non-polluting, renewable energy source. Significantly, hydroelectric power can also be used for load following unlike most renewable energy sources which are intermittent. Ultimately, the energy in a hydroelectric power plant is supplied by the sun. Heat from the sun evaporates water, which condenses as rain in higher altitudes and flows downhill. Pumped-storage hydroelectric plants also exist, which use grid electricity to pump water uphill when demand is low, and use the stored water to produce electricity when demand is high.

Hydroelectric power plants generally require the creation of a large artificial lake. Evaporation from this lake is higher than evaporation from a river due to the larger surface area exposed to the elements, resulting in much higher water consumption. The process of driving water through the turbine and tunnels or pipes also briefly removes this water from the natural environment, creating water withdrawal. The impact of this withdrawal on wildlife varies greatly depending on the design of the power plant.

Pressurized water is used in water blasting and water jet cutters. Also, very high pressure water guns are used for precise cutting. It works very well, is relatively safe, and is not harmful to the environment. It is also used in the cooling of machinery to prevent overheating, or prevent saw blades from overheating. This is generally a very small source of water consumption relative to other uses.

Water is also used in many large scale industrial processes, such as thermoelectric power production, oil refining, fertilizer production and other chemical plant use, and natural gas extraction from shale rock. Discharge of untreated water from industrial uses is pollution. Pollution includes discharged solutes (chemical pollution) and increased water temperature (thermal pollution). Industry requires pure water for many applications and utilizes a variety of purification techniques both in water supply and discharge. Most of this pure water is generated on site, either from natural freshwater or from municipal grey water. Industrial consumption of water is generally much lower than withdrawal, due to laws requiring industrial grey water to be treated and returned to the environment. Thermoelectric power plants using cooling towers have high consumption, nearly equal to their withdrawal, as most of the withdrawn water is evaporated as part of the cooling process. The withdrawal, however, is lower than in once-through cooling systems.

6.9 Drinking water.

It is estimated that 8% of worldwide water use is for household purposes. These include drinking water, bathing, cooking, sanitation, and gardening. Basic household water requirements have been estimated by Peter Gleick at around 50 liters per person per day, excluding water for gardens. Drinking water is water that is of sufficiently high quality so that it can be consumed or used without risk of immediate or long term harm. Such water is commonly called potable water. In most developed countries, the water supplied to households, commerce and industry is all of drinking water standard even though only a very small proportion is actually consumed or used in food preparation.

6.10 Recreation water use.

Recreational water use is usually a very small but growing percentage of total water use. Recreational water use is mostly tied to reservoirs. If a reservoir is kept fuller than it would otherwise be for recreation, then the water retained could be categorized as recreational usage. Release of water from a few reservoirs is also timed to enhance whitewater boating, which also could be considered a recreational usage. Other examples are anglers, water skiers, nature enthusiasts and swimmers.

Recreational usage is usually non-consumptive. Golf courses are often targeted as using excessive amounts of water, especially in drier regions. It is, however, unclear whether recreational irrigation (which would include private gardens) has a noticeable effect on water resources. This is largely due to the unavailability of reliable data. Additionally, many golf courses utilize either primarily or exclusively treated effluent water, which has little impact on potable water availability.

Some governments, including the Californian Government, have labelled golf course usage as agricultural in order to deflect environmentalists' charges of wasting water. However, using the above figures as a basis, the actual statistical effect of this reassignment is close to zero. In Arizona, an organized lobby has been established in the form of the Golf Industry Association, a group focused on educating the public on how golf impacts the environment.

Recreational usage may reduce the availability of water for other users at specific times and places. For example, water retained in a reservoir to allow boating in the late summer is not available to farmers during the spring planting season. Water released for whitewater rafting may not be available for hydroelectric generation during the time of peak electrical demand.

6.11 Environmental water use.

Explicit environmental water use is also a very small but growing percentage of total water use. Environmental water may include water stored in impoundments and released for environmental purposes (held environmental water), but more often is water retained in waterways through regulatory limits of abstraction. Environmental water usage includes watering of natural or artificial wetlands, artificial lakes intended to create wildlife habitat, fish ladders, and water releases from reservoirs timed to help fish spawn, or to restore more natural flow regimes

Like recreational usage, environmental usage is non-consumptive but may reduce the availability of water for other users at specific times and places. For example, water release from a reservoir to help fish spawn may not be available to farms upstream, and water retained in a river to maintain waterway health would not be available to water abstractors downstream.

6.12 Water crisis and water stress.

The concept of water stress is relatively simple. According to the World Business Council for Sustainable Development, it applies to situations where there is not enough water for all uses, whether agricultural, industrial or domestic. Defining thresholds for stress in terms of available water per capita is more complex, however, entailing assumptions about water use and its efficiency. Nevertheless, it has been proposed that when annual per capita renewable freshwater availability is less than 1,700 cubic meters, countries begin to experience periodic or regular water stress. Below 1,000 cubic meters, water scarcity begins to hamper economic development and human health and well-being.

In 2000, the world population was 6.2 billion. The UN estimates that by 2050 there will be an additional 3.5 billion people with most of the growth in developing countries that already suffer water stress. Thus, water demand will increase unless there are corresponding increases in water conservation and recycling of this vital resource. In building on the data presented here by the UN, the World Bank goes on to explain that access to water for producing food will be one of the main challenges in the decades to come. Access to water will need to be balanced with the importance of managing water itself in a sustainable way while taking into account the impact of climate change, and other environmental and social variables.

Business activity ranging from industrialization to services such as tourism and entertainment continues to expand rapidly. This expansion requires increased water services including both supply and sanitation, which can lead to more pressure on water resources and natural ecosystems.

The trend towards urbanization is accelerating. Small private wells and septic tanks that work well in low-density communities are not feasible within high-density urban areas. Urbanization requires significant investment in water infrastructure in order to deliver water to individuals and to process the concentrations of wastewater – both from individuals and from business. These polluted and contaminated waters must be treated or they pose unacceptable public health risks.

In 60% of European cities with more than 100,000 people, ground water is being used at a faster rate than it can be replenished. Even if some water remains available, it costs more and more to capture it.

Climate change could have significant impacts on water resources around the world because of the close connections between the climate and hydrological cycle. Rising temperatures will increase evaporation and lead to increases in precipitation, though there will be regional variations in rainfall. Overall, the global supply of freshwater will increase. Both droughts and floods may become more frequent in different regions at different times, and dramatic changes in snowfall and snow melt are expected in mountainous areas. Higher temperatures will also affect water quality in ways that are not well understood. Possible impacts include increased eutrophication. Climate change could also mean an increase in demand for farm irrigation, garden sprinklers, and perhaps even swimming pools. There is now ample evidence that increased hydrologic variability and change in climate has and will continue have a profound impact on the water sector through the hydrologic cycle, water availability, water demand, and water allocation at the global, regional, basin, and local levels.

There is now ample evidence that increased hydrologic variability and change in climate has and will continue to have a profound impact on the water sector through the hydrologic cycle, water availability, water demand, and water allocation at global, regional, basin, and local levels.

Due to the expanding human population, competition for water is growing such that many of the world major aquifers are becoming depleted. This is due both for direct human consumption as well as agricultural irrigation by groundwater. Millions of pumps of all sizes are currently extracting groundwater throughout the world. Irrigation in dry areas such as northern China and India is supplied by groundwater, and is being extracted at an unsustainable rate. Cities that have experienced aquifer drops between 10 to 50 meters include Mexico City, Bangkok, Manila, Beijing, Madras and Shanghai.

6.13 Pollution and water protection.

Water pollution is one of the main concerns of the world today. The governments of numerous countries have striven to find solutions to reduce this problem. Many pollutants threaten water supplies, but the most widespread, especially in developing countries, is the discharge of raw sewage into natural waters; this method of sewage disposal is the most common method in underdeveloped countries, but also is prevalent in quasi-developed countries such as China, India and Iran. Sewage, sludge, garbage, and even toxic pollutants are all dumped into the water. Even if sewage is treated, problems still arise. Treated sewage forms sludge, which may be placed in landfills, spread out on land, incinerated or dumped at sea. In addition to sewage, nonpoint source pollution such as agricultural runoff is a significant source of pollution in some parts of the world, along with urban storm water runoff and chemical wastes dumped by industries and governments.

Over the past 25 years, politicians, academics and journalists have frequently predicted that disputes over water would be a source of future wars. Commonly cited quotes include: that of former Egyptian Foreign Minister and former Secretary-General of the United Nations Boutrous Ghali, who forecast, “The next war in the Middle East will be fought over water, not politics”; his successor at the UN, Kofi Annan, who in 2001 said, “Fierce competition for fresh water may well become a source of conflict and wars in the future,” and the former Vice President of the World Bank, Ismail Serageldin, who said the wars of the next century will be over water unless significant changes in governance occurred. The water wars hypothesis had its roots in earlier research carried out on a small number of trans boundary rivers such as the Indus, Jordan and Nile. These particular rivers became the focus because they had experienced water-related disputes. Specific events cited as evidence include Israel's bombing of Syria's attempts to divert the Jordan's headwaters, and military threats by Egypt against any country building dams in the upstream waters of the Nile. However, while some links made between conflict and water were valid, they did not necessarily represent the norm.

The only known example of an actual inter-state conflict over water took place between 2500 and 2350 BC between the Sumerian states of Lagash and Umma. Water stress has most often led to conflicts at local and regional levels. Tensions arise most often within national borders, in the downstream areas of distressed river basins. Areas such as the lower regions of China's Yellow River or the Chao Phraya River in Thailand, for example, have already been experiencing water stress for several years. Water stress can also exacerbate conflicts and political tensions which are not directly caused by water. Gradual reductions over time in the quality and/or quantity of fresh water can add to the instability of a region by depleting the health of a population, obstructing economic development, and exacerbating larger conflicts.

Water resources that span international boundaries, are more likely to be a source of collaboration and cooperation, than war. Scientists working at the International Water Management Institute, in partnership with Aaron Wolf at Oregon State University, have been investigating the evidence behind water war predictions. Their findings show that, while it is true there has been conflict related to water in a handful of international basins, in the rest of the world's approximately 300 shared basins the record has been largely positive. This is exemplified by the hundreds of treaties in place guiding equitable water use between nations sharing water resources. The institutions created by these agreements can, in fact, be one of the most important factors in ensuring cooperation rather than conflict.

The International Union for the Conservation of Nature (IUCN) published the book Share: Managing water across boundaries. One chapter covers the functions of trans-boundary institutions and how they can be designed to promote cooperation, overcome initial disputes and find ways of coping with the uncertainty created by climate change. It also covers how the effectiveness of such institutions can be monitored.

6.14 World water supply and distribution.

Food and water are two basic human needs. However, global coverage figures from 2002 indicate that, of every 10 people:

roughly 5 have a connection to a piped water supply at home (in their dwelling, plot or yard);

3 make use of some other sort of improved water supply, such as a protected well or public standpipe;

2 are unserved;

In addition, 4 out of every 10 people live without improved sanitation.

At Earth Summit 2002 governments approved a Plan of Action to:

Halve by 2015 the proportion of people unable to reach or afford safe drinking water. The Global Water Supply and Sanitation Assessment 2000 Report (GWSSAR) defines "Reasonable access" to water as at least 20 liters per person per day from a source within one kilometer of the user's home.

Halve the proportion of people without access to basic sanitation. The GWSSR defines "Basic sanitation" as private or shared but not public disposal systems that separate waste from human contact.

In 2025, water shortages will be more prevalent among poorer countries where resources are limited and population growth is rapid, such as the Middle East, Africa, and parts of Asia. By 2025, large urban and peri-urban areas will require new infrastructure to provide safe water and adequate sanitation. This suggests growing conflicts with agricultural water users, who currently consume the majority of the water used by humans.

Generally speaking the more developed countries of North America, Europe and Russia will not see a serious threat to water supply by the year 2025, not only because of their relative wealth, but more importantly their populations will be better aligned with available water resources. North Africa, the Middle East, South Africa and northern China will face very severe water shortages due to physical scarcity and a condition of overpopulation relative to their carrying capacity with respect to water supply. Most of South America, Sub-Saharan Africa, Southern China and India will face water supply shortages by 2025; for these latter regions the causes of scarcity will be economic constraints to developing safe drinking water, as well as excessive population growth.

1.6 billion people have gained access to a safe water source since 1990. The proportion of people in developing countries with access to safe water is calculated to have improved from 30 percent in 1970 to 71 percent in 1990, 79 percent in 2000 and 84 percent in 2004. This trend is projected to continue.

Water supply and sanitation require a huge amount of capital investment in infrastructure such as pipe networks, pumping stations and water treatment works. It is estimated that Organisation for Economic Cooperation and Development (OECD) nations need to invest at least USD 200 billion per year to replace aging water infrastructure to guarantee supply, reduce leakage rates and protect water quality.

International attention has focused upon the needs of the developing countries. To meet the Millennium Development Goals targets of halving the proportion of the population lacking access to safe drinking water and basic sanitation by 2015, current annual investment on the order of USD 10 to USD

15 billion would need to be roughly doubled. This does not include investments required for the maintenance of existing infrastructure.

Once infrastructure is in place, operating water supply and sanitation systems entails significant ongoing costs to cover personnel, energy, chemicals, maintenance and other expenses. The sources of money to meet these capital and operational costs are essentially either user fees, public funds or some combination of the two.

But this is where the economics of water management start to become extremely complex as they intersect with social and broader economic policy. Such policy questions are beyond the scope of this article, which has concentrated on basic information about water availability and water use. They are, nevertheless, highly relevant to understanding how critical water issues will affect business and industry in terms of both risks and opportunities.

The World Business Council for Sustainable Development in its H_2O Scenarios engaged in a scenario building process to:

Clarify and enhance understanding by business of the key issues and drivers of change related to water.

Promote mutual understanding between the business community and non-business stakeholders on water management issues.

Support effective business action as part of the solution to sustainable water management.

It concludes that:

Business cannot survive in a society that thirsts.

One does not have to be in the water business to have a water crisis.

Business is part of the solution, and its potential is driven by its engagement.

Growing water issues and complexity will drive up costs.

COMPREHENSION

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TEXT 7
WATER SUPPLY

Water supply is the provision of water by public utilities, commercial organisations, community endeavours or by individuals, usually via a system of pumps and pipes.

In 2010 about 84% of the global population (6.74 billion people) had access to piped water supply through house connections or to an improved water source through other means than house, including standpipes, "water kiosks", protected springs and protected wells. However, about 14% (884 million people) did not have access to an improved water source and had to use unprotected wells or springs, canals, lakes or rivers for their water needs.

A clean water supply, especially so with regard to sewage, is the single most important determinant of public health. Destruction of water supply and/or sewage disposal infrastructure after major catastrophes (earthquakes, floods, war, etc.) poses the immediate threat of severe epidemics of waterborne diseases, several of which can be life-threatening.

7.1 Technical overview.

Water supply systems get water from a variety of locations, including groundwater (aquifers), surface water (lakes and rivers), conservation and the sea through desalination. The water is then, in most cases, purified, disinfected through chlorination and sometimes fluoridated. Treated water then either flows by gravity or is pumped to reservoirs, which can be elevated such as water towers or on the ground. Once water is used, wastewater is typically discharged in a sewer system and treated in a wastewater treatment plant before being discharged into a river, lake or the sea or reused for landscaping, irrigation or industrial use.

7.2 Service quality.

Many of the 3.5 billion people having access to piped water receive a poor or very poor quality of service, especially in developing countries where about 80% of the world population lives. Water supply service quality has many dimensions: continuity water quality pressure and the degree of responsiveness of service providers to customer complaints

Continuity of water supply is taken for granted in most developed countries, but is a severe problem in many developing countries, where sometimes water is only provided for a few hours every day or a few days a week. It is estimated that about half of the population of developing countries receives water on an intermittent basis.

7.3 Water quality and water pressure.

Drinking water quality has a micro-biological and a physico-chemical dimension. There are thousands of parameters of water quality. In public water supply systems water should, at a minimum, be disinfected-most commonly through the use of chlorination or the use of ultra violet light-or it may need to undergo treatment, especially in the case of surface water.

Water pressures vary in different locations of a distribution system. Water mains below the street may operate at higher pressures, with a pressure reducer located at each point where the water enters a building or a house. In poorly managed systems, water pressure can be so low as to result only in a trickle of water or so high that it leads to damage to plumbing fixtures and waste of water. Pressure in an urban water system is typically maintained either by a pressurized water tank serving an urban area, by pumping the water up into a tower and relying on gravity to maintain a constant pressure in the system or solely by pumps at the water treatment plant and repeater pumping stations.

Typical UK pressures are 4–5 bar for an urban supply. However, some people can get over eight bars or below one bar. A single iron main pipe may cross a deep valley, it will have the same nominal pressure, however each consumer will get a bit more or less because of the hydrostatic pressure (about 1 bar/10 m height). So people at the bottom of a 100-foot (30 m) hill will get about 3 bars more than those at the top.

The effective pressure also varies because of the supply resistance even for the same static pressure. An urban consumer may have 5 metres of ½-inch lead pipe running from the iron main, so the kitchen tap flow will be fairly unrestricted, so high flow. A rural consumer may have a kilometre of rusted and limed ¾" iron pipe, so their kitchen tap flow will be small.

For this reason the UK domestic water system has traditionally (prior to 1989) employed a "cistern feed" system, where the incoming supply is connected to the kitchen sink and also a header/storage tank in the attic. Water can dribble into this tank through a ½" lead pipe, plus ball valve, and then supply the house on 22 or 28 mm pipes. Gravity water has a small pressure (say ¼ bar in the bathroom) but needs wide pipes allow higher flows. This is fine for baths and toilets but is frequently inadequate for showers. People install shower booster pumps to increase the pressure. For this reason urban houses are increasingly using mains pressure boilers (combies) which take a long time to fill a bath but suit the high back pressure of a shower.

7.4 Comparing the performance of water and sanitation service providers.

Comparing the performance of water and sanitation service providers (utilities) is needed, because the sector offers limited scope for direct competition (natural monopoly). Firms operating in competitive markets are under constant pressure to out perform each other. Water utilities are often sheltered from this pressure, and it frequently shows: some utilities are on a sustained improvement track, but many others keep falling further behind best practice. Benchmarking the performance of utilities allows to simulate competition, establish realistic targets for improvement and create pressure to catch up with better utilities. Information on benchmarks for water and sanitation utilities is provided by the International Benchmarking Network for Water and Sanitation Utilities.

A great variety of institutions have responsibilities in water supply. A basic distinction is between institutions responsible for policy and regulation on the one hand; and institutions in charge of providing services on the other hand.

7.5 Policy and regulation.

Water supply policies and regulation are usually defined by one or several Ministries, in consultation with the legislative branch. In the United States the United States Environmental Protection Agency, whose administrator reports directly to the President, is responsible for water and sanitation policy and standard setting within the executive branch. In other countries responsibility for sector policy is entrusted to a Ministry of Environment (such as in Mexico and Colombia), to a Ministry of Health (such as in Panama, Honduras and Uruguay), a Ministry of Public Works (such as in Ecuador and Haiti), a Ministry of Economy (such as in German states) or a Ministry of Energy (such as in Iran). A few countries, such as Jordan and Bolivia, even have a Ministry of Water. Often several Ministries share responsibilities for water supply. In the European Union, important policy functions have been entrusted to the supranational level. Policy and regulatory functions include the setting of tariff rules and the approval of tariff increases; setting, monitoring and enforcing norms for quality of service and environmental protection; benchmarking the performance of service providers; and reforms in the structure of institutions responsible for service provision. The distinction between policy functions and regulatory functions is not always clear-cut. In some countries they are both entrusted to Ministries, but in others regulatory functions are entrusted to agencies that are separate from Ministries.

7.6 Regulatory agencies.

Dozens of countries around the world have established regulatory agencies for infrastructure services, including often water supply and sanitation, in order to better protect consumers and to improve efficiency. Regulatory agencies can be entrusted with a variety of responsibilities, including in particular the approval of tariff increases and the management of sector information systems, including benchmarking systems. Sometimes they also have a mandate to settle complaints by consumers that have not been dealt with satisfactorily by service providers. These specialized entities are expected to be more competent and objective in regulating service providers than departments of government Ministries. Regulatory agencies are supposed to be autonomous from the executive branch of government, but in many countries have often not been able to exercise a great degree of autonomy. In the United States regulatory agencies for utilities have existed for almost a century at the level of states, and in Canada at the level of provinces. In both countries they cover several infrastructure sectors. In many US states they are called Public Utility Commissions. For England and Wales, a regulatory agency for water was created as part of the privatization of the water industry in 1989. In many developing countries, water regulatory agencies were created during the 1990s in parallel with efforts at increasing private sector participation.

Many countries do not have regulatory agencies for water. In these countries service providers are regulated directly by local government, or the national government. This is, for example, the case in the countries of continental Europe, in China and India.

7.7 Service provision.

Water supply service providers, which are often utilities, differ from each other in terms of their geographical coverage relative to administrative boundaries; their sectoral coverage; their ownership structure; and their governance arrangements.

Many water utilities provide services in a single city, town or municipality.

However, in many countries municipalities have associated in regional or inter-municipal or multi-jurisdictional utilities to benefit from economies of scale. In the United States these can take the form of special-purpose districts which may have independent taxing authority. An example of a multi-jurisdictional water utility in the United States is WASA, a utility serving Washington, DC and various localities in the state of Maryland. Multi-jurisdictional utilities are also common in Germany, where they are known as "Zweckverbaende", in France and in Italy.

In some federal countries there are water service providers covering most or all cities and towns in an entire state, such as in all states of Brazil and some states in Mexico. In England and Wales, water supply and sewerage is supplied almost entirely through ten regional companies. Some smaller countries, especially developed countries, have established service providers that cover the entire country or at least most of its cities and major towns. Such national service providers are especially prevalent in West Africa and Central America, but also exist, for example, in Tunisia, Jordan and Uruguay. In rural areas, where about half the world population lives, water services are often not provided by utilities, but by community-based organizations which usually cover one or sometimes several villages.

7.8 Sector coverage.

Some water utilities provide only water supply services, while sewerage is under the responsibility of a different entity. This is for example the case in Tunisia. However, in most cases water utilities also provide sewer and wastewater treatment services. In some cities or countries utilities also distribute electricity. In a few cases such multi-utilities also collect solid waste and provide local telephone services. An example of such an integrated utility can be found in the Colombian city of Medellín. Utilities that provide water, sanitation and electricity can be found in Frankfurt, Germany, in Casablanca, Morocco and in Gabon in West Africa. Multi-utilities provide certain benefits such as common billing and the option to cross-subsidize water services with revenues from electricity sales, if permitted by law.

7.9 Ownership and governance arrangements.

Water supply providers can be either public, private, mixed or cooperative. Most urban water supply services around the world are provided by public entities. As Willem-Alexander, Prince of Orange (2002) stated, "The water crisis that is affecting so many people is mainly a crisis of governance - not of water scarcity." The introduction of cost-reflective tariffs together with cross-subsidisation between richer and poorer consumers is an essential governance reform in order to reduce the high levels of Unaccounted or Water (UAW) and to provide the finance needed to extend the network to those poorest households who remain unconnected. Partnership arrangements between the public and private sector can play an important role in order to achieve this objective

7.10 Private sector participation.

An estimated 10 percent of urban water supply is provided by private or mixed public-private companies, usually under concessions, leases or management contracts. Under these arrangements the public entity that is legally responsible for service provision delegates certain or all aspects of service provision to the private service provider for a period typically ranging from 4 to 30 years. The public entity continues to own the assets. These arrangements are common in France and in Spain. Only in few parts of the world water supply systems have been completely sold to the private sector (privatization), such as in England and Wales as well as in Chile. The largest private water companies in the world are Suez and Veolia Environment from France; Aguas de Barcelona from Spain; and Thames Water from the UK, all of which are engaged internationally.

7.11 Public water service provision.

90% of urban water supply and sanitation services are currently in the public sector. They are owned by the state or local authorities, or also by collectives or cooperatives. They run without an aim for profit but are based on the ethos of providing a common good considered to be of public interest. In most middle and low-income countries, these publicly-owned and managed water providers can be inefficient as a result of political interference, leading to over-staffing and low labour productivity. Ironically, the main losers from this institutional arrangement are the urban poor in these countries. Because they are not connected to the network, they end up paying far more per litre of water than do more well-off households connected to the network who benefit from the implicit subsidies that they receive from loss-making utilities. We are still so far from achieving universal access to clean water and sanitation shows that public water authorities, in their current state, are not working well enough. Yet some are being very successful and are modeling the best forms of public management. As Ryutaro Hashimoto, former Japanese Prime Minister, notes: "Public water services currently provide more than 90 per cent of water supply in the world. Modest improvement in public water operators will have immense impact on global provision of services."

7.12 Governance arrangements.

Governance arrangements for both public and private utilities can take many forms. Governance arrangements define the relationship between the service provider, its owners, its customers and regulatory entities. They determine the financial autonomy of the service provider and thus its ability to maintain its assets, expand services, attract and retain qualified staff, and ultimately to provide high-quality services. Key aspects of governance arrangements are the extent to which the entity in charge of providing services is insulated from arbitrary political intervention; and whether there is an explicit mandate and political will to allow the service provider to recover all or at least most of its costs through tariffs and retain these revenues. If water supply is the responsibility of a department that is integrated in the administration of a city, town or municipality, there is a risk that tariff revenues are diverted for other purposes. In some cases, there is also a risk that staff are appointed mainly on political grounds rather than based on their professional credentials.

7.13 Tariffs.

Almost all service providers in the world charge tariffs to recover part of their costs. According to estimates by the World Bank the average global water tariff is US$ 0.53 per cubic meter. In developed countries the average tariff is US$ 1.04, while it is only U$ 0.11 in the poorest developing countries. The lowest tariffs in developing countries are found in South Asia (US$ 0.09/m3), while the highest are found in Latin America (US$ 0.41/m3) Data for 132 cities were assessed. The tariff is estimate for a consumption level of 15 cubic meters per month. Few utilities do recover all their costs. According to the same World Bank study only 30% of utilities globally, and only 50% of utilities in developed countries, generate sufficient revenue to cover operation, maintenance and partial capital costs.

According to another study undertaken in 2006 by NUS Consulting, the average water and sewerage tariff in 14 mainly OECD countries excluding VAT varied between US$ 0.66 per cubic meter in the United States and the equivalent of US$ 2.25 per cubic meter in Denmark. However, water consumption is much higher in the US than in Europe. Therefore, residential water bills may be very similar, even if the tariff per unit of consumption tends to be higher in Europe than in the US.

A typical family on the US East Coast paid between US$30 and US$70 per month for water and sewer services in 2005.

In developing countries, tariffs are usually much further from covering costs. Residential water bills for a typical consumption of 15 cubic meters per month vary between less than US$ 1 and US$ 12 per month.

Water and sanitation tariffs, which are almost always billed together, can take many different forms. Where meters are installed, tariffs are typically volumetric (per usage), sometimes combined with a small monthly fixed charge. In the absence of meters, flat or fixed rates – which are independent of actual consumption – are being charged. In developed countries, tariffs are usually the same for different categories of users and for different levels of consumption.

In developing countries, the situation is often characterized by cross-subsidies with the intent to make water more affordable for residential low-volume users that are assumed to be poor. For example, industrial and commercial users are often charged higher tariffs than public or residential users. Also, metered users are often charged higher tariffs for higher levels of consumption (increasing-block tariffs). However, cross-subsidies between residential users do not always reach their objective. Given the overall low level of water tariffs in developing countries even at higher levels of consumption, most consumption subsidies benefit the wealthier segments of society. Also, high industrial and commercial tariffs can provide an incentive for these users to supply water from other sources than the utility (own wells, water tankers) and thus actually erode the utility's revenue base.

7.14 Water metering and water meter.

Metering of water supply is usually motivated by one or several of four objectives:

First, it provides an incentive to conserve water which protects water resources (environmental objective).

Second, it can postpone costly system expansion and saves energy and chemical costs (economic objective).

Third, it allows a utility to better locate distribution losses (technical objective).

Fourth, it allows to charge for water based on use, which is perceived by many as the fairest way to allocate the costs of water supply to users. Metering is considered good practice in water supply and is widespread in developed countries, except for the United Kingdom. In developing countries it is estimated that half of all urban water supply systems are metered and the tendency is increasing.

Water meters are read by one of several methods:

the water customer writes down the meter reading and mails in a postcard with this info to the water department;

the water customer writes down the meter reading and uses a phone dial-in system to transfer this info to the water department;

the water customer logs in to the website of the water supply company, enters the address, meter ID and meter readings;

a meter reader comes to the premise and enters the meter reading into a handheld computer;

the meter reading is echoed on a display unit mounted to the outside of the premise, where a meter reader records them;

a small radio is hooked up to the meter to automatically transmit readings to corresponding receivers in handheld computers, utility vehicles or distributed collectors;

a small computer is hooked up to the meter that can either dial out or receive automated phone calls that give the reading to a central computer system.

Most cities are increasingly installing Automatic Meter Reading (AMR) systems to prevent fraud, to lower ever-increasing labor and liability costs and to improve customer service and satisfaction.

7.15 Costs and financing.

The cost of supplying water consists to a very large extent of fixed costs (capital costs and personnel costs) and only to a small extent of variable costs that depend on the amount of water consumed (mainly energy and chemicals). The full cost of supplying water in urban areas in developed countries is about US$1–2 per cubic meter depending on local costs and local water consumption levels. The cost of sanitation (sewerage and wastewater treatment) is another US$1–2 per cubic meter. These costs are somewhat lower in developing countries. Throughout the world, only part of these costs is usually billed to consumers, the remainder being financed through direct or indirect subsidies from local, regional or national governments.

Besides subsidies water supply investments are financed through internally generated revenues as well as through debt. Debt financing can take the form of credits from commercial Banks, credits from international financial institutions such as the World Bank and regional development banks (in the case of developing countries), and bonds (in the case of some developed countries and some upper middle-income countries).

7.16 History of water supply.

Throughout history people have devised systems to make getting and using water more convenient. Early Rome had indoor plumbing, meaning a system of aqueducts and pipes that terminated in homes and at public wells and fountains for people to use. London water supply infrastructure developed over many centuries from early mediaeval conduits, through major 19th century treatment works built in response to cholera threats, to modern large scale reservoirs.

Water towers appeared around the late 19th century, as building height rose, and steam, electric and diesel-powered water pumps became available. As skyscrapers appeared, they needed rooftop water towers.

The technique of purification of drinking water by use of compressed liquefied chlorine gas was developed in 1910 by U.S. Army Major (later Brig. Gen.) Carl Rogers Darnall (1867–1941), Professor of Chemistry at the Army Medical School. Shortly thereafter, Major (later Col.) William J. L. Lyster (1869–1947) of the Army Medical Department used a solution of calcium hypochlorite in a linen bag to treat water. For many decades, Lyster's method remained the standard for U.S. ground forces in the field and in camps, implemented in the form of the familiar Lyster Bag (also spelled Lister Bag). Darnall's work became the basis for present day systems of municipal water 'purification'.

Desalination appeared during the late 20th century, and is still limited to a few areas.

During the beginning of the 21st century, especially in areas of urban and suburban population centres, traditional centralized infrastructure have not been able to supply sufficient quantities of water to keep up with growing demand. Among several options that have been managed are the extensive use of desalination technology, this is especially prevalent in coastal areas and in "dry" countries like Australia. Decentralization of water infrastructure has grown extensively as a viable solution including Rainwater harvesting and Stormwater harvesting where policies are eventually tending towards a more rational use and sourcing of water incorporation concepts such as "Fit for Purpose".

7.17 Standardization.

International standards for water supply system are covered by International Classification of Standards (ICS) 91.140.60.

Outbreaks of diseases due to contaminated water supply:

In 1854, a cholera outbreak in London's Soho district was identified by Dr. John Snow as originating from contaminated water from the Broad street pump. This can be regarded as a founding event of the science of epidemiology.

In 1980, a hepatitis A surge due to the consumption of water from a feces-contaminated well, in Pennsylvania.

In 1987, a cryptosporidiosis outbreak is caused by the public water supply of which the filtration was contaminated, in western Georgia.

Fluoride intoxication in a long-term hemodialysis unit of university hospital due to the failure of a water deionization system.

In 1988, many people were poisoned in Camelford, when a worker put 20 tonnes of aluminium sulphate in the wrong tank.

In 1993, a fluoride poisoning outbreak resulting from overfeeding of fluoride, in Mississippi .

In 1993, Milwaukee Cryptosporidium outbreak.

An outbreak of typhoid fever in northern Israel, which was associated with the contaminated municipal water supply.

In 1997, 369 cases of cryptosporidiosis occurred, caused by a contaminated fountain in the Minnesota zoo. Most of the sufferers were children.

In 1998, a non-chlorinated municipal water supply was blamed for a campylobacteriosis outbreak in northern Finland.

In 2000, a gastroenteritis outbreak that was brought by a non-chlorinated community water supply, in southern Finland.

In 2000, an E coli outbreak occurred in Walkerton, Ontario, Canada. Seven people died from drinking contaminated water. Hundreds suffered from the symptoms of the disease, not knowing if they too would die.

In 2004, contamination of the community water supply, serving the Bergen city centre of Norway, was later reported after the outbreak of waterborne giardiasis.

In 2007, contaminated drinking water was pinpointed which had led to the outbreak of gastroenteritis with multiple aetiologies in Denmark.

7.18 Water supply network.

A water supply system or water supply network is a system of engineered hydrologic and hydraulic components which provide water supply. A water supply system typically includes:

A drainage basin;

A raw (untreated) water collection point (above or below ground) where the water accumulates, such as a lake, a river, or groundwater from an underground aquifer. Untreated drinking water (usually water being transferred to the water purification facilities) may be transferred using uncovered ground-level aqueducts, covered tunnels or underground water pipes.

Water purification facilities. Treated water is transferred using water pipes (usually underground).

Water storage facilities such as reservoirs, water tanks, or watertowers. Smaller water systems may store the water in cisterns or pressure vessels. (Tall buildings may also need to store water locally in pressure vessels in order for the water to reach the upper floors.)

Additional water pressurizing components such as pumping stations may need to be situated at the outlet of underground or above ground reservoirs or cisterns (if gravity flow is impractical)

A pipe network for distribution of water to the consumers (which may be private houses or industrial, commercial or institution establishments) and other usage points (such as fire hydrants)

Connections to the sewers (underground pipes, or aboveground ditches in some developing countries) are generally found downstream of the water consumers, but the sewer system is considered to be a separate system, rather than part of the water supply system.

7.19 Water abstraction and raw water transfer.

Raw water (untreated) is collected from a surface water source (such as an intake on a lake or a river) or from a groundwater source (such as a water well drawing from an underground aquifer) within the watershed that provides the water resource.

Shallow dams and reservoirs are susceptible to outbreaks of toxic algae, especially if the water is warmed by a hot sun. The bacteria grow from stormwater runoff carrying fertilizer into the river where it acts as a nutrient for the algae. Such outbreaks render the water unfit for human consumption.

The raw water is transferred to the water purification facilities using uncovered aqueducts, covered tunnels or underground water pipes.

7.20 Water treatment.

Virtually all large systems must treat the water; a fact that is tightly regulated by global, state and federal agencies, such as the World Health Organization (WHO) or the United States Environmental Protection Agency (EPA). Water treatment must occur before the product reaches the consumer and afterwards (when it is discharged again). Water purification usually occurs close to the final delivery points to reduce pumping costs and the chances of the water becoming contaminated after treatment.

Traditional surface water treatment plants generally consists of three steps: clarification, filtration and disinfection. Clarification refers to the separation of particles (dirt, organic matter, etc.) from the water stream. Chemical addition (i.e. alum, ferric chloride) destabilizes the particle charges and prepares them for clarification either by settling or floating out of the water stream. Sand, anthracite or activated carbon filters refine the water stream, removing smaller particulate matter. While other methods of disinfection exist, the preferred method is via chlorine addition. Chlorine effectively kills bacteria and most viruses and maintains a residual to protect the water supply through the supply network.

7.21 Water distribution network.

Most (treated) water distribution happens through underground pipes.

The product, delivered to the point of consumption, is called fresh water if it receives little or no treatment, or drinking water if the treatment achieves the water quality standards required for human consumption.

Once treated, chlorine is added to the water and it is distributed by the local supply network. Today, water supply systems are typically constructed of plastic, ferrous, or concrete circular pipe. However, other "pipe" shapes and material may be used, such as square or rectangular concrete boxes, arched brick pipe, or wood. Near the end point, the network of pipes through which the water is delivered is often referred to as the water mains.

The energy that the system needs to deliver the water is called pressure. That energy is transferred to the water, therefore becoming water pressure, in a number of ways: by a pump, by gravity feed from a water source (such as a water tower) at a higher elevation, or by compressed air.

The water is often transferred from a water reserve such as a large communal reservoir before being transported to a more pressurised reserve such as a water tower.

In small domestic systems, the water may be pressurised by a pressure vessel or even by an underground cistern (the latter however does need additional pressurizing). This eliminates the need of a water-tower or any other heightened water reserve to supply the water pressure.

These systems are usually owned and maintained by local governments, such as cities, or other public entities, but are occasionally operated by a commercial enterprise. Water supply networks are part of the master planning of communities, counties, and municipalities. Their planning and design requires the expertise of city planners and civil engineers, who must consider many factors, such as location, current demand, future growth, leakage, pressure, pipe size, pressure loss, fire fighting flows, etc. — using pipe network analysis and other tools. Construction comparable sewage systems, was one of the great engineering advances that made urbanization possible. Improvement in the quality of the water has been one of the great advances in public health.

As water passes through the distribution system, the water quality can degrade by chemical reactions and biological processes. Corrosion of metal pipe materials in the distribution system can cause the release of metals into the water with undesirable aesthetic and health effects. Release of iron from unlined iron pipes can result in customer reports of "red water" at the tap . Release of copper from copper pipes can result in customer reports of "blue water" and/or a metallic taste. Release of lead can occur from the solder used to join copper pipe together or from brass fixtures. Copper and lead levels at the consumer's tap are regulated to protect consumer health.

Utilities will often adjust the chemistry of the water before distribution to minimize its corrosiveness. The simplest adjustment involves control of pH and alkalinity to produce a water that tends to passivate corrosion by depositing a layer of calcium carbonate. Corrosion inhibitors are often added to reduce release of metals into the water. Common corrosion inhibitors added to the water are phosphates and silicates.

Maintenance of a biologically safe drinking water is another goal in water distribution. Typically, a chlorine based disinfectant, such as sodium hypochlorite or monochloramine is added to the water as it leaves the treatment plant. Booster stations can be placed within the distribution system to ensure that all areas of the distribution system have adequate sustained levels of disinfection.

7.22 Topologies of water distribution networks.

Like electric power lines, roads, and microwave radio networks, water systems may have a loop or branch network topology, or a combination of both. The piping networks are circular or rectangular. If any one section of water distribution main fails or needs repair, that section can be isolated without disrupting all users on the network.

Most systems are divided into zones. Factors determining the extent or size of a zone can include hydraulics, telemetry systems, history, and population density. Sometimes systems are designed for a specific area then are modified to accommodate development. Terrain affects hydraulics and some forms of telemetry. While each zone may operate as a stand-alone system, there is usually some arrangement to interconnect zones in order to manage equipment failures or system failures.

Water supply networks usually represent the majority of assets of a water utility. Systematic documentation of maintenance works using a Computerized Maintenance Management System is a key to a successful operation of a water utility.

COMPREHENSION

1. Read the text; as your read, note the topic dealt with in each paragraph, underline the topic sentence, key words, and important facts as your go along.

2. Analyze how the facts are connected, how the topic of a paragraph is connected with that of a preceding paragraph.

3. Make a list of all points you are going to mention in your précis. Write them down using the necessary key terms. These notes must contain all the essential facts.

4. Write a précis of the text.

5. Sum up the main points presented in the text. Write the plan of the text in the form of statements.

6. Develop your plan into summary.

7. Make your summary coherent by a sparing use of connectors.

8. Look through your summary. Find the least important sentences and delete them. Out the remaining ones produce a well-written, clear and concise summary.

TEXT 8
CENTRAL HEATING SYSTEM

A central heating system provides warmth to the whole interior of a building (or portion of a building) from one point to multiple rooms. When combined with other systems in order to control the building climate, the whole system may be an HVAC (heating, ventilation and air conditioning) system.

Central heating differs from local heating in that the heat generation occurs in one place, such as a furnace room in a house or a mechanical room in a large building (though not necessarily at the "central" geometric point). The most common method of heat generation involves the combustion of fossil fuel in a furnace or boiler. The resultant heat then gets distributed: typically by forced-air through ductwork, by water circulating through pipes, or by steam fed through pipes. Increasingly, buildings utilize solar-powered heat sources, in which case the distribution system normally uses water circulation.

In much of northern Europe and in urban portions of Russia, where people seldom require air conditioning in homes due to the temperate climate, most new housing comes with central heating installed. Such areas normally use gas heaters, district heating, or oil-fired systems. In the western and southern United States natural-gas-fired central forced-air systems occur most commonly; these systems and central-boiler systems both occur in the far northern regions of the USA. Steam-heating systems, fired by coal, oil or gas, feature in the USA, Russia and Europe: primarily for larger buildings. Electrical heating systems occur less commonly and are practical only with low-cost electricity or when geothermal heat pumps are used. Considering the combined system of central generating plant and electric resistance heating, the overall efficiency will be less than for direct use of fossil fuel for space heating.

8.1 History.

Some buildings in the Roman Empire used central heating systems, conducting air heated by furnaces through empty spaces under the floors and out of pipes in the walls—a system known as a hypocaust. A similar system of central heating was used in ancient Korea, where it is known as ondol. It is thought that the ondol system dates back to the Koguryo or Three Kingdoms (37 BC-AD 668) period when excess heat from stoves was used to warm homes.

In the early medieval Alpine upland, a simpler central heating system where heat travelled through underfloor channels from the furnace room replaced the Roman hypocaust at some places. In Reichenau Abbey a network of interconnected underfloor channels heated the 300 m² large assembly room of the monks during the winter months. The degree of efficiency of the system has been calculated at 90%.

In the 13th century, the Cistercian monks revived central heating in Christian Europe using river diversions combined with indoor wood-fired furnaces. The well-preserved Royal Monastery of Our Lady of the Wheel (founded 1202) on the Ebro River in the Aragon region of Spain provides an excellent example of such an application.

The Roman hypocaust continued to be used on a smaller scale during late Antiquity and by the Umayyad caliphate, while later Muslim builder employed a simpler system of underfloor pipes.

By about 1700 Russian engineers had started designing hydrologically based systems for central heating. The Summer Palace (1710–1714) of Peter the Great in Saint Petersburg provides the best extant example. Slightly later, in 1716, came the first use of water in Sweden to distribute heat in buildings. Martin Triewald, a Swedish engineer, used this method for a greenhouse at Newcastle upon Tyne. Jean Simon Bonnemain (1743–1830), a French architect, introduced the technique to industry on a cooperative, at Château du Pêcq, near Paris.

Angier March Perkins developed and installed some of the earliest steam-heating systems in the 1830s. The first was installed in the home of Governor of the Bank of England John Horley Palmer so that he could grow grapes in England's cold climate.

Franz San Galli, a Polish-born Russian businessman living in St. Petersburg, invented the radiator between 1855–1857, which was a major step in the final shaping of modern central heating.

8.2 Water heating.

Common components of a central heating system using water-circulation include:

Gas supply lines (sometimes including a propane tank), oil tank and supply lines or district heating supply lines.

Boiler (or a heat exchanger for district heating) heats water in a closed-water system.

Pump: circulates the water in the closed system.

Radiators: wall-mounted panels through which the heated water passes in order to release heat into rooms.

Engineers in the United Kingdom and in other parts of Europe commonly combine the needs of room heating with hot-water heating and storage. These systems occur less commonly in the USA. In this case, the heated water in a sealed system flows through a heat exchanger in a hot-water tank or hot-water cylinder where it heats water from the normal water supply before that water gets fed to hot-water outlets in the house. These outlets may service hot-water taps or appliances such as washing machines or dishwashers.

8.3 Sealed water-circulating system.

A sealed system provides a form of central heating in which the water used for heating usually circulates independently of the building's normal water supply. An expansion tank contains compressed gas, separated from the sealed-system water by a diaphragm. This allows for normal variations of pressure in the system. A safety valve allows water to escape from the system when pressure becomes too high, and a valve can open to replenish water from the normal water supply if the pressure drops too low. Sealed systems offer an alternative to open-vent systems, in which steam can escape from the system, and gets replaced from the building's water supply via a feed and central storage system.

8.4 Electric and gas-fired heaters.

Electric heating or resistance heating converts electricity directly to heat. Electric heat is often more expensive than heat produced by combustion appliances like natural gas, propane, and oil. Electric resistance heat can be provided by baseboard heaters, space heaters, radiant heaters, furnaces, wall heaters, or thermal storage systems.

Electric heaters are usually part of a fan coil which is part of a central air conditioner. They circulate heat by blowing air across the heating element which is supplied to the furnace through return air ducts. Blowers in electric furnaces move air over one to five resistance coils or elements which are usually rated at five kilowatts. The heating elements activate one at a time to avoid overloading the electrical system. Overheating is prevented by a safety switch called a limit controller or limit switch. This limit controller may shut the furnace off if the blower fails or if something is blocking the air flow. The heated air is then sent back through the home through supply ducts.

In larger commercial applications, central heating is provided through an air handler which incorporates similar components as a furnace but on a larger scale.

8.5 Hydronic and steam systems.

Hydronic heating systems are systems that circulate a medium for heating. Hydronic radiant floor heating systems use a boiler or district heating to heat water and a pump to circulate the hot water in plastic pipes installed in a concrete slab. The pipes, embedded in the floor, carry heated water that conducts warmth to the surface of the floor, where it broadcasts heat energy to the room above.

Hydronic systems circulate hot water for heating. Steam heating systems are similar to heating water systems, except that steam is used as the heating medium instead of water.

Hydronic heating systems generally consist of a boiler or district heating heat exchanger, hot water circulating pumps, distribution piping, and a fan coil unit or a radiator located in the room or space. Steam heating systems are similar, except that no circulating pumps are required.

Hydronic systems are closed loop: the same fluid is heated and then reheated. Hydronic heating systems are also used with antifreeze solutions in ice and snow melt systems for walkways, parking lots and streets. They are more commonly used in commercial and whole house radiant floor heat projects, whereas electric radiant heat systems are more commonly used in smaller "spot warming" applications.

8.6 Heat pumps.

In mild climates a heat pump can be used to air condition the building during hot weather, and to warm the building using heat extracted from outdoor air in cold weather. Air-source heat pumps are generally uneconomic for outdoor temperatures much below freezing. In colder climates, geothermal heat pumps can be used to extract heat from the ground. For economy, these systems are designed for average low winter temperatures and use supplemental heating for extreme low temperature conditions. The advantage of the heat pump is that it reduces the purchased energy required for building heating; often geothermal source systems also supply domestic hot water. Even in places where fossil fuels provide most electricity, a geothermal system may offset greenhouse gas production since most of the energy furnished for heating is supplied from the environment, with only 15–30% purchased.

8.7 Environmental aspects.

From an energy-efficiency standpoint considerable heat gets lost or goes to waste if only a single room needs heating, since central heating has distribution losses and (in the case of forced-air systems particularly) may heat some unoccupied rooms without need. In such buildings which require isolated heating, one may wish to consider non-central systems such as individual room heaters, fireplaces or other devices. Alternatively, architects can design new buildings to use low-energy building techniques which can virtually eliminate the need for heating, such as those built to the Passive House standard.

However, if a building does need full heating, combustion central heating offers a more environmentally friendly solution than electric-air central heating or than other direct electric heating devices. This stems from the fact that most electricity originates remotely using fossil fuels, with up to two-thirds of the energy in the fuel lost (unless utilized for district heating) at the power station and in transmission losses. In Sweden proposals exist to phase out direct electric heating for this reason. Nuclear and hydroelectric sources reduce this factor.

In contrast, hot-water central heating systems can use water heated in or close to the building using high-efficiency condensing boilers, biofuels, or district heating. Wet underfloor heating has proven ideal. This offers the option of relatively easy conversion in the future to use developing technologies such as heat pumps and solar combisystems, thereby also providing future-proofing.

Typical efficiencies for central heating are: 85-97% for gas fired heating; 80-89% for oil-fired, and 45-60% for coal-fired heating.

COMPREHENSION

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5 . Sum up the main points presented in the text. Write the plan of the text in the form of statements.

6. Develop your plan into summary.

7. Make your summary coherent by a sparing use of connectors.

8. Look through your summary. Find the least important sentences and delete them. Out the remaining ones to produce a well-written, clear and concise summary.

TEXT 9
GAS CENTRAL HEATING

Gas is the most widely used heating fuel in the UK.

Most households in the UK have mains gas central heating. This is a so-called ‘wet system’ where a gas-fired boiler heats water, which provides central heating via radiators and hot water through the taps in your home.

Some houses that aren’t connected to the gas network use liquid petroleum gas (LPG) or heating oil, which works in a similar way, although LPG and oil are delivered by road and stored in a tank, which you may have to buy or rent from your supplier.

Annual fuel cost for heating and hot water (not including installation costs):

Condensing boiler: £490.

Standard boiler: £730.

Carbon emissions per year:

Condensing boiler: 2.5 tonnes.

Standard boiler: 3.7 tonnes.

These are estimated yearly costs based on heating and hot water demands of a three-bedroomed, semi-detached, well-insulated house (insulated cavity walls, 270mm loft insulation, thermostatic radiator valves and insulated primary pipe work), the efficiencies of typical heating systems and the current average price per fuel per kWh. They are not from actual fuel bills.

9.1. Pros of gas central heating.

Gas is a highly efficient fuel, so you get a good return on every unit of energy. Modern condensing boilers, which use hot flue gases that are wasted in a standard boiler, have very high efficiency. Some are now 90% or more efficient.

Gas is piped direct to your home so you don’t need to store any fuel.

Replacing a standard gas boiler with a highly efficient modern condensing boiler is relatively straightforward. .

As gas is the most widely used heating fuel in the UK, finding a plumber on the Gas Safe Register scheme should be fairly easy if your boiler breaks down or needs servicing.

The gas registration scheme, which was previously run by Corgi was taken over by Capita on 1 April 2009. The new scheme is called the Gas Safe Register.

Anyone proposing to carry out work on your boiler is required by law to be on the Gas Safe Register. You can check an engineer or firm's registration on the Gas Safe Register website or by calling directly on 0800 408 5500.

9.2 Cons of gas central heating.

Gas prices are on the rise and are likely to remain high. The UK is no longer self-sufficient in gas and must compete with growing demand from other countries.

Installing a gas central heating system from scratch can be expensive and disruptive. If you're not on the gas network, connecting your property can also be costly.

Gas boilers need servicing annually to ensure they run efficiently and last as long as they should do.

As a fossil fuel, gas produces carbon dioxide when it's burnt and can't be considered a clean source of energy.

9.3 Home heating systems.

Getting a modern boiler will save you £200 a year. With high gas and electricity prices looking like they're here to stay, it's more important than ever that we heat our homes in the most efficient way. Using less energy is the best way to cut your bills, but this doesn't mean having to live in a cold, dark home.

Cutting energy bills .Insulating your roof and walls should save you between £150 and £450 a year. Adding a modern boiler and heating controls will save a further £200 a year .

For insulation, you can get help with the costs from grant schemes run by the government, local authorities and energy suppliers. This could even mean free insulation for people of a certain age, with disabilities or on certain benefits.

Renewable energy .If you use less energy, you'll also reduce the carbon emissions produced by your home. There are also a number of ways you can generate your own energy at home from low or zero carbon 'microgeneration' technology, such as solar heating systems, heat pumps .

Making your own energy instead of using mains gas and electricity reduces your carbon footprint. It also means you're less dependent on sources of energy that are increasingly subject to global demand and are likely to have high and volatile prices in future.

9.4 Cost of renewable energy systems.

If you're considering installing any microgeneration technologies in your home, it's important to take a long-term view. Renewable choices may look more expensive, but as the cost of gas and electricity continues to rise, the time taken to get your money back on an investment in microgeneration will come down.

In addition, the government will soon announce details of a generous financial incentive, the Renewable Heat Incentive, which will pay you to generate renewable heat, meaning these technologies will become more cost-effective. It's important, however, to ensure your property is suitable for the technology you choose, as not all properties have a south-facing roof or a garden.

For solar photovoltaics (PV) you can now get cashback thanks to the generous Feed-in Tariff. The Energy Saving Trust says a typical domestic solar electricity system, with an installation size of 2.2 kWp could earn around £800 a year. Cashback applies to other electricity-generating technologies such as wind and hydropower but not to technologies generating heat. However, these will soon qualify for the Renewable Heat Incentive.

9.5 How LPG central heating works.

Although most households in the UK have mains gas central heating, around 3.6m households are not connected to the mains gas network.

In parts of the UK where there is no mains gas network to connect to, such as rural areas, some homes use liquid petroleum gas (LPG) instead. This normally used in a ‘wet’ heating system where an LPG-fired boiler heats water, which provides central heating via radiators and hot water through the taps in your home.

The main difference between mains gas and LPG is that it is delivered by road and stored in a tank, which you may have to buy or rent from your supplier. Some boilers designed for mains gas can be converted to use LPG.

Annual fuel cost for heating and hot water (not including installation costs)

Fuel cost for heating and hot water: more than £1,300 (due to recent price rise) Carbon emissions: 3.4 tonnes

These yearly costs are estimated costs based on heating and hot water demands of a three-bedroomed, semi-detached, well-insulated house (insulated cavity walls, 270mm loft insulation, thermostatic radiator valves and insulated primary pipe work), the efficiencies of typical heating systems and the current average price per fuel per kWh (as at Dec 2010). They are not derived from actual fuel bills.

9.6 Pros of LPG central heating.

LPG is a highly efficient fuel, so you get a good return on every unit of energy. Modern condensing boilers, which use hot flue gases that are wasted in a standard boiler, now achieve efficiencies of 90% and more.

Replacing a standard LPG boiler with a highly efficient modern condensing boiler is a relatively straightforward job.

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Anyone proposing to carry out work on your boiler is required by law to be on the Gas Safe Register. You can check an engineer or firm's registration on the Gas Safe Register website or by calling directly on 0800 408 5500.

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9.7 Renewable heat.

With high gas and electricity prices and a generous government incentive for renewable heat, there has never been a better time to consider renewable heat technologies like heat pumps, solar water heating and woodburning stoves.

Solar panels should be mounted on a south-facing section of your roof.

But before considering renewable heat technologies, there are simple and cost-effective ways to save energy.

First, there are easy tips to follow to use less energy and therefore cut your bills. If you use less energy, you'll also reduce the carbon emissions produced by your home.

Secondly, you should look at energy-efficiency measures. Insulating your home means you will stop heat escaping from your roof, walls and windows. Insulating your roof and walls should save you between £150 and £450 a year. You can get help with the costs from grant schemes run by the government, local authorities and energy suppliers. This could even mean free insulation for people of a certain age, with disabilities or on certain benefits.

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9.8 Renewable energy.

There are also a number of ways you can generate your own energy at home from low or zero carbon 'microgeneration' technology, such as solar heating systems, heat pumps and wood burning stoves.

Making your own energy instead of using mains gas and electricity will not only reduce your carbon footprint. It will also mean you're less dependent on sources of energy that are increasingly subject to global demand – which means that prices in the future are likely to be high and volatile.

If you're considering installing any microgeneration technologies in your home, it's important to take a long-term view. Renewable choices may look more expensive, but as the cost of gas and electricity continues to rise, the time taken to get your money back on an investment in microgeneration will come down.

In addition, the government will soon announce details of a generous financial incentive, the Renewable Heat Incentive, which will pay you to generate renewable heat, meaning these technologies will become more cost-effective. It's important however to ensure your property is suitable for the technology you choose, as not all properties have a south-facing roof or a garden.

For solar photovoltaics (PV) you can now get cashback thanks to the generous Feed-in Tariff. The Energy Saving Trust says a typical domestic solar electricity system, with an installation size of 2.2 kWp could earn around £800 a year. Cashback applies to other electricity generating technologies such as wind and hydropower but not to the technologies generating heat. These will, however, soon qualify the Renewable Heat Incentive.

Savings are based on a three-bed semi detached house and data from the Energy Saving Trust. Installation costs: Indicative cost of equipment and installation. Annual savings: Estimated for homes currently heated by gas or electricity. Savings for heat pumps Based on EST's field trials and are given as a range depending on the performance of the heat pump.

COMPREHENSION

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TEXT 10
ENERGY RECOVERY VENTILATION

Energy recovery ventilation (ERV) is the energy recovery process of exchanging the energy contained in normally exhausted building or space air and using it to treat (precondition) the incoming outdoor ventilation air in residential and commercial HVAC systems. During the warmer seasons, the system pre-cools and dehumidifies while humidifying and pre-heating in the cooler seasons. The benefit of using energy recovery is the ability to meet the ASHRAE ventilation & energy standards, while improving indoor air quality and reducing total HVAC equipment capacity.

This technology, as expected, has not only demonstrated an effective means of reducing energy cost and heating and cooling loads, but has allowed for the scaling down of equipment. Additionally, this system will allow for the indoor environment to maintain a relative humidity of an appealing 40% to 50% range. This range can be maintained under essentially all conditions. The only energy penalty is the power needed for the blower to overcome the pressure drop in the system.

10.1 Methods of transfer.

An energy recovery ventilator (also abbreviated ERV) is a type of air-to-air heat exchanger that not only transfers sensible heat but also latent heat. Since both temperature and moisture is transferred, ERVs can be considered total enthalpic devices. On the other hand, a heat recovery ventilator (HRV) can only transfer sensible heat. HRVs can be considered sensible only devices because they only exchange sensible heat. In other words, whereas all ERVs are HRVs, not all HRVs are ERVs, but many people use the terms HRV, AAHX (air-to-air heat exchanger), and ERV interchangeably.

Throughout the cooling season, the system works to cool and dehumidify the incoming, outside air. This is accomplished by the system simply taking the rejected heat and sending it into the exhaust airstream. Sequentially, this air cools the condenser coil at a lower temperature than if the rejected heat had not entered the exhaust airstream. During the heating seasons, the system works in reverse. Instead of discharging the heat into the exhaust airstream, the system draws heat from the exhaust airstream in order to pre-heat the incoming air. At this stage, the air passes through a primary unit and then into a space. With this type of system, it is normal, during the cooling seasons, for the exhaust air to be cooler than the ventilation air and, during the heating seasons, warmer than the ventilation air. It is this reason the system works very efficiently and effectively. The Coefficient of Performance (COP) will increase as the conditions become more extreme (i.e., more hot and humid for cooling and colder for heating).

10.2 Efficiency.

The efficiency of an ERV system is the ratio of energy transferred between the two air streams compared with the total energy transported through the heat exchanger.

With the variety of products on the market, efficiency is unquestionably going to vary from product to product. Some of these systems have been known to have heat exchange efficiencies as high as 70-80% while others have as low as 50%. Even though this lower figure is preferable to the basic HVAC system, it is not up to par with the rest of its class. Studies are being done to increase the heat transfer efficiency to 90%.

The use of modern low-cost gas-phase heat exchanger technology will allow for significant improvements in efficiency. The use of high conductivity porous material is believed to produce an exchange effectiveness in excess of 90%. By exceeding a 90% effective rate, an improvement of up to 5 factors in energy loss can be seen.

The Home Ventilation Institute (HVI) has developed a standard test for any and all units manufactured within the United States. Regardless, not all have been tested. It is imperative to investigate efficiency claims, comparing data produced by HVI as well as that produced by the manufacturer. (Note: all unites sold in Canada are placed through the R-2000 program, a standard test synonymous to the HVI test).

10.3 Thermal Wheel.

The rotating wheel heat exchanger is composed of a rotating cylinder filled with an air permeable material resulting in a large surface area. The surface area is the medium for the sensible energy transfer. As the wheel rotates between the ventilation and exhaust air streams it picks up heat energy and releases it into the colder air stream. The driving force behind the exchange is the difference in temperatures between the opposing air streams which is also called the thermal gradient. Typical media used consists of polymer, aluminum, and synthetic fiber.

The Enthalpy Exchange is accomplished through the use of desiccants. Desiccants transfer moisture through the process of adsorption which is predominately driven by the difference in the partial pressure of vapor within the opposing air-streams. Typical desiccants consist of Silica Gel, and molecular sieves.

Though very effective in its energy recovery, rotary enthalpy wheels have the common characteristic of high static pressures and poor durability. Therefore they are not as practical for energy savings purposes, and should only be considered for a cheaper alternative - in comparison to other ERVs - for situations where increased fresh outdoor ventilation is required. High static pressures result in increased fan power lowering the net energy savings of an installation. As for durability, rotary enthalpy wheels are normally guaranteed for no longer than 1 year, and the characteristic lifetime is about 5 years. Some companies, like the 1983-started Finnish Enervent Oy, provide warranties for two years which is extendable up to five years for ERVs with integrated heat pump.

There are additional disadvantages to the use of the heat wheel. Initial costs are higher due to the power needed for the fan to overcome its resistance. The system demands that the two air streams be adjacent to one another, they consistently be maintained, and they have filtration. Weekly maintenance is focused on the required rotating mechanism. Further up-keeping of the fill medium is also required. Colder climates may call for an increase in services. Caution must be taken when providing all upkeep, specifically if additional services are required, because cross-contamination (of air streams) can occur.

10.4 Plate heat exchanger.

Fixed plate heat exchangers have no moving parts. Plates consist of alternating layers of plates that are separated and sealed. Typical flow is cross current and since the majority of plates are solid and non permeable, sensible only transfer is the result.

The tempering of incoming fresh air is done by a heat or energy recovery core. In this case, the core is made of aluminum or plastic plates. Humidity levels are adjusted through the transferring of water vapor. This is done with a rotating wheel either containing a desiccant material or permeable plates.

Enthalpy plates were introduced 2006 by Paul, a special company for ventilation systems for passive houses. A crosscurrent countercurrent air to air heat exchanger built with a humidity permeable material. Polymer fixed-plate countercurrent energy recovery ventilators were introduced in 1998 by Building Performance Equipment (BPE), a residential, commercial, and industrial air-to-air energy recovery manufacturer. These heat exchangers can be both introduced as a retrofit for increased energy savings and fresh air as well as an alternative to new construction. In new construction situations, energy recovery will effectively reduce the required heating/cooling capacity of the system. The percentage of the total energy saved will depend on the efficiency of the device (up to 90%) and the latitude of the building. A result of an ERV is that the HVAC install's initial cost is lower and the overall energy consumed by the building is lower as well.

The technology patented by Finnish company Recycling Energy Int. Corp. is based on a regenerative plate heat exchanger taking advantage of humidity of air by cyclical condensation and evaporation, e.g. latent heat, enabling not only high annual thermal efficiency but also microbe-free plates due to self-cleaning/washing method. Therefore the unit is called rather an enthalpy recovery ventilator than heat or energy recovery ventilator. Company´s patented Latent Heat Pump is based on its enthalpy recovery ventilator having COP of 33 in the summer and 15 in the winter.

Nearly half of global energy is used in buildings. And half of heating/cooling cost is caused by ventilation when it is done by the "open window" method according to the regulations. Secondly, energy generation and grid is made to meet the peak demand of power. To use proper ventilation recovery is the most cost-efficient, sustainable and quickest way to reduce global energy consumption, and give better indoor air quality (IAQ) and protect buildings (Sick Building Syndrome SBS) and environment.

10.5 Home heating systems.

Unlike gas, mains electricity is available almost everywhere in the UK.

The most cost-effective form of electric central heating uses storage heaters. These heaters use electricity supplied at a cheaper ‘night-time’ rate to heat up special heat-retaining bricks.

Storage heaters give out heat slowly and are designed to keep warm for the whole of the following day. Cheap-rate electricity can also be used to provide hot water via an immersion heater in your hot water tank.

Cheap-rate electricity tariffs:

Electricity tariffs that provide cheap-rate electricity are usually known as Economy 7, as they give you seven hours of cheaper electricity overnight. Economy 10 works in a similar way and gives you an extra three hours of cheap electricity – usually in the middle of the afternoon.

You can also get electric radiators that run off a standard single-rate electricity tariff. However, due to the relatively high price of electricity during the day, these can be expensive to run and should only be considered if you have a very well-insulated property and won’t have to use them regularly.

Annual fuel cost for heating and hot water (not including installation costs).

Fuel cost for heating and hot water: £1400 (less if on an Economy 7/10 tariff).

Carbon emissions per year.

Carbon emissions: 6 tonnes.

These yearly costs are estimated costs based on heating and hot water demands of a three-bedroomed, semi-detached, well-insulated house (insulated cavity walls, 270mm loft insulation and insulated primary pipe work), the efficiencies of typical heating systems and the current average price per fuel per kWh (as at March 2011). They are not derived from actual fuel bills.

Pros of electric central heating.

Electric storage heater systems are much cheaper to install than gas central heating systems as they require no pipe-work or flue.

With very few moving parts, storage heaters require very little maintenance and don't need to be serviced annually.

Unlike gas, mains electricity is available almost everywhere in the UK.

Cons of electric central heating.

Electricity prices are about three times higher than gas prices per unit of energy. And like gas, electricity prices are also rising and are likely to stay high. As most electricity in the UK is generated in gas-fired power stations, any increase in the price of gas will also be reflected in the cost of electricity.

The daytime rate on Economy 7 or Economy 10 tariffs is higher than on standard single-rate electricity tariffs, so while you'll get a cheaper rate for your heating, running appliances during the day – particularly if you need to use an electric heater to provide extra heat – could be expensive.

You don't have instant control over storage heaters: older models will give out heat as long as the bricks remain warm – day and night.

If your storage heaters don't have an automatic charge control (which measures the temperature in the room and adjusts the amount of heat stored overnight), you'll have to set this yourself – so keep an eye on the weather forecast for the following day.

10.6 HVAC control system.

HVAC here stands for Heating, Ventilation and Air Conditioning. Thus, a HVAC control system applies regulation to e.g. a heating. Usually, a sensing device is used to compare the actual state (e.g. temperature) with a target state. Then, the control system draws a conclusion what action has to be taken (e.g. start blower)

Central controllers and most terminal unit controllers are programmable, meaning the direct digital control program code may be customized for the intended use. The program features include time schedules, setpoints, controllers, logic, timers, trend logs, and alarms. The unit controllers typically have analog and digital inputs that allow measurement of the variable (temperature, humidity, or pressure) and analog and digital outputs for control of the transport medium (hot/cold water and/or steam). Digital inputs are typically (dry) contacts from a control device, and analog inputs are typically a voltage or current measurement from a variable (temperature, humidity, velocity, or pressure) sensing device. Digital outputs are typically relay contacts used to start and stop equipment, and analog outputs are typically voltage or current signals to control the movement of the medium (air/water/steam) control devices such as valves, dampers, and motors.

Groups of DDC controllers, networked or not, form a layer of system themselves. This "subsystem" is vital to the performance and basic operation of the overall HVAC system. The DDC system is the "brain" of the HVAC system. It dictates the position of every damper and valve in a system. It determines which fans, pumps and chiller run and at what speed or capacity. With this configurable intelligency in this "brain", we are moving to the concept of building automation.

10.7 Building Automation System.

More complex HVAC systems can interface to Building Automation System (BAS) to allow the building owners to have more control over the heating or cooling units. The building owner can monitor the system and respond to alarms generated by the system from local or remote locations. The system can be scheduled for occupancy or the configuration can be changed from the BAS. Sometimes the BAS is directly controlling the HVAC components. Depending on the BAS different interfaces can be used.

It was only natural that the first HVAC controllers would be pneumatic, as the engineers probably understood fluid control. Thus mechanical engineers could use their experience with the properties of steam and air to control the flow of heated or cooled air. There are still pneumatic HVAC systems in operation in some buildings, such as schools and offices, which can be a century old.

After the control of air flow and temperature was standardized, the use of electromechanical relays in ladder logic to switch dampers became standardized. Eventually, the relays became electronic switches, as transistors eventually could handle greater current loads. By 1985, pneumatic control could no longer compete with this new technology.

By the year 2000, computerized controllers were common. Today, some of these controllers can even be accessed by web browsers, which need no longer be in the same building as the HVAC equipment. This allows some economies of scale, as single operations center can easily monitor thousands of buildings.

10.8 Oil central heating.

Although most households in the UK have mains gas central heating, around 3.6 m households are not connected to the mains gas network.

In parts of the UK where there is no mains gas network to connect to, such as rural areas, some homes use heating oil instead. This is normally used in a ‘wet’ heating system where an oil-fired boiler heats water, which provides central heating via radiators and hot water through the taps in your home.

The main difference between mains gas and heating oil is that it is delivered by road and stored in a tank, which you may have to buy or rent from your supplier.

Heat-only and combination condensing oil-fired boiler types are both available. Most oil-fired combination boilers have an internal hot water store to supply domestic hot water rather than the instantaneous heating more common in gas boilers.

Annual fuel cost for heating and hot water (not including installation costs)

Fuel cost for heating and hot water: £850 (due to recent price rise).

Carbon emissions: 5-6.5 tonnes per year.

These are estimated yearly costs based on heating and hot water demands of a three-bedroomed, semi-detached, well-insulated house (insulated cavity walls, 270mm loft insulation, thermostatic radiator valves and insulated primary pipe work), the efficiencies of typical heating systems and the current average price per fuel per kWh (as of Dec 2010). They are not derived from actual fuel bills.

Pros of oil central heating.

Oil is a highly efficient fuel, so you get a good return on every unit of energy. Modern condensing boilers, which use hot flue gases that are wasted in a standard boiler, now achieve efficiencies of 90% and more. Replacing a standard oil boiler with a highly efficient modern condensing boiler is relatively straightforward.

Cons of oil central heating.

Like mains gas, oil prices are on the rise and are likely to remain high as the UK competes with growing demand from other countries. Recently prices of heating oil have gone up sharply and the Office of Fair Trading is now conducting a study of the off-grid energy market in the UK.

As oil is delivered by road there is a possibility you could run out while you wait for your next delivery. However, systems that monitor the amount of oil in your tank and automatically notify your supplier when it needs topping up are available.

Installing an oil central heating system from scratch can be expensive and disruptive. The storage tank can also be unsightly (although this can be resolved by going for an underground tank).

Oil boilers need servicing annually to ensure they run efficiently and last as long as they should.

Most condensing oil-fired boilers are floor standing so you may have problems trying to find a wall-mounted model. They will also need to be plumbed in to allow acidic condensate liquid to drain away.

Oil boilers generally limit the hot water flow rate to ensure the water is as hot as it should be, meaning the hot water flow rate is lower than a gas combi or hot water cylinder system and that the hot water temperature will decline as more water is used.

As a fossil fuel, oil produces carbon dioxide when it’s burnt and can’t be considered a clean source of energy.

With prices of LPG on the rise on one hand and the generous incentive for renewable heat on the other hand, if you are off the gas grid, you might like to consider a renewable alternative to contribute to heating your house like, a solar thermal system or a heat pump.

COMPREHENSION

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TEXT 11
VENTILATION

An air handling unit is used for the heating and cooling of air in a central location.

Ventilating (the V in HVAC) is the process of "changing" or replacing air in any space to provide high indoor air quality (i.e. to control temperature, replenish oxygen, or remove moisture, odors, smoke, heat, dust, airborne bacteria, and carbon dioxide). Ventilation is used to remove unpleasant smells and excessive moisture, introduce outside air, to keep interior building air circulating, and to prevent stagnation of the interior air.

Ventilation includes both the exchange of air to the outside as well as circulation of air within the building. It is one of the most important factors for maintaining acceptable indoor air quality in buildings. Methods for ventilating a building may be divided into mechanical/forced and natural types.

"Mechanical" or "forced" ventilation is used to control indoor air quality. Excess humidity, odors, and contaminants can often be controlled via dilution or replacement with outside air. However, in humid climates much energy is required to remove excess moisture from ventilation air.

Kitchens and bathrooms typically have mechanical exhaust to control odors and sometimes humidity. Kitchens have additional problems to deal with such as smoke and grease. Factors in the design of such systems include the flow rate (which is a function of the fan speed and exhaust vent size) and noise level. If ducting for the fans traverse unheated space (e.g., an attic), the ducting should be insulated as well to prevent condensation on the ducting. Directdrive fans are available for many applications, and can reduce maintenance needs.

Ceiling fans and table/floor fans circulate air within a room for the purpose of reducing the perceived temperature because of evaporation of perspiration on the skin of the occupants. Because hot air rises, ceiling fans may be used to keep a room warmer in the winter by circulating the warm stratified air from the ceiling to the floor. Ceiling fans do not provide ventilation as defined as the introduction of outside air.

Natural ventilation is the ventilation of a building with outside air without the use of a fan or other mechanical system. It can be achieved with openable windows or trickle vents when the spaces to ventilate are small and the architecture permits. In more complex systems warm air in the building can be allowed to rise and flow out upper openings to the outside (stack effect) thus forcing cool outside air to be drawn into the building naturally through openings in the lower areas. These systems use very little energy but care must be taken to ensure the occupants' comfort. In warm or humid months, in many climates, maintaining thermal comfort solely via natural ventilation may not be possible so conventional air conditioning systems are used as backups. Air-side economizers perform the same function as natural ventilation, but use mechanical systems' fans, ducts, dampers, and control systems to introduce and distribute cool outdoor air when appropriate

11.1 Definition.

Ventilation is the intentional movement of air from outside a building to the inside. Ventilation air, as defined in ASHRAE Standard 62.1 and the ASHRAE Handbook, is that air used for providing acceptable indoor air quality. It mustn't be confused with vents or flues; which mean the exhausts of clothes dryers, and combustion equipment such as water heaters, boilers, fireplaces, and wood stoves. The vents or flues carry the products of combustion which have to be expelled from the building in a way which does not cause harm to the occupants of the building. Movement of air between indoor spaces, and not the outside, is called transfer air.

In commercial, industrial, and institutional (CII) buildings, and modern jet aircraft, return air is often recirculated to the air handling unit. A portion of the supply air is normally exfiltrated through the building envelope or exhausted from the building (e.g., bathroom or kitchen exhaust) and is replaced by outside air introduced into the return air stream. The rate of ventilation air required, most often provided by this mechanically-induced outside air, is often determined from ASHRAE Standard 62.1 for CII buildings, or 62.2 for low-rise residential buildings, or similar standards.

When people or animals are present in buildings, ventilation air is necessary to dilute odors and limit the concentration of carbon dioxide and airborne pollutants such as dust, smoke and volatile organic compounds (VOCs). Ventilation air is often delivered to spaces by mechanical systems which may also heat, cool, humidify and dehumidify the space. Air movement into buildings can occur due to uncontrolled infiltration of outside air through the building fabric (see stack effect) or the use of deliberate natural ventilation strategies. Advanced air filtration and treatment processes such as scrubbing, can provide ventilation air by cleaning and recirculating a proportion of the air inside a building.

11.2 Types of ventilation.

Mechanical or forced ventilation: through an air handling unit or direct injection to a space by a fan. A local exhaust fan can enhance infiltration or natural ventilation, thus increasing the ventilation air flow rate.

Natural ventilation occurs when the air in a space is changed with outdoor air without the use of mechanical systems, such as a fan. Most often natural ventilation is assured through operable windows but it can also be achieved through temperature and pressure differences between spaces. Open windows or vents are not a good choice for ventilating a basement or other below ground structure. Allowing outside air into a cooler below ground space will cause problems with humidity and condensation.

Mixed Mode Ventilation or Hybrid ventilation: utilises both mechanical and natural ventilation processes. The mechanical and natural components may be used in conjunction with each other or separately at different times of day. The natural component, sometimes subject to unpredictable external weather conditions may not always be adequate to ventilate the desired space. The mechanical component is then used to increase the overall ventilation rate so that the desired internal conditions are met. Alternatively the mechanical component may be used as a control measure to regulate the natural ventilation process, for example, to restrict the air change rate during periods of high wind speeds.

Infiltration is separate from ventilation, but is often used to provide ventilation air.

11.3 Ventilation rate.

The ventilation rate, for CII buildings, is normally expressed by the volumetric flowrate of outside air being introduced to the building. The typical units used are cubic feet per minute (CFM) or liters per second (L/s). The ventilation rate can also be expressed on a per person or per unit floor area basis, such as CFM/p or CFM/ft^2, or as air changes per hour.

For residential buildings, which mostly rely on infiltration for meeting their ventilation needs, the common ventilation rate measure is the number of times the whole interior volume of air is replaced per hour, and is called air changes per hour (I or ACH; units of 1/h). During the winter, ACH may range from 0.50 to 0.41 in a tightly insulated house to 1.11 to 1.47 in a loosely insulated house.

ASHRAE now recommends ventilation rates dependent upon floor area, as a revision to the 62-2001 standard whereas the minimum ACH was 0.35, but no less than 15 CFM/person (7.1 L/s/person). As of 2003, the standards have changed to an addition of 3 CFM/100 sq. ft. (15 l/s/100 sq. m.) to the 7.5 CFM/person (3.5 L/s/person) standard.

11.4 Ventilation standards.

In 1973, in response to the 1973 oil crisis and conservation concerns, ASHRAE Standards 62-73 and 62-81 reduced required ventilation from 10 CFM (4.76 L/s) per person to 5 CFM (2.37 L/s) per person. This was found to be a primary cause of sick building syndrome.

Current ASHRAE standards (Standard 62-89) states that appropriate ventilation guidelines are 20 CFM (9.2 L/s) per person in an office building, and 15 CFM (7.1 L/s) per person for schools. In commercial environments with tobacco smoke, the ventilation rate may range from 25 CFM to 125 CFM.

In certain applications, such as submarines, pressurized aircraft, and spacecraft, ventilation air is also needed to provide oxygen, and to dilute carbon dioxide for survival. Batteries in submarines also discharge hydrogen gas, which must also be ventilated for health and safety. In any pressurized, regulated environment, ventilation is necessary to control any fires that may occur, as the flames may be deprived of oxygen.

ANSI/ASHRAE (Standard 62-89) sets maximum CO2 guidelines in commercial buildings at 1000 ppm, however, OSHA has set a limit of 5000 ppm over 8 hours.

Ventilation guidelines are based upon the minimum ventilation rate required to maintain acceptable levels of bioeffluents. Carbon dioxide is used as a reference point, as it is the gas of highest emission at a relatively constant value of 0.005 L/s. The mass balance equation is:

$Q = G/(Ci - Ca)$

Q = ventilation rate (L/s)

G = CO_2 generation rate

Ci = acceptable indoor CO_2 concentration

Ca = ambient CO_2 concentration

Ventilation equipment:

Fume hood.

Biological safety cabinet.

Dilution ventilation.

Room air distribution.

Heat recovery ventilation.

11.5 Natural ventilation.

Natural ventilation involves harnessing naturally available forces to supply and removing air through an enclosed space. There are three types of natural ventilation occurring in buildings: wind driven ventilation, pressure-driven flows, and stack ventilation. The pressures generated by 'the stack effect' rely upon the buoyancy of heated or rising air. wind driven ventilation relies upon the force of the prevailing wind to pull and push air through the enclosed space as well as through breaches in the building’s envelope. Natural ventilation is generally impractical for larger buildings, as they tend to be large, sealed and climate controlled specifically by HVAC systems. Both are examples of passive engineering and have applications in renewable energy.

11.6 Demand-controlled ventilation (DCV).

DCV makes it possible to maintain proper ventilation and improve air quality while saving energy. ASHRAE has determined that: "It is consistent with the Ventilation rate procedure that Demand Control be permitted for use to reduce the total outdoor air supply during periods of less occupancy." CO2 sensors will control the amount of ventilation for the actual number of occupants. During design occupancy, a unit with the DCV system will deliver the same amount of outdoor air as a unit using the ventilation-rate procedure. However, DCV can generate substantial energy savings whenever the space is occupied below the design level.

11.7 Local exhaust ventilation.

Local exhaust ventilation addresses the issue of avoiding the contamination of indoor air by specific high-emission sources by capturing airborne contaminants before they are spread into the environment. This can include water vapor control, lavatory bioeffluent control, solvent vapors from industrial processes, and dust from wood- and metal-working machinery. Air can be exhausted through pressurized hoods or through the use of fans and pressurizing a specific area.

A local exhaust system is composed of 5 basic parts:

A hood that captures the contaminant at its source.

Ducts for transporting the air.

An air-cleaning device that removes/minimizes the contaminant.

A fan that moves the air through the system.

An exhaust stack through which the contaminated air is discharged.

11.8 Ventilation and combustion.

Combustion (e.g., fireplace, gas heater, candle, oil lamp, etc.) consumes oxygen while producing carbon dioxide and other unhealthy gases and smoke, requiring ventilation air. An open chimney promotes infiltration (i.e. natural ventilation) because of the negative pressure change induced by the buoyant, warmer air leaving through the chimney. The warm air is typically replaced by heavier, cold air.

Ventilation in a structure is also needed for removing water vapor produced by respiration, burning, and cooking, and for removing odors. If water vapor is permitted to accumulate, it may damage the structure, insulation, or finishes. When operating, an air conditioner usually removes excess moisture from the air. A dehumidifier may also be appropriate for removing airborne moisture.

11.9 Smoking and ventilation.

ASHRAE standard 62 states that air removed from an area with environmental tobacco smoke shall not be recirculated into ETS-free air. A space with ETS requires more ventilation to achieve similar perceived air quality to that of a non-smoking environment.

The amount of ventilation in an ETS area is equal to the amount of ETS-free area plus the amount V, where:

$V = DSD \times VA \times A/60E$

V = recommended extra flow rate in CFM (L/s)

DSD = design smoking density (estimated number of cigarettes smoked per hour per unit area)

VA = volume of ventilation air per cigarette for the room being designed (ft3/cig]

E = contaminant removal effectiveness.

11.10 Problems.

In hot, humid climates, unconditioned ventilation air will deliver approximately one pound of water each day for each cfm of outdoor air per day, annual average. This is a great deal of moisture, and it can create serious indoor moisture and mold problems.

Ventilation efficiency is determined by design and layout, and is dependent upon placement and proximity of diffusers and return air outlets. If they are located closely together, supply air may mix with stale air, decreasing efficiency of the HVAC system, and creating air quality problems.

System imbalances occur when components of the HVAC system are improperly adjusted or installed, and can create pressure differences (too much circulating air creating a draft or too little circulating air creating stagnancy).

Cross-contamination occurs when pressure differences arise, forcing potentially contaminated air from one zone to an uncontaminated zone. This often involves undesired odors or VOCs.

Re-entry of exhaust air occurs when exhaust outlets and fresh air intakes are either too close, or prevailing winds change exhaust patterns, or by infiltration between intake and exhaust air flows.

Entrainment of contaminated outside air through intake flows will result in indoor air contamination. There are a variety of contaminated air sources, ranging from industrial effluent to VOCs put off by nearby construction work.

11.11 Air Quality Procedures.

Ventilation Rate Procedure is rate based on standard, and "prescribes the rate at which ventilation air must be delivered to a space and various means to condition that air." Air quality is assessed (through CO_2 measurement) and ventilation rates are mathematically derived using constants.

Indoor Air Quality Procedure "uses one or more guidelines for the specification of acceptable concentrations of certain contaminants in indoor air but does not prescribe ventilation rates or air treatment methods." This addresses both quantitative and subjective evaluation, and is based on the Ventilation Rate

Procedure. It also accounts for potential contaminants that may have no measured limits, or limits are not set (such as formaldehyde offgassing from carpet and furniture).

COMPREHENSION

1. Read the text; as your read, note the topic dealt with in each paragraph, underline the topic sentence, key words, and important facts as your go along.
2. Analyze how the facts are connected, how the topic of a paragraph is connected with that of a preceding paragraph.
3. Make a list of all points you are going to mention in your précis. Write them down using the necessary key terms. These notes must contain all the essential facts.
4. Write a précis of the text.
5 . Sum up the main points presented in the text. Write the plan of the text in the form of statements.
6. Develop your plan into summary.
7. Make your summary coherent by a sparing use of connectors.
8. Look through your summary. Find the least important sentences and delete them. Out the remaining ones to produce a well-written, clear and concise summary.

TEXT 12
SOLAR ENERGY

Solar energy, radiant light and heat from the sun, has been harnessed by humans since ancient times using a range of ever-evolving technologies. Solar energy technologies include solar heating, solar photovoltaics, solar thermal electricity and solar architecture, which can make considerable contributions to solving some of the most urgent problems the world now faces.

Solar technologies are broadly characterized as either passive solar or active solar depending on the way they capture, convert and distribute solar energy. Active solar techniques include the use of photovoltaic panels and solar thermal collectors to harness the energy. Passive solar techniques include orienting a building to the Sun, selecting materials with favorable thermal mass or light dispersing properties, and designing spaces that naturally circulate air.

In 2011, the International Energy Agency said that "the development of affordable, inexhaustible and clean solar energy technologies will have huge longer-term benefits. It will increase countries' energy security through reliance on an indigenous, inexhaustible and mostly import-independent resource, enhance sustainability, reduce pollution, lower the costs of mitigating climate change, and keep fossil fuel prices lower than otherwise. These advantages are global. Hence the additional costs of the incentives for early deployment should be considered learning investments; they must be wisely spent and need to be widely shared".

About half the incoming solar energy reaches the Earth's surface.

The Earth receives 174 petawatts (PW) of incoming solar radiation (insolation) at the upper atmosphere. Approximately 30% is reflected back to space while the rest is absorbed by clouds, oceans and land masses. The spectrum of solar light at the Earth's surface is mostly spread across the visible and near-infrared ranges with a small part in the near-ultraviolet.

Earth's land surface, oceans and atmosphere absorb solar radiation, and this raises their temperature. Warm air containing evaporated water from the oceans rises, causing atmospheric circulation or convection. When the air reaches a high altitude, where the temperature is low, water vapor condenses into clouds, which rain onto the Earth's surface, completing the water cycle. The latent heat of water condensation amplifies convection, producing atmospheric phenomena such as wind, cyclones and anti-cyclones. Sunlight absorbed by the oceans and land masses keeps the surface at an average temperature of 14 °C. By photosynthesis green plants convert solar energy into chemical energy, which produces food, wood and the biomass from which fossil fuels are derived.Yearly Solar fluxes & Human Energy Consumption.

Solar 3,850,000 EJ
Wind 2,250 EJ

Biomass 3,000 EJ
Primary energy use (2005) 487 EJ
Electricity (2005) 56.7 EJ

The total solar energy absorbed by Earth's atmosphere, oceans and land masses is approximately 3,850,000 exajoules (EJ) per year. In 2002, this was more energy in one hour than the world used in one year. Photosynthesis captures approximately 3,000 EJ per year in biomass. The amount of solar energy reaching the surface of the planet is so vast that in one year it is about twice as much as will ever be obtained from all of the Earth's non-renewable resources of coal, oil, natural gas, and mined uranium combined.

Solar energy can be harnessed in different levels around the world. Depending on a geographical location the closer to the equator the more "potential" solar energy is available.

12.1 Applications of solar technology.

Average insolation showing land area (small black dots) required to replace the world primary energy supply with solar electricity. 18 TW is 568 Exajoule (EJ) per year. Insolation for most people is from 150 to 300 W/m2 or 3.5 to 7.0 kWh/m2/day.

Solar energy refers primarily to the use of solar radiation for practical ends. However, all renewable energies, other than geothermal and tidal, derive their energy from the sun.

Solar technologies are broadly characterized as either passive or active depending on the way they capture, convert and distribute sunlight. Active solar techniques use photovoltaic panels, pumps, and fans to convert sunlight into useful outputs. Passive solar techniques include selecting materials with favorable thermal properties, designing spaces that naturally circulate air, and referencing the position of a building to the Sun. Active solar technologies increase the supply of energy and are considered supply side technologies, while passive solar technologies reduce the need for alternate resources and are generally considered demand side technologies.

12.2 Architecture and urban planning.

Sunlight has influenced building design since the beginning of architectural history. Advanced solar architecture and urban planning methods were first employed by the Greeks and Chinese, who oriented their buildings toward the south to provide light and warmth.

The common features of passive solar architecture are orientation relative to the Sun, compact proportion (a low surface area to volume ratio), selective shading (overhangs) and thermal mass. When these features are tailored to the local climate and environment they can produce well-lit spaces that stay in a comfortable temperature range. Socrates' Megaron House is a classic example of passive solar design. The most recent approaches to solar design use computer modeling tying together solar lighting, heating and ventilation systems in an integrated solar design package. Active solar equipment such as pumps, fans and switchable windows can complement passive design and improve system performance.

Urban heat islands (UHI) are metropolitan areas with higher temperatures than that of the surrounding environment. The higher temperatures are a result of increased absorption of the Solar light by urban materials such as asphalt and concrete, which have lower albedos and higher heat capacities than those in the natural environment. A straightforward method of counteracting the UHI effect is to paint buildings and roads white and plant trees. Using these methods, a hypothetical "cool communities" program in Los Angeles has projected that urban temperatures could be reduced by approximately 3 °C at an estimated cost of US$1 billion, giving estimated total annual benefits of US$530 million from reduced air-conditioning costs and healthcare savings.

12.3 Agriculture and horticulture.

Agriculture and horticulture seek to optimize the capture of solar energy in order to optimize the productivity of plants. Techniques such as timed planting cycles, tailored row orientation, staggered heights between rows and the mixing of plant varieties can improve crop yields. While sunlight is generally considered a plentiful resource, the exceptions highlight the importance of solar energy to agriculture. During the short growing seasons of the Little Ice Age, French and English farmers employed fruit walls to maximize the collection of solar energy. These walls acted as thermal masses and accelerated ripening by keeping plants warm. Early fruit walls were built perpendicular to the ground and facing south, but over time, sloping walls were developed to make better use of sunlight. In 1699, Nicolas Fatio de Duillier even suggested using a tracking mechanism which could pivot to follow the Sun. Applications of solar energy in agriculture aside from growing crops include pumping water, drying crops, brooding chicks and drying chicken manure. More recently the technology has been embraced by vinters, who use the energy generated by solar panels to power grape presses.

Greenhouses convert solar light to heat, enabling year-round production and the growth (in enclosed environments) of specialty crops and other plants not naturally suited to the local climate. Primitive greenhouses were first used during Roman times to produce cucumbers year-round for the Roman emperor Tiberius. The first modern greenhouses were built in Europe in the 16th century to keep exotic plants brought back from explorations abroad. Greenhouses remain an important part of horticulture today, and plastic transparent materials have also been used to similar effect in polytunnels and row covers.

12.4 Solar lighting.

The history of lighting is dominated by the use of natural light. The Romans recognized a right to light as early as the 6th century and English law echoed these judgments with the Prescription Act of 1832. In the 20th century artificial lighting became the main source of interior illumination but day lighting techniques and hybrid solar lighting solutions are ways to reduce energy consumption.

Day lighting systems collect and distribute sunlight to provide interior illumination. This passive technology directly offsets energy use by replacing artificial lighting, and indirectly offsets non-solar energy use by reducing the need for air-conditioning. Although difficult to quantify, the use of natural lighting also offers physiological and psychological benefits compared to artificial lighting. Day lighting design implies careful selection of window types, sizes and orientation; exterior shading devices may be considered as well. Individual features include sawtooth roofs, clerestory windows, light shelves, skylights and light tubes. They may be incorporated into existing structures, but are most effective when integrated into a solar design package that accounts for factors such as glare, heat flux and time-of-use. When day lighting features are properly implemented they can reduce lighting-related energy requirements by 25%.

Hybrid solar lighting is an active solar method of providing interior illumination. HSL systems collect sunlight using focusing mirrors that track the Sun and use optical fibers to transmit it inside the building to supplement conventional lighting. In single-story applications these systems are able to transmit 50% of the direct sunlight received.

Solar lights that charge during the day and light up at dusk are a common sight along walkways. Solar-charged lanterns have become popular in developing countries where they provide a safer and cheaper alternative to kerosene lamps.

Although daylight saving time is promoted as a way to use sunlight to save energy, recent research has been limited and reports contradictory results: several studies report savings, but just as many suggest no effect or even a net loss, particularly when gasoline consumption is taken into account. Electricity use is greatly affected by geography, climate and economics, making it hard to generalize from single studies.

12.5 Solar thermal.

Solar thermal technologies can be used for water heating, space heating, space cooling and process heat generation.

12.5.1 Water heating.

Solar hot water systems use sunlight to heat water. In low geographical latitudes (below 40 degrees) from 60 to 70% of the domestic hot water use with temperatures up to 60 °C can be provided by solar heating systems. The most common types of solar water heaters are evacuated tube collectors (44%) and glazed flat plate collectors (34%) generally used for domestic hot water; and unglazed plastic collectors (21%) used mainly to heat swimming pools.

As of 2007, the total installed capacity of solar hot water systems is approximately 154 GW. China is the world leader in their deployment with 70 GW installed as of 2006 and a long term goal of 210 GW by 2020. Israel and Cyprus are the per capita leaders in the use of solar hot water systems with over 90% of homes using them. In the United States, Canada and Australia heating swimming pools is the dominant application of solar hot water with an installed capacity of 18 GW as of 2005.

12.5.2 Heating, cooling and ventilation.

In the United States, heating, ventilation and air conditioning (HVAC) systems account for 30% (4.65 EJ) of the energy used in commercial buildings and nearly 50% (10.1 EJ) of the energy used in residential buildings. Solar heating, cooling and ventilation technologies can be used to offset a portion of this energy.

Thermal mass is any material that can be used to store heat—heat from the Sun in the case of solar energy. Common thermal mass materials include stone, cement and water. Historically they have been used in arid climates or warm temperate regions to keep buildings cool by absorbing solar energy during the day and radiating stored heat to the cooler atmosphere at night. However they can be used in cold temperate areas to maintain warmth as well. The size and placement of thermal mass depend on several factors such as climate, daylighting and shading conditions. When properly incorporated, thermal mass maintains space temperatures in a comfortable range and reduces the need for auxiliary heating and cooling equipment.

A solar chimney (or thermal chimney, in this context) is a passive solar ventilation system composed of a vertical shaft connecting the interior and exterior of a building. As the chimney warms, the air inside is heated causing an updraft that pulls air through the building. Performance can be improved by using glazing and thermal mass materials in a way that mimics greenhouses.

Deciduous trees and plants have been promoted as a means of controlling solar heating and cooling. When planted on the southern side of a building, their leaves provide shade during the summer, while the bare limbs allow light to pass during the winter. Since bare, leafless trees shade 1/3 to 1/2 of incident solar radiation, there is a balance between the benefits of summer shading and the corresponding loss of winter heating. In climates with significant heating loads, deciduous trees should not be planted on the southern side of a building because they will interfere with winter solar availability. They can, however, be used on the east and west sides to provide a degree of summer shading without appreciably affecting winter solar gain.

12.5.3 Water treatment.

Solar distillation can be used to make saline or brackish water potable. The first recorded instance of this was by 16th century Arab alchemists. A large-scale solar distillation project was first constructed in 1872 in the Chilean mining town of Las Salinas. The plant, which had solar collection area of 4,700 m2, could produce up to 22,700 L per day and operated for 40 years. Individual still designs include single-slope, double-slope (or greenhouse type), vertical, conical, inverted absorber, multi-wick, and multiple effect. These stills can operate in passive, active, or hybrid modes. Double-slope stills are the most economical for decentralized domestic purposes, while active multiple effect units are more suitable for large-scale applications.

Solar water disinfection (SODIS) involves exposing water-filled plastic polyethylene terephthalate (PET) bottles to sunlight for several hours. Exposure times vary depending on weather and climate from a minimum of six hours to two days during fully overcast conditions. It is recommended by the World Health Organization as a viable method for household water treatment and safe storage. Over two million people in developing countries use this method for their daily drinking water.

Solar energy may be used in a water stabilisation pond to treat waste water without chemicals or electricity. A further environmental advantage is that algae grow in such ponds and consume carbon dioxide in photosynthesis, although algae may produce toxic chemicals that make the water unusable.

12.6 Solar cooker.

Solar cookers use sunlight for cooking, drying and pasteurization. They can be grouped into three broad categories: box cookers, panel cookers and reflector cookers. The simplest solar cooker is the box cooker first built by Horace de Saussure in 1767. A basic box cooker consists of an insulated container with a transparent lid. It can be used effectively with partially overcast skies and will typically reach temperatures of 90–150 °C. Panel cookers use a reflective panel to direct sunlight onto an insulated container and reach temperatures comparable to box cookers. Reflector cookers use various concentrating geometries (dish, trough, Fresnel mirrors) to focus light on a cooking container. These cookers reach temperatures of 315 °C and above but require direct light to function properly and must be repositioned to track the Sun.

The solar bowl is a concentrating technology employed by the Solar Kitchen in Auroville, Pondicherry, India, where a stationary spherical reflector focuses light along a line perpendicular to the sphere's interior surface, and a computer control system moves the receiver to intersect this line. Steam is produced in the receiver at temperatures reaching 150 °C and then used for process heat in the kitchen.

A reflector developed by Wolfgang Scheffler in 1986 is used in many solar kitchens. Scheffler reflectors are flexible parabolic dishes that combine aspects of trough and power tower concentrators. Polar tracking is used to follow the Sun's daily course and the curvature of the reflector is adjusted for seasonal variations in the incident angle of sunlight. These reflectors can reach temperatures of 450–650 °C and have a fixed focal point, which simplifies cooking. The world's largest Scheffler reflector system in Abu Road, Rajasthan, India is capable of cooking up to 35,000 meals a day. As of 2008, over 2,000 large Scheffler cookers had been built worldwide.

12.7 Solar pond, salt evaporation pond and solar furnace.

Solar concentrating technologies such as parabolic dish, trough and Scheffler reflectors can provide process heat for commercial and industrial applications. The first commercial system was the Solar Total Energy Project (STEP) in Shenandoah, Georgia, USA where a field of 114 parabolic dishes provided 50% of the process heating, air conditioning and electrical requirements for a clothing factory. This grid-connected cogeneration system provided 400 kW of electricity plus thermal energy in the form of 401 kW steam and 468 kW chilled water, and had a one hour peak load thermal storage.

Evaporation ponds are shallow pools that concentrate dissolved solids through evaporation. The use of evaporation ponds to obtain salt from sea water is one of the oldest applications of solar energy. Modern uses include concentrating brine solutions used in leach mining and removing dissolved solids from waste streams.

Clothes lines, clotheshorses, and clothes racks dry clothes through evaporation by wind and sunlight without consuming electricity or gas. In some states of the United States legislation protects the "right to dry" clothes.

Unglazed transpired collectors (UTC) are perforated sun-facing walls used for preheating ventilation air. UTCs can raise the incoming air temperature up to 22 °C and deliver outlet temperatures of 45–60 °C. The short payback period of transpired collectors (3 to 12 years) makes them a more cost-effective alternative than glazed collection systems. As of 2003, over 80 systems with a combined collector area of 35,000 m2 had been installed worldwide, including an 860 m2 collector in Costa Rica used for drying coffee beans and a 1,300 m2 collector in Coimbatore, India used for drying marigolds.

12.8 Solar power.

Solar power is the conversion of sunlight into electricity, either directly using photovoltaics (PV), or indirectly using concentrated solar power (CSP). CSP systems use lenses or mirrors and tracking systems to focus a large area of sunlight into a small beam. PV converts light into electric current using the photoelectric effect.

Commercial CSP plants were first developed in the 1980s, and the 354 MW SEGS CSP installation is the largest solar power plant in the world and is located in the Mojave Desert of California. Other large CSP plants include the Solnova Solar Power Station (150 MW) and the Andasol solar power station (100 MW), both in Spain. The 97 MW Sarnia Photovoltaic Power Plant in Canada, is the world's

Concentrated solar power.

Concentrating Solar Power (CSP) systems use lenses or mirrors and tracking systems to focus a large area of sunlight into a small beam. The concentrated heat is then used as a heat source for a conventional power plant. A wide range of concentrating technologies exists; the most developed are the parabolic trough, the concentrating linear fresnel reflector, the Stirling dish and the solar power tower. Various techniques are used to track the Sun and focus light. In all of these systems a working fluid is heated by the concentrated sunlight, and is then used for power generation or energy storage.

12.9 Photovoltaics.

A solar cell, or photovoltaic cell (PV), is a device that converts light into electric current using the photoelectric effect. The first solar cell was constructed by Charles Fritts in the 1880s. In 1931 a German engineer, Dr Bruno Lange, developed a photo cell using silver selenide in place of copper oxide. Although the prototype selenium cells converted less than 1% of incident light into electricity, both Ernst Werner von Siemens and James Clerk Maxwell recognized the importance of this discovery. Following the work of Russell Ohl in the 1940s, researchers Gerald Pearson, Calvin Fuller and Daryl Chapin created the silicon solar cell in 1954. These early solar cells cost 286 USD/watt and reached efficiencies of 4.5–6%.

12.10 Solar chemical.

Solar chemical processes use solar energy to drive chemical reactions. These processes offset energy that would otherwise come from a fossil fuel source and can also convert solar energy into storable and transportable fuels. Solar induced chemical reactions can be divided into thermochemical or photochemical. A variety of fuels can be produced by artificial photosynthesis. The multielectron catalytic chemistry involved in making carbon-based fuels (such as methanol) from reduction of carbon dioxide is challenging; a feasible alternative is hydrogen production from protons, though use of water as the source of electrons (as plants do) requires mastering the multielectron oxidation of two water molecules to molecular oxygen. Some have envisaged working solar fuel plants in coastal metropolitan areas by 2050 - the splitting of sea water providing hydrogen to be run through adjacent fuel-cell electric power plants and the pure water by-product going directly into the municipal water system.

Hydrogen production technologies been a significant area of solar chemical research since the 1970s. Aside from electrolysis driven by photovoltaic or photochemical cells, several thermochemical processes have also been explored. One such route uses concentrators to split water into oxygen and hydrogen at high temperatures (2300-2600° C). Another approach uses the heat from solar concentrators to drive the steam reformation of natural gas thereby increasing the overall hydrogen yield compared to conventional reforming methods.[Thermochemical cycles characterized by the decomposition and regeneration of reactants present another avenue for hydrogen production. The Solzinc process under development at the Weizmann Institute uses a 1 MW solar furnace to decompose zinc oxide (ZnO) at temperatures above 1200° C. This initial reaction produces pure zinc, which can subsequently be reacted with water to produce hydrogen.

Sandia's Sunshine to Petrol (S2P) technology uses the high temperatures generated by concentrating sunlight along with a zirconia/ferrite catalyst to break down atmospheric carbon dioxide into oxygen and carbon monoxide (CO). The carbon monoxide can then be used to synthesize conventional fuels such as methanol, gasoline and jet fuel.

A photogalvanic device is a type of battery in which the cell solution (or equivalent) forms energy-rich chemical intermediates when illuminated. These energy-rich intermediates can potentially be stored and subsequently reacted at the electrodes to produce an electric potential. The ferric-thionine chemical cell is an example of this technology.

Photoelectrochemical cells or PECs consist of a semiconductor, typically titanium dioxide or related titanates, immersed in an electrolyte. When the semiconductor is illuminated an electrical potential develops. There are two types of photoelectrochemical cells: photoelectric cells that convert light into electricity and photochemical cells that use light to drive chemical reactions such as electrolysis.

A combination thermal/photochemical cell has also been proposed. The Stanford PETE process uses solar thermal energy to raise the temperature of a thermionic metal to about 800° C to increase the rate of production of electricity to electrolyse atmospheric CO_2 down to carbon or carbon monoxide which can then be used for fuel production, and the waste heat can be used as well.

12.11 Solar vehicles.

Development of a solar powered car has been an engineering goal since the 1980s. The World Solar Challenge is a biannual solar-powered car race, where teams from universities and enterprises compete over 3,021 kilometres (1,877 mi) across central Australia from Darwin to Adelaide. In 1987, when it was founded, the winner's average speed was 67 kilometres per hour (42 mph) and by 2007 the winner's average speed had improved to 90.87 kilometres per hour (56.46 mph).The North American Solar Challenge and the planned South African Solar Challenge are comparable competitions that reflect an international interest in the engineering and development of solar powered vehicles.

Some vehicles use solar panels for auxiliary power, such as for air conditioning, to keep the interior cool, thus reducing fuel consumption.

In 1975, the first practical solar boat was constructed in England. By 1995, passenger boats incorporating PV panels began appearing and are now used extensively] In 1996, Kenichi Horie made the first solar powered crossing of the Pacific Ocean, and the sun21 catamaran made the first solar powered crossing of the Atlantic Ocean in the winter of 2006–2007. There are plans to circumnavigate the globe in 2010.

In 1974, the unmanned AstroFlight Sunrise plane made the first solar flight. On 29 April 1979, the Solar Riser made the first flight in a solar powered, fully controlled, man carrying flying machine, reaching an altitude of 40 feet (12 m). In 1980, the Gossamer Penguin made the first piloted flights powered solely by photovoltaics. This was quickly followed by the Solar Challenger which crossed the English Channel in July 1981. In 1990 Eric Scott Raymond in 21 hops flew from California to North Carolina using solar power. Developments then turned back to unmanned aerial vehicles (UAV) with the Pathfinder (1997) and subsequent designs, culminating in the Helios which set the altitude record for a non-rocket-propelled aircraft at 29,524 metres (96,864 ft) in 2001.The Zephyr, developed by BAE Systems, is the latest in a line of record-breaking solar aircraft, making a 54-hour flight in 2007, and month-long flights are envisioned by 2010.

A solar balloon is a black balloon that is filled with ordinary air. As sunlight shines on the balloon, the air inside is heated and expands causing an upward buoyancy force, much like an artificially heated hot air balloon. Some solar balloons are large enough for human flight, but usage is generally limited to the toy market as the surface-area to payload-weight ratio is relatively high.

Solar sails are a proposed form of spacecraft propulsion using large membrane mirrors to exploit radiation pressure from the Sun. Unlike rockets, solar sails require no fuel. Although the thrust is small compared to rockets, it continues as long as the Sun shines onto the deployed sail and in the vacuum of space significant speeds can eventually be achieved.

The High-altitude airship (HAA) is an unmanned, long-duration, lighter-than-air vehicle using helium gas for lift, and thin film solar cells for power. The United States Department of Defense Missile Defense Agency has contracted Lockheed Martin to construct it to enhance the Ballistic Missile Defense System (BMDS). Airships have some advantages for solar-powered flight: they do not require power to remain aloft, and an airship's envelope presents a large area to the Sun.

12.12 Energy storage methods.

Solar energy is not available at night, and energy storage is an important issue because modern energy systems usually assume continuous availability of energy.

Thermal mass systems can store solar energy in the form of heat at domestically useful temperatures for daily or seasonal durations. Thermal storage systems generally use readily available materials with high specific heat capacities such as water, earth and stone. Well-designed systems can lower peak demand, shift time-of-use to off-peak hours and reduce overall heating and cooling requirements.

Phase change materials such as paraffin wax and Glauber's salt are another thermal storage media. These materials are inexpensive, readily available, and can deliver domestically useful temperatures (approximately 64 °C). The "Dover House" (in Dover, Massachusetts) was the first to use a Glauber's salt heating system in 1948.

Solar energy can be stored at high temperatures using molten salts. Salts are an effective storage medium because they are low-cost, have a high specific heat capacity and can deliver heat at temperatures compatible with conventional power systems. The Solar Two used this method of energy storage, allowing it to store 1.44 TJ in its 68 m3 storage tank with an annual storage efficiency of about 99%.

Off-grid PV systems have traditionally used rechargeable batteries to store excess electricity. With grid-tied systems, excess electricity can be sent to the transmission grid, while standard grid electricity can be used to meet shortfalls. Net metering programs give household systems a credit for any electricity they deliver to the grid. This is often legally handled by 'rolling back' the meter whenever the home produces more electricity than it consumes. If the net electricity use is below zero, the utility is required to pay for the extra at the same rate as they charge consumers. Other legal approaches involve the use of two meters, to measure electricity consumed vs. electricity produced. This is less common due to the increased installation cost of the second meter.

Pumped-storage hydroelectricity stores energy in the form of water pumped when energy is available from a lower elevation reservoir to a higher elevation one. The energy is recovered when demand is high by releasing the water to run through a hydroelectric power generator.

12.13 Development, deployment and economics.

Beginning with the surge in coal use which accompanied the Industrial Revolution, energy consumption has steadily transitioned from wood and biomass to fossil fuels. The early development of solar technologies starting in the 1860s was driven by an expectation that coal would soon become scarce. However development of solar technologies stagnated in the early 20th century in the face of the increasing availability, economy, and utility of coal and petroleum.

The 1973 oil embargo and 1979 energy crisis caused a reorganization of energy policies around the world and brought renewed attention to developing solar technologies. Deployment strategies focused on incentive programs such as the Federal Photovoltaic Utilization Program in the US and the Sunshine Program in Japan. Other efforts included the formation of research facilities in the US (SERI, now NREL), Japan (NEDO), and Germany (Fraunhofer Institute for Solar Energy Systems ISE).

Commercial solar water heaters began appearing in the United States in the 1890s. These systems saw increasing use until the 1920s but were gradually replaced by cheaper and more reliable heating fuels. As with photovoltaics, solar water heating attracted renewed attention as a result of the oil crises in the 1970s but interest subsided in the 1980s due to falling petroleum prices. Development in the solar water heating sector progressed steadily throughout the 1990s and growth rates have averaged 20% per year since 1999. Although generally underestimated, solar water heating and cooling is by far the most widely deployed solar technology with an estimated capacity of 154 GW as of 2007.

The International Energy Agency has said that solar energy can make considerable contributions to solving some of the most urgent problems the world now faces:

The development of affordable, inexhaustible and clean solar energy technologies will have huge longer-term benefits. It will increase countries' energy security through reliance on an indigenous, inexhaustible and mostly import-independent resource, enhance sustainability, reduce pollution, lower the costs of mitigating climate change, and keep fossil fuel prices lower than otherwise. These advantages are global. Hence the additional costs of the incentives for early deployment should be considered learning investments; they must be wisely spent and need to be widely shared.

In 2011, the International Energy Agency said that solar energy technologies such as photovoltaic panels, solar water heaters and power stations built with mirrors could provide a third of the world's energy by 2060 if politicians commit to limiting climate change. The energy from the sun could play a key role in de-carbonizing the global economy alongside improvements in energy efficiency and imposing costs on greenhouse gas emitters. "The strength of solar is the incredible variety and flexibility of applications, from small scale to big scale".

The International Organization for Standardization has established a number of standards relating to solar energy equipment. For example, ISO 9050 relates to glass in building while ISO 10217 relates to the materials used in solar water heaters.

COMPREHENSION

1. Read the text; as your read, note the topic dealt with in each paragraph, underline the topic sentence, key words, and important facts as your go along.
2. Analyze how the facts are connected, how the topic of a paragraph is connected with that of a preceding paragraph.
3. Make a list of all points you are going to mention in your précis. Write them down using the necessary key terms. These notes must contain all the essential facts.
4. Write a précis o the text.
5. Sum up the main points presented in the text. Write the plan of the text in the form of statements.
6. Develop your plan into summary.
7. Make your summary coherent by a sparing use of connectors.
8. Look through your summary. Find the least important sentences and delete them. Out the remaining ones to produce a well-written, clear and concise summary.

PART II

TEXT 1
BRITAIN

The United Kingdom of Great Britain (England, Scotland, Wales) and Northern Ireland is a monarchy; the Queen is the head of the State, In practice the United Kingdom is governed by Her Majesty's Government in the name of the Queen. Area and population. Britain ranks about 75th in size among the countries of the world. In population, with about 2 per cent of the world's population, it ranks 9th. In density of population it is 4th after Japan, Belgium and the Netherlands. 80 per cent of its population live in towns; seven great urban areas, whose centres are London, Manchester, Birmingham, Leeds, Liverpool, Newcastle upon Tyne and Glasgow, contain nearly 40 per cent of the population. Greater London has a population of over 8 million.

The economy. Britain lives by manufacture and trade. It is one of the most industrialised countries in the world: for every person employed in agriculture, 11 are employed in mining, manufacturing and building. Its agriculture provides only half the food it needs, and, apart from coal and low-grade iron ore, it has few natural resources. The other half of its food and most of the raw materials for its industries have to be imported and paid for by exports of manufactures, and by its net earnings from overseas investment, shipping, tourism and a variety of commercial and financial services.

The physical background. The British Isles form a group lying off the northwest coast of Europe. The largest islands are Great Britain proper and Ireland (or the Emerald Isle), comprising Northern Ireland and the Irish Republic. Off the southern coast of England is the Isle of Wight. The Isle of Man in the Irish Sea and the Channel Islands have a large measure of administrative autonomy.

The seas surrounding the British Isles are everywhere shallow – usually less than 50 fathom (300 feet, or about 90 m) – because the islands lie on the continental shelf. To the north-west where the shelf ends the sea floor plunges abruptly to 3,000 feet (900 m). These shallow waters are in portant because they provide excellent fishing grounds. The estuaries of the short British rivers (the Severn, 210 miles long, the Thames, 200, the Mersey, the Tyne, the Clyde, the Tweed) are valuable as natural harbours.

Britain has a generally mild and temperate climate. The prevailing winds are south-westernly. The climate is subject to frequent changes but few extremes of temperature. During a normal summer, the temperature occasionally rises above 27°C in the south. Extreme minimum temperatures depend on local conditions, but -7°C may occur on a still, clear winter night; -12°C is rare, and -18°C or below has been recorded only during exceptionally severe winter periods.

In fine, still weather there is occasionally haze in summer and mist and fog in winter. Smogs have become less severe. Soil and vegetation. Many parts of Highland Britain have only thin, poor soils with large stretches of moorland over the Highlands of Scotland, the Pennines, the Lake District, the mountains of Wales.

Almost the whole of Lowland Britain has been cultivated, and farmland covers the area, except where there are urban and industrial settlements. Woodlands now occupy only about 7 per cent of the surface of the country.

The cool temperate climate and the even distribution of rainfall ensure a long growing season.

Fauna. Some of the larger mammals, including the wolf, the bear, the boar and the raindeer have become extinct. Some other kinds of deer, badgers, foxes and others have survived. There are many species of birds, including many song-birds, some of them are resident. River and lake fish include salmon, trout, perch, roach, pike and some others.

Translate into Russian

A. Asyndetic attributive clauses

1. He had a long conversation with his father avoiding his private life and the emptiness he had felt these last three days.

2. He planned to stay up all night – it seemed the least you could do the day your mother died.

3. I never mentioned the discovery to my brother because I had realized the moment I saw the revolver the use I intended to make of it.

4. There he found that the attorney's affairs were in a bad way, and instead of inheriting the fortune he expected, he was left with little but debts to settle.

5. Experience is the name everyone gives to their mistakes.

B. Passive Voice

1. A prize will be offered to the best speaker. The best speaker will be offered a prize. 2. Was the same story told by everybody? Was everybody told the same story? 3. A new book was given to every student. Every student was given a new book. 4. Two thousand pounds were left to him. He was left two thousand pounds.

C. have to + Pass. Inf.

1. Mother has to be looked after the whole time. You never know what she is up to. 2. I laid on an eager smiles: all responses to George had to be overdone. 3. New and more sophisticated ways had to be invented to tackle this problem. 4. Modern machines will have to be imported if we want to develop the agriculture in this country.

Translate the following sentences paying attention to the words underlined.

1.to rank

How do you rank William Golding as a novelist? They rank X among the world's great statesmen. A major ranks above a captain.

Друзья поспорили, можно ли X отнести к числу лучших спортсменов года. Говорят, что его имя находится в списке неудачников. В молодости он мечтал получить высокий чин.

2. to live

He lived a double life. He hopes to live down the scandal caused by his divorce. He didn' live up to his reputation.

I don't like the noise of these jet aircrafts but I've learnt to live with it.

Трудно осуществить на практике принципы, которые он выдвигает. Не волнуйтесь, вы еще доживете до того дня, когда о вашем проступке забудут. Он научился жить с сознанием того, что болезнь его безнадежна. Он жил и умер холостяком.

3. to provide He has a large family to provide for. We must provide for the entertainment of our visitors. He has provided against a coal shortage next winter. I'm already provided with all I need.

Он содержит не только свою старую мать, но и семью брата. Мы должны сделать так, чтобы вечер удался. Вы побеспокоились о том, чтобы шторм не причинил вреда? Он снабдил экспедицию продуктами и инструментами.

4. occasion (ally) I've met Mr. White on several occasions.

This is not an occasion for laughter. He speaks French on occasion. The Government must rise to the occasion. I've had no occasion to visit him recently. He pays me occasional visits. These are ordinary occasional verses.

У нее нет повода надеть новое платье. К сожалению, мы не смогли оказаться на высоте положения. Вчера он воспользовался возможностью поговорить с этим известным драматургом, У вас нет повода сердиться. У меня не было случая съездить в эти края. В течение дня возможны ливни. Я вижу его иногда.

5. proper This is not a proper time for merry-making. He's not at all a proper person for a young girl to know. He gave his wife a proper licking. Do it properly or not at all.

Он уверен, что делает все, как нужно. Не могу найти подходящий инструмент. Она всегда находит нужные слова.

TEXT 2
LONDON

A contemporary guide-book on London says: "London as a single personality simply doesn't exist. London is indeed a thousand villages."

Greater London is made up of the present County of London, which includes nearly all of Middlesex and parts of Essex, Hertfordshire, Kent and Surrey. Within Greater London there are 32 London boroughs which seem self-contained and unrelated to each other; among them are Kensington, Paddington, Tottenham, Bloomsbury, Chelsea, Harrow, Hempstead and others. The population of Greater London is over 8 million, a seventh of the population of the islands.

The City is the true heart of London. It officially covers about one square mile running along the Thames Embankment from about Waterloo Bridge to Tower Bridge. The boundaries of the City are marked, the most prominent being the statue of the griffin where the Strand becomes Fleet Street before the Royal Courts.

Within its magic mile the City holds Fleet Street, the newspaper centre of the world, the Old lady of Threadneedle Street, as the Bank of England is known, Lloyd's, the Royal Exchange, the Lord Mayor, the Mansion House, St. Paul's Cathedral, the Old Bailey, renowned as the world's most famous criminal court, and the Tower of London. The latter, originally intended aз a fortress, has served both as a palace and as a prison. Now it is a museum, the Royal Treasury.

Westminster (the Palace and the Abbey) and Whitehall is the Government quarter of the City.

Westminster Abbey was founded by King Edward the Confessor, who died in January 1066, on the eve of the consecration of the new church, and was buried behind the high altar. Almost all English kings are burled in the Abbey; Queen Victoria is buried in Windsor.

William the Conqueror was the first king to be crowned in Westminster Abbey. After that time all English monarchs were crowned here.

Here in Westminster Abbey is the tomb of the Unknown Warrior, who represents a million dead, fallen in the First World War. The idea of such a memoralization was conceived by a British chaplain in 1916 who noticed in a back garden of a house at Armentiers, France, a grave with a rough cross inscribed "An Unknown British Soldier."

In the South transept of the Abbey we come to the Poet's Corner where many writers are either buried or memoralized. This tradition was started by Geoffrey Chaucer, the author of CANTERBURY TALES, who was buried here in 1400, which set a precedent. Since then many famous poets and writers have been buried here, among them Ben Jonson, Dr. Johnson, Dickens, Tennyson, Browning, Kipling, T.S. Eliot. There are memorials to some writers who were buried elsewhere - Shakespeare, Milton, Burns, Byron. There is a magnificent bronze bust of William Blake made by an outstanding contemporary artist Jacob Epstein.

The Houses of Parliament stand across the roadway from the eastern end of the Abbey; they are still officially known as the Palace of Westminster, although no palace has existed there since the reign of Henry VIII (1509-1547).

Whitehall, the wide thoroughfare that runs from the Houses of Parliament to Trafalgar Square, is lined with government offices: the Home Office, the War Office, the Board of Trade, the Treasury, the Admiralty. In the roadway opposite the entrance to the Home Office stands the Cenotaph, the memorial to the men who died in the two World Wars. On the West aide of Whitehall is a quiet little street called Downing Street in which No. 10 is the residence of the Prime Minister of the day. The New Scotland Yard, familiar to all readers of detective stories, is also here, in Whitehall.

The West End. At the end of Whitehall we come to Trafalgar Square with its tall Nelson Column, commemorating the greatest British sailor and his historic victory over the French navy at Cape Trafalgar in 1805.

The West End is the piece for gayety and entertainment. The largest and the best hotels, the best theatres, restaurants and shops of all kinds are to be found here. The West End is anywhere within a leisurely walk of Piccadilly Circus - to Londoners "the Hub of the Universe ", bright in the daytime with flower-girls, and at night with electric advertisements. Regent Street and Bond Street are famous for their fashionable shops. If we go from Trafalgar square down the broad street called the Mall we shall come to Buckingham Palace, the residence of the Royal family. Here you can watch the famous ceremony of the changing of Life Guard. In front of the palace stands the Queen Victoria Memorial; behind the palace is St. James's Park, one of the most beautiful spots in London. Other parks in London: Hyde Park, Regent's Park, Kensington Gardens, Kew Gardens. Almost all of the parks were designed by John Nash (1752-1835) or contrived by him. Sir Christopher Wren {1632-1723) is another man who contributed much to the appearance of the City. In 1666 he-was appointed Principal Architect for rebuilding the City of London after the Great Fire (1666). For the next 33 years Wren was kept busy rebuilding the City churches of which 53 are attributed to him. St Paul's Cathedral was rebuilt by him on the lines initiated by another famous English architect Inigo Jones (1575-1652). (His Banqueting Hall, designed as a part of a palace, is a masterpiece of the English Renaissance).

The Monument, a fluted Doric column designed by Robert Hooke (1635-1705), the author of the "Hooke's law" in physics.

The only modern part of the City is South Barbican'. There are six tall glass slabs of modern buildings on either side of a street, all on land which was cleared by a blitz. These art offices, and to the North there is a residential part of Barbican.

♦ barbican - fortified building, especially a double tower over a gate or bridge, used in olden times as an cuter defense to a city or castle /Hornby/.

Translate into English

A. Passive Voice

1. What a pity these beautiful pictures are never looked at.
2. He was looked on as one of the greatest men of his time,
3. The child hasn't been properly looked after.
4. Jones is always listened to.
5. I was spoken to very rudely.
6. Henry can always be relied on.
7. The target is aimed t.
8. That point has not been overlooked.

B. to be + Pass. Inf.

1. The chauffeur was nowhere to be found. 2. The fruit of these months is to be found in the little pamphlet, now a bibliographical rarity, NEW ESSAYS BY GOLDSMITH. 3. Some books are to be tasted, others to be swallowed, and some few to be chewed and digested.

C. Infinitive as an attribute.

1. Jack London was the best short-story writer in America to arise after Edgar Poe. 2. What was the first book to be printed in Russia? 3. He was the first to believe in the young artist's talent. 4. It was the first church to be built in London. 5. At that time he was the only scientist to support this theory.

Translate paying attention to the words underlined,

1. to renew A snake renews its skin. We must renew our supplies of food. He renewed his complaints. We wanted to renew his contract.

Противник возобновил атаку. Мне нужно обновить мебель. Нужно пополнить наш запас воды. После перерыва докладчик снова начал обвинять всех в плохой работе.

2. crown Queen Elizabeth succeeded to the crown in 1953. His efforts were crowned with success. I want to open a bottle of wine to crown our feast.

Английского наследного принца зовут Чарльз, принц Уэльский. Тяжелый труд был увенчан победой. Для полного торжества не хватает только телеграммы от родителей жениха.

3. time You will learn how to do it in time. He did the work in four hours; I could have done it in half the time. There is a time for everything. He timed his journey so that he arrived before dark. We both arrived at seven - that's what I call a perfect' timing! The remark was well timed.

Мы не должны терять времени. Он помедлил с ответом, чтобы выиграть время. Он сидит за столом целый день, но половину времени просто мечтает. Очень важно точно рассчитывать свои действия во времени. Его выступление очень не ко времени.

4. to hold The red band was holding the papers together. A paper bag will hold sand but it won't hold water. Do you hold such strange opinions? Plato held that the soul is immortal.

От хохота он схватился за бока. Все восхищаются тем, как он прямо держится в его-то годы. Интересно, этот мешок выдержит такую тяжесть? Я не люблю этого человека, он придерживается странных взглядов на прогресс.

5. former I remember him in former days. Sometimes I dream of my happiness in a former life. I've read both Iris Murdoch and Margaret Drabble and I must say that I prefer the former. In the picture you can see the Queen with her former prime minister.

Хорошо помню, как красив он был в былые времена. Бывший директор цирка работает теперь на ипподроме. Он назвал два романа этого писателя, ему больше нравится первый из них.

6. compel (ling) His conscience compelled him to confess.

The Abbey was founded by King Edward the Confessor, that strange but compelling personality remembered nostalgically as the last of the English kings. She found the Bond Street world compelling, irresistible. His words compelled everybody's attention.

Он был вынужден подать в отставку по болезни. Все согласились с тем, что молодой ученый обладает притягательной силой. Мир телевидения показался новичку завораживающим.

7. contribute (to) The Red Cross contributed food and clothing for the refugees. The new assistant contributed new information on this problem. Drink contributed to his ruin. Mr. Green has contributed poems to this magazine for several years.

Этот человек пожертвовал много денег на Красный Крест. Перенапряжение способствовало его тяжелой болезни. Неудача усугубила его плохое настроение. Старый ученый внес большой вклад в успех дела. Он регулярно дает материалы в эту газету. Всех граждан города призвали способствовать делу победы над врагом.

8. attribute (to) He attributes wisdom to his teachers. This comedy has always been attributed to Shakespeare.

Он объясняет свой успех удачным стечением обстоятельств. Это высказывание приписывается Мольеру.

TEXT 3

Daylight was appearing over London, the great city of bachelors. Half-pint bottles of milk began to be stood on the doorsteps of houses containing single apartments from Hempstead Heath to Greenwich Park, and from Wanstead Flats to Putney Heath; but especially in Hampstead, and especially in Kensington,

In Queen's Gate, Kensington, in Harrington Road, the Bolt-one, Holland Park, and in King's Road, Chelsea, and its backwaters, the bachelors stirred between their sheets, reached for their wound watches, and with waking intelligences noted the time; then, remembering it was Saturday morning, turned over on their pillows. But soon, since it was Saturday, most would be out in the streets shopping for their bacon and eggs, their week's supplies of breakfasts, and occasional suppers; and these bachelors would set out early, before a quarter past ten, in order to avoid being jostled by the women, the legitimate shoppers.

At a quarter past ten, Ronald Bridges, aged thirty-seven, who during the week was assistant curator at a small museum of handwriting in the City of London, stopped in the Old Brompton Road to speak to his friend Martin Bowles, a barrister of thirty – five.

Ronald moved his old plastic shopping hag up and down twice, to suggest to Martin that it was a greater weight than it really was, and that a whole business was a bore.

'Where', said Ronald, pointing to a package on the top of Martin's laden bag, 'did you get your frozen peas?'

' Clayton's'

'How much?'

'One and six. That’s for a small packet; does for two. A large is two and six; six helpings."

'Terrible price,' said Ronald agreeably.

'Your hand's never out of your pocket,' said Martin.

'What else have you got there?' -Ronald said.

‘Cod. You bake it in yoghourt with a sprinkle of marjoram and it tastes like halibut. My old Ma's away for a fortnight with the old housekeeper.'

'Marjoram, where do you get marjoram?'

'Oh, Fortnum's. You get all the herbs there, I get a bag of stuff every month. I do nearly all the shopping and most of the cooking since my old Ma's had her op. And old Carrie isn't up to it now - she never was much of a cook.'

'You must have it in you,' said Ronald,' going all the way to Piccadilly for herbs.'

'I usually work it in with something else,' said Martin. 'We like our herbs, Ma and I. Come on in here.'

He meant a cofee-bar. They sat beside their shopping bags and sipped their Espressos with contented languor.

'I've forgotten Tide,' said Ronald. 'I must remember to get Tide.'

'Don't you make a list?' said Martin.

'No. I depend on my memory.'

'I make a list,' said Martin, 'when my Ma's away. I always do the shopping at the week-ends. When Ma's at home she makes the list. It's always unreadable, though.'

'A waste of time,' said Ronald, 'if you've got a memory.'

'Do you mind?' said a girl who had just come into the coffee-shop. She was referring to Ronald's bag of shopping; it was taking up the seat which ran along the wall.

'Oh, sorry,' said Ronald, removing his bag and dumping it on the floor.

'New potatoes in the shops,' Ronald said.

'They're always in the shops,' said Martin, 'these days. In season and out of season. It's the same with everything: you can get new potatoes and new carrots all the year round now, and peas and spinach any time, and tomatos in the spring, even.'

'At a price,' said Ronald.

'At a price,' Martin said. 'What bacon do you get?'

'I make do with streaky. I grudge breakfasts,' said Ronald.

'Same here.'

'Your hand's never out of your pocket, ' Ronald said before Martin could say it.

/ Muriel Spark /

<u>Translate into Russian</u>

A. <u>Word Order</u> (rhematic subject)

1. A fly buzzed against the window pane. 2. A woman in a fluttering shawl was creeping slowly by the railings. 3. Another telephone on his table sounded. 4. A cry of pain broke from the lad's lips. 5. An unfinished glass of orange juice awaited her. 6. A scrap of paper was inserted in the frame of the looking-glass - "Gone to the Italian Club." 7. A man came forward. He was one of those in the line-up, and he said he heard and saw the whole thing. 8. Sunburnt young men in helmets came out to meet us. 9. Two state police patrol cars were at the scene.

B. <u>though</u>, adv = however

1. He said he would come; he didn't, <u>though</u>. 2. This moment was safe, though; this could not be touched. 3. You have to be in the right mood, though, to appreciate this play. 4. He was mostly an easy person to live with. In his had moments, though, he would sulk and fall silent. 5. His descent from the Iancasters, though, is doubtful.

C. adjectives ending in -<u>able</u>, -<u>ible</u> = V+able = N which can be V+ed, or descriptive.

1. He is depend<u>able</u>. I can rely on him no matter what it is.

2. My electric razor created a sensation among the natives; so did the washable wallpaper in the bathroom.

3. Through the glasses it was possible to see a series of ridges running across the faces of others; they were quite climbable.

4. Schoenberg is a discussable composer.

Translate paying attention to the words underlined

1. appear When we reached the top of the hill, the town appeared below us. He is a famous singer and has appeared in every big concert hall in Europe.

Он обещал приехать ровно в шесть, но появился только в восемь. В самом конце улицы показался старый автомобиль. Он выступает с лекциями по всем крупным городам страны.

2. contain The atlas contains forty maps. Can't you contain your enthusiasm?

В книге содержится много полезной информации. При виде такой жестокости он с трудом сдержал гнев.

3. single He decided to remain single. I'd like to have a single room. He was known to be a man ot single purpose.

Мне нравится этот человек и его простые идеи. Твой друг женат? - Нет, он холост. Странно, что пассажир взял билет только в один конец, как будто не собирался вернуться.

4. do Go and do your hair. Will you the make beds while I do the windows. This room will do me quite well. These shoes won't do for mountain-climbing. This photograph does not do you justice. The meat is overdone. That will do.

Мы проделали весь путь за пять часов. Мне нравится ваша прическа. Он перевел шесть страниц, но не уверен, что этого достаточно. Ваш костюм не годится для выпускного вечера.

5. waking What do you do in your waking hours? She dreamed as soon as she went to sleep; she was looking at a film she had seen before - had, in waking life, seen twice. The question was put to him, what hope is; and the answer was, "The dream of a waking man." (Diogenes).

Когда не спится, я часто думаю о судьбе этого человека. Герой романа чувствует, что за ним следит чье-то недремлющее око. С этого момента началась моя сознательная жизнь.

6. suggest Her black dress, simple to austerity, suggested her bereaved condition. The most insignificant of his works suggest a personality which is strange, tormented and complex.

Его имя говорило присутствующим многое. Сияющие глаза молодой девушки заставляли думать о весне и счастье. Его план предполагает большую подготовку. Ему предложили сменить половину сотрудников. Его книга заставляет думать.

7. make We make paper into many things. His father wants to make a doctor of him. She was sent to make the beds. Popular wisdom claims: make hay while the sun shines. He makes friends as easily as he makes enemies. Everybody is convinced that he will make a good husband.

Эту дорогу построили совсем недавно. Ребята попросили своего нового друга разжечь костер. Поразительно, как он умеет наживать врагов. Из нее получится хороший архитектор. Нужно, чтобы все помнили, что продукты кончаются, придется обходиться одним бутербродом.

TEXT 4

The problem of talking to complete strangers is a cultural one rather more than, a linguistic one. The English have the reputation of being standoffish and proud or snobbish, of keeping themselves very much to themselves. But, in fact, the reputation is not wholly deserved. The English are very shy people on the whole and because of this they find it difficult; to talk to strangers.

Firstly, people don't go up and talk to strangers unless it is unavoidable - this comes through in the tone of voice, a tone which is immediately appreciated by English people, and is therefore very important. It shows itself in the use of rising intonation and in an elaborately polite mode of address. Then there are the hesitation signals: <u>er</u>, <u>um</u> and so on, and the lack of dogmatism in speech. 'Let's see' and 'I think' are the formulae used - sometimes even when we are really quite sure. Note, too, the attention-gathering formula - 'excuse me' - this is merely a noise, like 'how do you do', or 'goodbye'. The actual words don't mean anything - the whole sound carries its significance - that you require attention - but that you want to be polite about getting it. But note (and this is a common mistake made by non-speakers of English) that this 'excuse me' formula is generally used as an initiating remark; it is an attention-gatherer. It is very rarely used when we wish to apologise, except with a totally different intonation, and it is never used when we want to interrupt or contradict someone else's remark except sarcastically or indignantly.

Translate into Russian

A. <u>Gerunds</u>

1. Before taking the taxi he lingered for some further chatter, unwilling to end the evening. 2. - How do you come to know all this? - Prom piecing together what I hear and see. 3. She has taken to studying languages. 4. The thought of refusing the food and running away crossed my mind for an instant. 5. I found him detestable and as soon as he was out of danger I had no hesitation in telling him so. 6. He was that interesting example of modern life - a man who lived in a permanent condition of being torn asunder. 7. The difficulty of writing about Henry Fielding, a man, is that very little is known of him.

B. <u>except</u>, <u>unless</u>, <u>double negation</u>

1. She did not sit down, except to take her dinner, from her rising at dawn to her retiring at one in the morning. 2. My father did not go to church except on family occasions and then with derision. 3. She would not act except under orders. 4. Ho will not be able to do it unless we help him. 6. He is never displeased.

C.

1. Charles Dickens had come up from the country with the sole purpose of meeting Andersen, whose <u>stories</u> Dickens <u>loved</u> and <u>admired</u>. 2. Senor Martinez reported the nuns' willingness to <u>keep</u> and <u>care for Geoffrey</u>. 3. She commands

loyalty and respect, but she does not so easily inspire familiar affection. 4. He denied any suggestion that he was connected with or was responsible for the absence of the main witness at the trial. 5. He called for and got sympathy in the way most of us could never do.

Translate paying attention to the words underlined.

1. whole I want to know the whole truth about this matter..

It rained for three whole days. You're lucky to escape with a whole skin. We must consider these matters as a whole.

Больная просила сказать ей всю правду. Целых три зимы не было снега. Мальчик сказал, что ему разрешили съесть весь пирог. Он всем сердцем поддерживает эту идею. В общем, это совсем простая история. Необходимо определить свое отношение к этим проблемам в целом.

2. complete It was a complete surprise to me. He is a complete fool. He wants to buy a complete edition of Graham Greene's novels. This completes my happiness. He was completely bewildered by what had happened.

Его приход был для меня полной неожиданностью. Мне нужен еще один том, и тогда у меня будет полный Шекспир. Они просят три месяца для завершения исследования. Железная дорога еще не достроена. Спектакль был полнейшим провалом.

3. address How do you address your mother-in-law? The letter was addressed to my sister. Prime Minister's New Year address was pre-taped. When I had come up with him, he would pat me affectionately on the shoulder, then turning towards the heights he addressed himself once more to the climb.

Он попросил друга надписать конверт своей рукой. Англичане не любят обращаться к посторонним на улице. По радио объявили, что передадут речь президента. У него такая манера говорить, что непонятно, к кому обращены его слова.

4. stranger The dog barks at strangers. I don't know the town yet, I'm a stranger here. He is no stranger to to this kind of emotions.

Он прочитал нам свое обращение к жителям и гостям города. В этой компании я чувствую себя чужим. Никто не догадался, что он приезжий. Этот человек не знает страха и сомнений.

TEXT 5

Endless are the nominal titles and duties of the Queen of England. The Monarch is Commander-in-Chief of the Navy, the Army and the Air Force, Governor of the Church of England. She has to open, prorogue and dissolve every new Parliament, give her assent to bills before they can become law, see, in theory at least, all Cabinet documents, all Foreign Office notes to other powers and despatches to embassies, appoint ministers, diplomats, bishops of the Church of England; she has to make all treaties, to make peace, to make war.

The Queen has her own Privy Council. Some members of the Royal family, the Archbishops, all senior ministers and ex-ministers, together with other "distinguished" appointees make up the Council which in mediaeval times advised the king on all important questions and exercised wide arbitrary powers in his name, but which has now virtually given way to the Cabinet.

Much of the power to rule which used to be wielded by the monarch has now been taken over in the name of the Crown by the various organs of government.

Britain has rather an unusual constitution. It has no written form and is derived solely from /1/ statutes of the realm -that is to say the laws passed in Parliament; /2/ common law - which comprises the decisions made by the judges in dealing with legal cases in the past, and /3/ various unwritten conventions which are always scrupulously preserved /precedents/, such as, for instance, a relatively recent one that a member of the House of Lords cannot become Prime Minister.

To understand how the constitution works we have to consider the question of who wields the power in the state. First, there is the Queen and Parliament, that is the legislature, which is composed of the House of Lords and the elected House of Commons; secondly, the executive, consisting of the Prime Minister and the rest of the government; thirdly, the judiciary, that is the judges and the courts.

Parliament is the supreme authority in the land and during its five-year life it can make or unmake any law. The government is composed of fifty ministers, about twenty of whom form the Cabinet. The task of the Cabinet as a whole is to decide what policy to submit to Parliament, to carry it out once it is agreed upon by Parliament, and to see that the government departments function efficiently. The Cabinet depends for its existence on the support of the majority of the members in the Commons and is constantly open to criticism from them. The Prime Minister is the leader of the party with the majority in the Commons. He is immensely powerful. He deals with many urgent matters even before they come before the Cabinet, over which he presides. He chooses the government from members of his own party in Parliament and they all resign with him if the government is defeated.

The House of Lords is still largely composed of hereditary peers, though certain important reforms have been effected due to which peers can now disclaim their peerages for their lifetime in order to sit in the Commons. On the other hand, the Crown can create life peers whose titles disappear with them, such peerages being given to eminent members of the public for their services to the State. The actual power of the lords is now severely limited and they can no longer hold up legislation (passing of bills) for more than one year.

The Commons has 630 members, it is presided over by the Speaker, himself a member of Parliament, who is elected by the other members (MPs). The party in opposition in the Commons forms a shadow cabinet and with a shadow prime minister officially designated Her Majesty's Leader of the Opposition and paid a salary by the government. Apart from being a place where a government can stand or fail as the result of a vote on an important issue, the Commons debate urgent matters. Its chief task, however, is the consideration of bills, most of which emanate from the Cabinet. If these bills are passed after three readings in each House, they receive the Royal Assent in the old Norman French words Le Reine le veult' and are then entered in the Statute Book. /

Translate into Russian

A. Passive Voice

1. Then there was a long interval during which the twins were heard of but not seen. Great things were hoped of their careers. Then Nigel was said to have left the stage. 2. Nearly all the furniture was taken out of the dining-room; the big piano was put in the corner. 3. Already the men were going away. Only the tall fellow was left.

B. used to

1. He used to come here sometimes, and I used to see him wandering about the town. 2. Mrs Bundle used very kindly to ask us in to supper on Sundays. They were pleasant informal gatherings, and I used quite to look forward to them.

C. have to + Inf.

1. George had finally to own himself defeated. 2. He knew he would have to go down and open the door but every tired nerve of him was rebelling against it. 3. We'll have to have a few extra opinions on that. 4. Poirot sighed to himself. There was to be no short cuts to the truth. Instead he would have to adopt a longer but a reasonably sure method. There would have to be conversation. Much conversation.

Translate paying attention to the words underlined

1. nominal The king was only the nominal head of the state.

The rent he paid for the house was nominal.

Он только называется директором фирмы, на самом деле все решает его брат. Это только видимость, что у него много дел. Завод купил эти станки по номинальной стоимости.

2. power It's not within my power to help you. The power of the blow was surprising. Are the powers of the prime minister strictly defined by law?

США – одна из величайших держав мира. Мы не можем одобрить политику с позиции силы. Он обладает большим влиянием в правительстве. Мы не можем помочь мальчику, он во власти злого человека. В нашей стране широко используется электроэнергия.

3 name Can you name all the flowers in the garden? I know several persons of the name of Smith. A lot of cruel things are done now in Ulster in the name of law. He writes all his articles under the name of Pox.

Ребенка назвали по деду. Я никогда не видел этого человека, знаю его только по имени. Нехорошо обзывать людей. В романах Дюма часто звучат слова: "Именем короля". Меня попросили назвать пьесы Пристли, а я думал, он пишет под псевдонимом тоже.

4. exercise Walking, rowing, jumping are all healthy forms of exercise. Exercise of the mental faculties is as important as exercise of the body. Your composition shows considerable exercise of imagination. His diplomatic practice has taught him to exercise patience.

Вам нужно больше физической нагрузки. Весь город говорил о больших военных учениях. Его любимое занятие – осуществлять свою власть над людьми. В такой обстановке он был вынужден воспользоваться своим правом и распустил собрание.

5. make peace/war/treaty

Всем было приятно услышать, что враги заключили мир. Англия может объявить войну только именем королевы.

6. deal The money must be dealt out fairly. The news dealt me a serious blow. He deals with Smith, the butcher. That man is impossible to deal with. They discussed the best way of dealing with this problem.

Кто будет сдавать карты? Он нанес мальчику сильный удар по лицу. Он вошел в лавку, где торговали самыми разными вещами. Не знаю, как бы я обошелся с этим человеком. В своем романе он рассматривает проблему нового поколения.

7. enjoy independence/good health/ a good income/rights

This country enjoys a large measure of independence and is ready to fight for it. It is always nice to see people who enjoy such good health.

Вот этот худой человек обладает хорошим доходом. Каждый может воспользоваться правом на труд. Уже пятый год страна пользуется независимостью. Ему доставляют удовольствие свои шутки.

8. follow The critic left the exhibition hall followed by the outraged artist.

Артисты поднялись на сцену в сопровождении группы поклонниц. Человек на велосипеде проехал по парку под удивленными взглядами прохожих. Наконец хозяин вошел в холл, за ним шел врач.

9. urgent SOS is an urgent message. It is most urgent that the patient should be taken to hospital. 'Come here,' he said in an urgent voice.

Жертвы землетрясения остро нуждаются в лекарствах. Поторопись, это срочное дело. Нужно принять безотлагательные меры.

Он услышал звонок и тревожные голоса в прихожей. Мой муж не любит, когда ему говорят о срочных сообщениях.

10. carry out Sometimes it is easy to make plans but difficult to carry them out. My orders must be carried out without delay.

Мы должны выполнить то, что обещали. Он не осуществит своей угрозы. Сообщите, когда этот проект будет реализован.

11. depend/rely on sb. for sth.

He can be relied upon for judgement and good health. She was a good-looking woman, her looks depending more on skilful grooming than actual features. Children rely on parents for food and clothing. Do you enjoy walking in the country? It depends.

Италия зависит от других государств в отношении поставок нефти. Ценность книги не зависит от ее величины. Мы не можем положиться на его информацию. Как часто вы ходите в театр? По-разному.

TEXT 6

The British ruling class is extremely clever at setting up a facade of democracy. From the latter half of the nineteenth century, when it began to seem as if representatives of the working class movement might, unless some antidote or anaesthetic was applied, come to wield great influence in Parliament, that ruling class set out to west more and more power in the hands of the Cabinet, which they found it comparatively easy to control by making money available to complaisant Cabinets and withholding it from recalcitrant ones. The British Parliament having no written Constitution on which to take its stand, has found it increasingly difficult to resist the whittling away of its status by the Cabinet.

An example of the exercise of monopolist control of the Cabinet was given in 1931. Seeing in 1929 that one of the capitalism's recurrent crises was imminent the British ruling class jockeyed into power a weak Labour Government. The Labour Party was at that time the biggest in Parliament but had no clear majority over the Tory and liberal Parties; it could not, therefore, enact measures. Which at least the Liberals (mostly representatives of capitalist interests) would not support. Banks and other finance houses refused, unless the Labour Cabinet would agree to reduce worker's wages and intensify the hardships imposed on the unemployed, to make the short-term loans on which the British Government relies for day-to-day spending. Moreover, financiers deliberately embarrassed the labour Government further by sending out of the country more and more of their gold reserves. By undermining confidence for the time being in Britain's financial stability, they forced, helped by the spineless Labour Party leaders, the resignation of the labour Cabinet and the establishment of a so-called "Natitonal" Government, in the Cabinet of which was a majority of Tories.

/ George Bidwell /

Translate into Russian

A. Gerund

1. He rather regretted smashing up the cot in his first fury.

2. I amused myself by thinking that in his choice of books he showed the irreconcilable sides of his fantastic nature.

3. Having a little light in the room made it look infinitely worse.

4. Writing is the most private of all the arts and yet few of us hesitate to invade the writer's home.

5. The number of scientists who wish to conquer the world, said Harry Purvis, has been grossly exaggerated. In fact, I can remember encountering only a single one.

B. Article

1. A Christmas came when I was not allowed to see Crystal. 2. The other witness seems to have been a James Jenkins. Last heard of going to Australia. 3. The other witness was the James Jenkins, who, as your friend Mrs leaman has told you, departed for Australia.4. And just at that moment a horn began to play. Somewhere in the town, not far away, a horn began a blues time. 5. He looked forward to a month's holiday. But an unrepenting and violent Alice appeared suddenly at he hotel, 6. In a flat in London the telephone Doll rang. 7. She walked into the office of a Mr Charlie Cooper. 8. A Doctor Calgary has just been to see us.

C. Mixed

1. She would accept occasional invitations to dinner. 2. I don't at all disbelieve you. 3. The sea was rough and unswimmable. 4. It was a glimpse of a mysterious world where immence power was wielded by men who all seemed to have gone to the same clubs. 5. Not far away were the stairs to the first floor, and once upstairs she could escape. 6.After this Norma took a fancy to me and used to drop into my house on her way to and from the huge walks she went for every day. 7. A sudden pang seized him, and his knees felt so weak that he almost fell. 8. Changes have taken place - oh yes, vital ones - in your attitudes to those around you, but you are hardly aware of them.

Translate paying attention to the words underlined

1. to set up The statue was set up in the centre of the town.

This is the man who had set up this school. He was set up over his rivals.

Памятник, поставленный в центре площади, очень ее украсил. Эта торговая фирма учреждена пять лет назад. Он выдвинул эту необычную теорию на конгрессе архитекторов.

2. to take a stand/a look round/time/the trouble to do sth

Он сделал всю работу не спеша. Прежде чем войти в дом он огляделся. Она не побеспокоилась предупредить меня о его приходе. Интересно, кто будет завтра командовать. Он председательствует на собрании. Необходимо выработать свое отношение к его затее.

3. to undermine The sea is undermining the cliffs. The orchestra undermined the conductor's intentions. Drink is undermining his health.

Сильные дожди подмывают дорогу. Эти слухи распространяют враги, чтобы повредить его репутации. Река подмыла берег. Его глупые слова подорвали веру в его карьеру. Оркестр сорвал все старания дирижера.

4. clever Jon is extremely clever at arithmetic. This jeweller is known as a clever workman. He delivered what was considered one of his cleverest speeches.

Приятно читать умные книги. Я знаю одного старого рабочего, он искусный токарь. Он очень способен к физике и химии.

TEXT 7

Almost every nation has a reputation of some kind. The French are supposed to be amorous, gay, fond of champagne; the Germans are dull, fond of military uniforms and parades; the Americans are boastful, energetic and vulgar. The British are reputed to be cold, reserved, rather naughty people, who do not yell in the street, make love in public, change their governments as often as they change their underclothes, or have revolutions. They are steady, easy-going, and fond of sport. The foreigner's view of the British is often based on the type of Briton he has met travelling abroad. Since these are largely members of the upper and middle classes, it's obvious that their behaviour cannot be taken as general for the whole people. There is a common illusion, for instance, that the British are cold and reserved. A foreigner sitting in a second-class railway-carriage, however, would soon realize that the British are just as friendly and warm-hearted as the people of his own country. The upper class is cold, formal and reserved; it is trained to be by the public schools with their stiff-upper-lip philosophy.

There are, however, certain kinds of behaviour, manners, and custom which are peculiar to Britain, and are different from German ones. In general, the British are more polite in public than the Germans.

The quiet, reserved Briton can best be observed at a football match. Naturally the British shout and yell as much as any nation especially if their side is losing.

George Bidwell

Translate into Russian

A, can+Pass.Inf.

1. Mrs Michael Brown could not have been called ill-dressed. 2. It cannot be said that they are without guile. 3. A suitable week-end can be selected for that purpose. 4. They decided against dining in this restaurant, where the food could not be expected to be up to much. 5. The flat could be let furnished.

B. since (miscellaneous)

1. I haven't seen him since last summer. 2. She had a vitality that he had long since lost. 3. He had got so drunk at his wedding feast that the bride had fled and he had never seen her since. 4. Since that time knowledge of her has spread by word of mouth. 5. Since the chair was too small for him, he was sitting on the floor.

C. Subjective with the Infinitive Construction

1. They all seemed to be old friends of his. 2. The weather seems to have changed slightly. 3. The weather seems to be changing slightly. 4. The only person who appears to have seen the young man is the captain of that little steam boat. 5. I happened to be spending a day in Paris. 6. Englishmen are considered

to be conservative. 7. He was believed to be insane. 8. This proposal is said to have been adopted.

Translate paying attention to the words underlined

1. reserve/d You must reserve your strengtn for climb. The judge reserved his decision. All seats are reserved for the occasion. He is too reserved to be popular.

На столах лежали таблички "занято". Ничего не знаю о его делах, он такой замкнутый. Он оставил за собой право написать ответ. Он хвалил пьесу, но сдержанно. Вас ждет светлое будущее.

2. general This is a matter of general interest. A general election is held each fourth year. This word is in general use. I have only a general idea of what the book is about. He explained the task in general terms.

Во Франции началась всеобщая забастовка. Он проводит эту работу для общего блага. Он дал общую оценку спектакля. Эта деятельность писателя важна для всех.

3. common Parks in a town are common property. Pine-trees are common in many parts of the world. The common man in every country is anxious for world peace. The guests were shocked by his common manners. They have nothing in common with one another. Saturday cricket will take place on the village common. In the afternoon I took a walk across the Commons to listen to the speakers.

В этой семье, где муж – голландец, а жена – датчанка, общим языком служит английский. Каждому известно, что нельзя отправляться в путь так поздно. Он просто самый обыкновенный человек. Такие ошибки – самое обычное дело. У нее совсем заурядная внешность.

4. lose He lost two sons in the war. The child has lost his terrified look. The book is such that you soon lose interest in it. My hints were not lost upon him. There's no love lost between them. He was lost in thought.

Давайте не терять ни минуты. Ваши насмешки абсолютно не трогают его. Ваша игра проиграна. Эта история много потеряла в пересказе.

5. dull The book is rather dull. He is a dull pupil. He's got a dull mind. Sorrow is dulled by the passage of time.

dull colour/sound/mirror/sky/weather

Мы были огорчены, что он оказался средним учеником. Так как торговли почти не было, он решил закрыть лавку. Этот человек просто скучен. Лекарства сняли боль, Осторожно, эта бритва тупая.

6. formal call/manner/clothes/dress/occasion

I was surprised at his formal manner. On certain occasions you should wear formal clothes. The French prefer formal gardens. His visit was a mere formality. His style is rather formal.

Он ответил на мое приветствие очень официально. Письмо было не интересным, просто отписка. Все понимали, что это официальный визит.

TEXT 8

Are most Englishmen mad? A good many people think so. And one reason for this is the fondness a healthy majority of Anglo-Saxons feel for the game of cricket. It is a long game requiring anything from three to five days for completion. Progress is often slow; and there is no certainty that a result will be achieved even when two teams play for the best part of a week. And yet, although fewer English people go to watch the game these days than just after the war, it is still immensely popular. You have only to see lunchtime crowds standing 10-deep round a shop window where a television set is showing a big game to realize this is so.

To some people, cricket is just a boring old game (it started in 17th century England) played by twenty-two fools in long white trousers. To others, it has the intellectual fascination of chess and the dramatic appeal of a five-act play. But even those who hate it most have to admit one thing: that it's given a useful phrase to the language. If a man says something is 'not cricket', he means it's unfair, unsporting and un-English. 'It's not cricket' to run off with your best friend's girl. 'It's not cricket' to kick a man when he's already down.

In cricket, it is, of course, perfectly possible to cheat. But being English we have invented another word for it. We don't call it cheating. We call it 'gamesmanship'. This can take many forms: running off the cricket field every time you feel a spot of rain in order to waste your opponent's time; whispering nasty remarks about the morals of your opponent's wife just as he is about to face the bowler; even pretending that you've lost the cricket ball altogether whilst actually-hiding it in your pocket.

The problem with cricket at the moment is that too many people think it belongs to the England of the past. What value has cricket, they say, in this age of LSD, the Rolling Stones, constant motion and instant everything? Admittedly, cricket is old-fashioned, dignified and non-violent. But perhaps this is why cricket is against the spirit of the times. England without cricket would be like Hamlet without the Prince, bacon without eggs. Long may it thrive!

<u>Translate into Russian</u>

A. <u>have to + Inf</u>,

1. You <u>have to</u> be firm with that sort of people. 2. We'll have to get moving if we're not going to be late. 2. She simply had to accept the fact that inside this world ordinary rules, values, standards did not apply. 4. There were three days left oe-fore Kate had to fly off to Turkey - if the air-strike ended in time, for if not she would have to go by train.

B. <u>do</u>(as an intensifier)

1. I do hate sneering behind people's back. 2. When he did awake at last it was brilliant morning and a servant was standing staring at him. 3. Such crimes

as did occur were never mysterious. 4. Virgil preferred staying in the capital and eating his heart out. That he did eat his heart out is known to all.

C. Mixed

1. Probably, if it had not teen the storm, something else would have arisen to justify not going. 2. They had to pay a formal call on the Ambassador. 3. His partnership oannot be taken for granted.4. By the time the last of the delegates doscended from the skies, entertainments, excursions$_{t}$ cultural delights of all kinds were waiting. 5. This was the time of the early evening when, since the kitchen was too hot, she would go for a little while outdoors. 6. It was not till much later that he even saw a picture of her, a snapshot taken of her and Gwen in Hyde Park. 7. He was not used to the white wine, of which copious draughts were used to wash down the meal.

Translate paying attention to the words underlined

1. a game of cricket/chess ; a football/ice-hockey match

Мы хотели сыграть партию в шахматы. Я взял билеты на футбол. Игра окончена.

2. best He spends the best part of a week at his club. Although he is nearly sixty he can still climb mountains with the best. He was at his best that evening and amused us with his clever talk.

Жаль, что большая часть дня ушла на дорогу. Что лучше всего сделать сейчас? Хотя спортсмен долго болел, он бегает не хуже других. Приходите, этот певец сейчас в полном блеске. Он живет за городом большую часть года.

3. waste His efforts were wasted. Consumption is a wasting disease. We are learning to make use of waste products.

Побережье снова залито нефтяными отходами. Это занятие означает пустую трату сил и времени. Не уговаривайте его, не тратьте зря слов.

4. moral Man is a moral being. He certainly won a moral morals victory. You may draw your own moral from this morale. His morals are excellent. These numerous defeats robbed the army of its morale.

Вы должны морально поддержать товарища. В книге поднимаются важные нравственные проблемы. Это сделали, чтобы поднять дух армии. Этот фильм безнравственен. Мораль сей басни ясна.

5. admit The servant admitted me into the house. Let's admit, that there is life on other planets. The accused man admitted his guilt. He is admittedly an atheist.

Допускаю, что это верно. Хорошенькая горничная впустила нас в дом. Вчера он наконец признал свою ошибку. Его не допускают к решению важных дел. Предположительно он сделал все сам.

6. gamesmanship, authorship, scholarship, craftsmanship, apprenticeship

Authorship demands much knowledge and even more talent. These swords are a fine example of this lost craftsmanship, You can't boast of extensive scholarship.

Он зарабатывает себе на хлеб писательским трудом. Старинные вещи поражают качеством работы. В средние века было накоплено много знаний по астрономии.

7. good a good excuse; to go for a good long walk; to have a good mind to; to wait for a good hour; a good half-acre; as good as (=practically)

Он не мог привести никакого солидного оправдания своему поведению. Как славно мы погуляли – всегда говорила моя няня. Я твердо решил поехать туда первым же поездом. Больной ждет врача добрых два часа. Практически, он отказался помочь нам.

8. fair He has got a fair chance of success. All's fair in love and war. He was completely charmed by her fair skin and hair. He made a fair copy of the essay. He's getting more than his fair share of profits. Have you seen "My Fair Lady"?

Справедливая игра означает честные поступки. Его знания языка умеренны, а могли быть лучше. Такое поведение бросает тень на его честное имя. Он знает эту страну довольно хорошо.

5. fairly He treated me quite fairly. We were at the back of the hall but we could see and hear fairly well. He was fairly beside himself with rage.

Она всегда беспристрастно судит обо всем. Мы довольны, что она выполнила задание довольно хорошо. Он по-настоящему рассердился на друзей.

TEXT 9
AUTUMN

Some English people think of autumn as a melancholy season. It marks the end of summer, of warmth and sunshine and colour. They think of the succession of bleak days, with biting wind and frosts which must be lived through before another spring.

But the autumn has some compensations, for this is when the summer crops are harvested, and there is a last tremendously prolific growth of vegetables and ripening fruit to be hoarded and preserved against the onset of winter. If you live in the country it is possible to gather something to add variety to your table - black-berries or mushrooms or nuts - every time you go for a walk. And though the colours of the flowers and trees are a little hectic, rather feverishly bright, it can be exhilarating to walk through a wood on a fine day in September, and to watch the leaves, crimson and russet and yellow, whipping to and fro on the branches, and then, freed at last, whirling and spinning to the ground in a riot of colour. Autumn in England indeed has its glories. Then for a brief period the countryside is more beautiful than at any other time of the year.

/ Mozaika /

<u>Translate into Russian</u>

A. <u>Qpjective with the Infinitive/Participle Construction</u>

1. They believed <u>him to be</u> very ill. 2. I want you to marry for love. 3. I hate you waiting for me. 4. She refused to have him sent for. 5. The greatest pleasure I know is to do a good action secretly, and to have it found out by accident. 6. He heard her voice say something, felt her lips touch his nose and fell at last into a dreamless sleep. 7. The doctor heard the clock striking midnight as he finished his last entry in the diary. 8. Charlotte felt the playing of Chopin to be a minimum basic requirement for any young lady. 9. He felt himself getting hot and red under her scrutiny.

B. <u>Infinitive as attribute</u>

1. This is an occasion <u>to be remembered</u> for ever. 2. The earliest tablets to be discovered were of wood. 5. Under a strange sky, where there was none to render us aid, we tossed about over the sea. 4. The Globe playhouse was opened in 1599, and JULIUS CAESAR might have been the first Shakespeare to be presented there. 5. The choice of the road to be taken was not difficult.

C. <u>Mixed</u>

1. To have known her is a privilege. 2. Jenny could not remember having had a better meal. 3. It would have been more prudent to have held his tongue. 4. His manner had not at first seemed accusing because his being here was an accusation. 5. For some ten minutes he tried loyally to sleep, counting a great

number of thistles in a row. He seemed to have been hours counting. 6. They did invite him, but he wouldn't accept the invitation.

Translate paying attention to the words underlined

1. mark(ed) These qualities marked him as a born leader. Mark my words. He was marked out for promotion. There is a marked difference between the two successive editions of the dictionary.

Он говорил с заметным акцентом. Попомните мои слова, он еще наделает нам массу неприятностей. Его отобрали, чтобы послать учиться в столицу. Эти товары отличает высокое качество. Дженни училась жить в совершенно другом мире.

2. bleak The house stands on a bleak hillside. One of my friends was carried away by THE BLEAK HOUSE.

Наступил бледный рассвет. Старик не любил зиму и ее холодные безрадостные дни.

3. Ьiting A biting wind was blowing all the night. He could not forget his wife's last biting words.

Он открыл дверь, и колючий ветер ударил ему навстречу. Мне не нравятся ваши язвительные замечания. Никогда не думал, что такое красивое создание может быть злым.

4. succession We had to sit for three different meetings in succession. Our team has won four successive games.

Последовало несколько интересных выступлений подряд. Этот полководец одержал ряд побед. У нас сегодня 4 занятия подряд. Эта семья дала родине целую плеяду знаменитых ученых.

5. country All the country opposed the plan to increase taxes. This is unknown country to me. I had some difficulty in running Julian to earth but at last I found him week-ending somewhere in the country. He liked country life much better than life in the city.

Я уверена, что весь наш народ не хочет войны. В конце жизни он вернулся на родину. В нем было что-то типично провинциальное. Мы ехали по красивой горной местности.

6. Indeed He did not wait for a reply, and indeed Dr. Ames seemed rather at a loss for the moment. Stormgren was not surprised that the secret had been discovered: indeed, it was surprising that it had been kept so long. The boredom was as deep as the love and more enduring - indeed it descends on me too often today.

Он и в самом деле был рад услышать эту новость. Как мило с вашей стороны помочь мне. Все спрашивают, кто эта женщина, кто она в самом-то деле?

TEXT 10

Since money is the fount of all modern romantic adventure, the City of London, which holds more money to the square yard, than any other place in the world, is the most romantic of cities. This is a profound truth, but people will not recognize it. There is no more prosaic person than your bank clerk, who ladles out romance from nine to four with a copper trowel without knowing it. There is no more prosaic building than your stone-faced banking office, which hums with romance all day, and never guesses what a place of wonders it is. The truth, however, remains; and some time in the future it will be universally admitted. And if the City, as a whole, is romantic, its banks are doubly and trebly romantic. Nothing is more marvelous than the rapid growth of our banking system, which is twice as great now as it was twenty years ago - and it was great enough then.

Such were the reflections of a young man, on a June morning, who stood motionless on the busy pavement opposite the headquarters of the British & Scottish Banking Company, Limited. He was a man of medium size, fair, thick-set, well-dressed and wearing gold-rimmed spectacles. The casual observer might have taken him for a superior sort of clerk but the perfect style of his hat precluded such a possibility: It is in the second-rate finish of his extremities that the superior clerk, often gorgeous in a new frock-coat, betrays himself. This particular young man, the tenor of whose thoughts showed that he possessed imagination - the rarest of all qualities except honesty - had once been a clerk, but he was a clerk no longer.

/ Arnold Bennett /

Translate into Russian

A. will not/would not +Indef. Inf. (= unwillingness)

1. It's no good talking to Timothy. He simply won't listen.

2. I wanted to return her the brooch but she wouldn't hear of it. 3. That's always the trouble. People will not believe that a murderer is unsafe. 4. He closed his eyes and relaxed, but sleep would not come. 5. The wound wouldn't stop bleeding. 6. He who will not when he may, when he will will have a nay.

B. never (intensifier)

1. Did you tell her? - She knew. I never said a word. 2.Tough Bill never spoke another word you could see him go yellow. 3. He never gave a glance at the room I had been at pains to make pleasing to the eye. 4. We went to the hotel and waited an hour on the pavement, hoping that the manager would come out, but he rever did.

C. The emphatic construction it is/was ... who (for the Subj.)

it is/was ...that (for other members and clauses)

1. It was Manuma who answered Walker. 2. It was the Germans who discovered uranium fission. 3. Yet it was Danby who had turned out to be a business man. 4. It was with a heavy heart that I drove back home. 5. It's only by accident that we've heard of it. 6. It was then that Norman proposed to me. 7. It was only after a considerable length of time that the strain began to tell. 8. It was not until August that I heard from him again. 9. It was with lively curiosity that Mackintosh looked forward to his first meeting with Walker. 10. It was not until I reached London that I heard the full story. 11. When I said, 'Hullo', it was Henry who answered. 12. It was not until after I got these letters that I talked with her.

D. Emphasize each member of the sentence and the clause using the emphatic construction shown above

My father mentioned the subject for the first time, and rather reluctantly, a fortnight before I went to Oxford, when we were both staying at my aunt's.

Translate paying attention to the words underlined

1. reflect She smiled at her reflection in the looking-glass. I reflected for a while on the life that the Captain suggested to my imagination. He looked reflectively at the picture that stood on his easel.

Солнце отражалось в воде. Луна светит отраженным светом. На его лице отражаются все его чувства. Мне не хочется сомневаться в искренности ваших слов. Ему нужно обдумать, какой дать вам совет. Старик размышлял над тем, как им трудно спастись.

2. casual The doctor was not casual about his practice. Women reporters in casual dress and sandals, some of advanced age, came and went. He is always bringing her up (in conversation) casually.

Их встреча была совсем случайной. Он бросил небрежный взгляд на часы и вскочил. Он зарабатывает себе на жизнь случайными заработками. Она очень необязательный человек.

3. once Once Mackintosh caught a queer soft look in his eyes.

He wore a most remarkable coat that I ever had seen or expect to see. Once it must have been the military coat of an officer. Come here at one. They crowded round him and all talked at once. Once it was all over she was pleased with herself. Once you tell her that she will pester you with it till the end of your days.

Я видела его однажды в библиотеке. Сейчас это просто старик, а когда-то он был очень красив. Стоит вам засомневаться, и вы пропали. Раз уж мы об этом заговорили, вот моя версия случившегося.

4. romance My first meeting with her was quite a romance. He travelled abroad in search of romance. There was an air of romance about the old inn. The story of Tristan and Isolde belongs to the genre of Romance. He specialized in the romance languages.

Она любит читать средневековые любовные баллады. В этом тихом доме с темными окнами было что-то романтическое. История их жизни – настоящий роман. К романским языкам относятся французский, итальянский, румынский и другие, развившиеся из латыни.

5. busy pavement/traffic/day/shop

Перед рождеством все магазины переполнены. Мой приход был некстати, у него был тяжелый день. Приезжего обычно поражает большое движение на улицах старого города.

6. never

Жена ругала его долго, он так ничего ей и не ответил. Он даже не взглянул на сына, который так ждал этой встречи. “Питер Пэн” - это сказка о мальчике, который не взрослел.

TEXT 11
THESE NOVELS

A great many people must now be engaged in writing fiction. But what of that? In such a world as this, writing fiction is a comparatively innocent occupation, its worst result being nothing more than a certain curtailing of exercise and certain increase of irritation and vanity. On the whole, writing novels will do a man less harm than going to the races, standing in bars drinking double whiskies, falling in love with the wrong women, murdering animals and birds, sitting at bridge tables, or dining too expensively and heavily. It is only on very rare occasions that doctors have to warn their patients not to write any more novels. Now that all kind of mischief are open to young girls, they are probably better employed sitting quietly in the little spare rooms upstairs writing fiction than in doing almost anything else they would like to do. When a girl appears in a police court and is charged with being the author of a certain novel, the event is so rare that the news papers make a tremendous fuss about it. No doubt, members of both sexes would be more sensibly occupied if they took to gardening, but then you cannot be always out of doors, and authorship provides you with one of the pleasantest and safest indoor recreation.

We are told that very few of these new novelists can possibly make much money out of their work. Bat what of that? They have had their fun. If they do not make much money, then they will be kept away from the miseries of professional authorship; for most of these novelists are enthusiastic amateurs and you may depend upon it that they will not turn professional unless they see that their fiction is about to be very profitable.

J.B. Priestley

Translate into Russian.

A. must = probability

1. He must be quite mad to say such a thing. There must have been eight or ten of us gathered together. 3. She wore a plain beige dress which must certainly have been made in Paris. 4. And suddenly I had an inkling of what it must feel to be mad.

B. will/would + Indef. Inf.(= habitual action) 1. Accidents will occur in the best regulated families. 2. A suppressed resolve will betray itself in the eyes. 3. Sometimes, if he felt in the mood, he would return home on foot. 4. Theirs was the only house she would dress for. 5. Charley would walk for half an hour window shopping. 6. She would bully me. She would insist on her ideas being carried out.

C. Absolute Participial Construction

1. He entered her room from his own, the door being open. 2. We set off, the rain still coming down heavily. 3. There being nothing to read, he felt bored.

4. It was a beautiful clear night, with a crescent moon sinking in the West. 5. Our efforts to start the car having failed, we spent the night at a nearby village.

D. Mixed

1. It was literature that attracted him most. 2. Charlotte decided the time had come for Debora to get married. 3. In the light humorous tone that probably had been his normal manner, he said: 'You don't give me a chance, Maureen, dc you?' 4. Would the actors have been able to convey such perfection of casual authority, such assurance? 5. Man does not live by bread alone. 6. The pictures seemed to me ugly, but they suggested without disclosing a secret of momentous significance, 7. She had never seen Istanbul before, and the moment she left the hotel she found herself in a city of legend, mystery and romance.

Translate, paying attention to the words underlined 1. charge This young man is charged with murder. He charged me with neglecting my duty. The wounded lion suddenly charged at me. He charges double for any of his services. He was charged with an important mission.

Никто не мог поверить, что эту девушку обвиняют в мошенничестве. Наши солдаты снова атаковали противника. Он взял с меня слишком дорого за эту книгу. Электроны заряжены отрицательным зарядом. Брат дал ему трудное задание – найти помощника. Нельзя обвинить его в небрежности.

2. possibly He spent as much time as he possibly could with his son. The Prime Minister is ill and cannot possibly attend the meeting of the Cabinet.

Он никак не может быть там вовремя. Как вы только могли подумать, что я вас обману. Как только я сумею найти этого человека, я пришлю его вам. Не может быть, чтобы было уже шесть.

3. engage He is deeply engaged in politics. My time is fully engaged. Her attention was engaged by the display of new hats in the window shop. He gave us an engaging smile.

Они обручены. Для аукциона наняли дополнительно двенадцать переводчиков. Удивительно, как серьезно он увлекся этой проблемой. Мы не задержим ваше внимание надолго.

4. take to When he retire he will take to gardening. Has the baby taken to the new nurse?

Он разочаровался в любви и начал всерьез заниматься. Увидев солдат, противник обратился в бегство. Этому мальчику никогда не пристраститься к спорту.

5. turn This hot weather has turned the milk. Anxiety has turned his hair white. He turned a piece of prose into verse. Nobody has expected him to turn traitor.

Ничто не отвратит его от цели. Необходимо обратить внимание на самые важные моменты. Он покраснел от гнева. Вы можете перевести этот отрывок на испанский. Он мечтает перейти в профессионалы. Непонятно, что выйдет из этого ребенка.

TEXT 12

The basic assumptions were two: "that economic interests are subordinate to the real business of life, which is salvation, and that economic eonduct is one aspect of personal conduct, upon which as on other parts of it, the rules of morality are binding." In other words, it is right for a man to seek such wealth as is necessary for a livelihood in his station. To seek more is not enterprise but avarice, and avarice is a deadly sin.

Significant changes in the psychological atmosphere accompanied the economic development of capitalism. A spirit of restlessness began to pervade life toward the end of the middle ages. The concept of time in the modern sense began to develop. Minutes became valuable; a symptom of this new sense of time is the fact that in Nurnberg the clocks have been striking the quarter hours since the 16th century. Too many holidays began to appear as a misfortune. Time was so valuable that one felt one should never spend it for any purpose which was not useful. Work became increasingly a supreme value. Begging orders were resented as unproductive, and hence immoral.

The idea of efficiency assumed the role of one of the highest moral virtues. At the same time the desire for wealth and material success became the all-absorbing passion. "All the world," says the preacher Martin Butzer, "is running after those trades and occupations that will bring the most gain. The study of the arts and sciences is set aside for the basest kind of manual work. All the clever heads, which had been endowed by God with a capacity for the nobler studies, are engrossed by commerce, which nowadays is so saturated with dishonesty that it is the last sort of business an honorable man should engage in."

Mozaika

Translate into Russian

A. Word Order

1. A smile crept out across his face and his blue fringed eyes looked up at her. 2. In the drawing-room a tray of morning coffee with two biscuits was awaiting them. 3. Accident brought them here and all their energies went in trying to get back. 4. A vast amount of research took place before we started this enterprise, 5. Scores of people were passing but none seemed to have noticed this calamity. 6. No details were given about the attempted assassination of Prime Minister. 7. Somewhere in the back of his mind a vague idea stirred.

B. Mixed

1. Philip glanced at Maureen for aid but she would not give it. 2. She walked on, her face burning. 3. Kate was accompanied into a small room where she saw Geoffrey. 4. Dyson couldn't be expected to wetnurse his staff. They should try and use a bit of initiative. 5. Another advantage of using the first person when writing a book is that it enlists your sympathy with the narrator. 6. She was

looking at herself in the glass. - Women will do that. 7. Macomber was watching the opposite bank when he felt Wilson take hold of his arm. 8. You as an American should be the last to despise a man for starting at the bottom of the ladder. 9. This is the way my father must have felt a hundred times in his life, beat up and aching.

Translate paving attention to the words underlined

1. bind Commerce binds the two countries together. He is bound to take an action. This problem is bound up with many others. A promise of any kind is always binding.

Пленника связали по рукам и ногам. По договору он обязан обратиться к нам за помощью. Он обязуется закончить строительство в срок. Не давайте никаких обязывающих вас обещаний. В ближайшие годы обязательно возникнет еще одна проблема.

2. manual This is a shorthand manual. Manual labour is getting mechanized.

Он обещал принести мне руководство по садоводству. Дети должны заниматься физическим трудом.

3. virtue Virtue is its own reward. Our climate has the virtue of never being too hot or too cold. The great virtue of the scheme is that it costs very little. He claimed a pension by virtue of his long military service (=by reason)

Всегда считалось, что терпение – это большое достоинство. Он глубоко верит в достоинства трав как лекарств. Краткость – главное преимущество этого романа.

4. Vice Gluttony is just as much a vice as is drunkenness.

Этот человек отличается многими достоинствами и лишь одним пороком – болтливостью. Понятия порока и добродетели претерпели большие изменения в течение веков.

5. desire He has not much desire for fame. 2. He works hard from a desire to become rich. 3. He spoke about his country's desires for friendly relations. 4. The guests, left at the desire of the manager of the hotel.

Он много работал из желания прославиться. Невозможно удовлетворять каждое желание ребенка. Это государство нуждается в молодых специалистах. Надеюсь, что сбудутся все ваши желания.

6. station He was a man of low station. One of the cruisers was out of station. They took him to the policestation.

Борьба за мир объединяет людей разных слоев. Недалеко отсюда работает радиостанция. Жаль, что этот станок не работает. Дженни объяснила, что Лестер должен оставить ее, так как она не его круга.

7. order the order of knights/baronets; the lower orders

TEXT 13
THE LINGUISTIC ASPECTS OF PHILATELY

Since their introduction, a little over 125 years ago, adhesive stamps for the prepayment of postage have become the shop-windows of the countries issuing them - shop-windows in which can be, and often have been, displayed their economic, industrial, historical and cultural events, products and traditions. It is possible by modern means of visual reproduction to present, within the relatively small limits of one square inch or so, miniature, often multi-coloured masterpieces which are, in their own way, as perfect as those produced by any other method. In addition to their purely utilitarian value, postage stamps have an enormous aesthetic and educational appeal. It is today possible to study through them to quite an advanced degree such diverse subjects as the history of forms of transport, zoology and architecture. The term 'thematic' has been coined to describe collections based on this principle rather than on that of the purely chronological arrangement of the stamps of individual countries which formed the backbone of most early collections. The designing of stamps is now on a thematic rather than a numismatic basis, and the fact that there are now close on 120,000 individual stamps which have appeared since the famous 'Penny Black' on May 1, 1840, means that most collectors have had to be selective, either in the direction of a specific country or a special theme.

Since there are very few stamps 'without words on them, and since words are the raw material and tools of the linguist, it will be obvious that there are many points at which the interests of the linguist and philatelist coincide.

The field of linguistic history is reflected in numerous ways on postage stamps. We find, for example, reference to certain philologists who have studied out-of-the-way languages.

The stamp album is a wonderful place in which to examine the various alphabets or syllabaries used to record various languages. We can find runes on a stamp from Denmark and examples of hieroglyphs cm various stamps from Egypt. The phenomenon of bilingualism is also reflected in them.

It is hoped that this brief survey will have whetted the appetite both of linguists and philatelists and that it will cause them to look a little more closely at the wording or subject of the many stamps being issued virtually daily by a large variety of linguistic communities.

/ Mozaika /

Translate into Russian

A. will + Ind.Inf./ Perf. Inf. (supposition)

1. My honourable friends will have heard the tremendous news broadcast throughout the world. 2. Several very curious accidents have happened in the last few days. You will have heard –no perhaps you will not. You only arrived

yesterday, did you not? 3. Now the climb was getting steeper. Grey light showed through the slots in the armour. Outside another day of brazen heat and ugly wind would be beginning.

B. as + Adj. + as any/ever

1. The photographs were as sharp and clear as any he had ever seen. 2. He was as angry as ever , and more than a little surprised. 3. His reception by the Swedes had been as punctilious and correct as anyone could wish. 4. Once at war, they (the British) were as tricky and nasty as anyone on earth. 5. The blustering, biting wind across the airfield was as strong as ever.

C rather than

1. There was amusement rather than tension in the faces that were turned towards him. 2. His approach is usually intellectual rather than emotional. 3. English short-story writers of any merit of recent years have followed Checkov rather than Maupassant. 4. It was a lane, or alley, rather than a street.

D. since (caus.)

1. It so happened that she finished school early, since she was clever. 2. This week, lying awake later since she was not exhausted she thought of her new work. 3. They went to bed early, that is, before 1 in the morning, since the conference would start tomorrow.

E. Word Order

1. A faint colour rose in Philip's pale cheeks, 2. There had been a demonstration of students that morning in front of the office. A rock had been thrown through a plate-glass window, and the police had to be called. 3. Etchings of Greek temples adorned the walls of the reception room.

Translate paying attention to the words underlined

1. issue The commission argued some political issues. He will certainly bring the campaign to a successful issue. There are most recent issues of periodicals on the table.

Он может точно определить, когда выпущена каждая марка. Школа выдала ученикам новые комбинезоны. Он известен тем, что поднял этот вопрос для обсуждения. В соседней комнате ожидали результатов голосования. У нашей любви нет будущего.

2. appeal The prisoner appealed to the judge for mercy. Bright colours appeal to children. That sort of music does not have much appeal for me. She approached the father with a look of appeal on her face.

Вы можете подать апелляцию в суд. Они обратились за поддержкой ко всем честным людям мира. Его романы перестали меня волновать. Скорость – вот что привлекает в мотоспорте. Она поняла, что письмо было мольбой Нэнси о помощи.

3. arrange(ment) She's good at arranging flowers. I've arranged for a car to meet you at the airport. He became known for his arrangements for the piano. Mrs. White often has to arrange differences between the two boys.

Перед отъездом он привел в порядок дела. Заседание, назначенное на завтра, откладывается. Мы постараемся как-нибудь договориться о расходах. Все восторгались тем, как были расставлены вещи в комнате. Все приготовления к путешествию на север закончены. Мне не нравится это переложение для скрипки.

4. field New oil fields have been discovered in the north. Various fields of medical research are covered in the latest issue of this magazine.

Гостям с гордостью показывали огромные пшеничные поля. Он один из крупнейших специалистов в этой области. Богатые месторождения олова привлекают в страну иностранный капитал. Когда к ученому обратились за советом, он сказал, что этот вопрос не по его части.

TEXT 14

The weather now became intensely cold, and much snow fell. The newspapers came out every day with horror stories of sheep buried in snowdrifts, of song-birds frozen to the branches on which they perched, of fruit trees hopelessly nipped in the bud and the situation seemed dreadful to those who, like Mrs. Heathery, believe all they see in print without recourse to past experience. I tried to cheer her up by telling her, what, in fact, proved to be the case, that in a very short time the fields would be covered with sheep, the trees with birds and the barrows with fruit just as usual. But though the future did not disturb me I found the present most disagreeable, that winter should set in again so late in the spring, at a time when it would not be unreasonable to expect delicious weather, almost summer-like, warm enough to sit out of doors for an hour or two. The sky was overeat with a thick yellow placket from which an endless pattern of black and white snowflakes came swirling down, and this went on day after day.

One morning 1 sat by my window gazing idly at the pattern and thinking idle thoughts, wondering if it would ever be warm again, thinking how like a child's snowball Christ Church looked through a curtain of flakes, thinking too how cold it was going to be at Norma's that evening without lady Montdore to stoke the fire, and how dull without Cedric. Thank goodness, I thought, that I had sold my father's diamond brooch and installed central heating with the proceeds, then I began to remember what the house had been like two years before when the workmen were still in it, and how I had looked out through the same pane of glass, filthy dirty then, and splashed with whitewash, and seen Polly struggling into the wind with her future husband. I half wanted and half did not want Polly in my life again. I was expecting another baby and felt tired, not up to much.

Then, suddenly, the whole tempo of the morning completely altered because here in my drawing-room, beautiful as ever, in a red coat and no hat, was Polly, and of course, all feelings of not wanting her melted away and were forgotten. In my drawing-room too was Harvey, looking old and worn.

Nancy Mitford

Translate into Russian

A. what (Object clause)

1. She passed him what he asked for without a word. 2. Liberty consists in doing what one desires. 3. A typed reminder from his secretary confirmed what he had just recalled. 4.Reading is to the mind what exercise is to the body. 5. He seemed completely uninvolved in the pain and mystery of what was about to take place. 6. The most interesting thing in life is what might lie just around the corner. 7. Men willingly believe what they wish.

B. should (emotional)

1. It was singular that a woman of that age should flush so easily. 2. I think it's terrible that she should have been deprived of life in that cruel way. 3. It

seemed to me cruel that the happy life of that pair should have been broken to pieces by a ruthless chance. 4. Isn't it strange that I who have written only unpopular books should be such a popular fellow? (A. Einstein). 5. Why should you think that beauty, which is the most precious thing in the world, lies like a stone on the beach for the careless passer-by to pick up idly?

C. Mixed

1. It was as good as the theatre - better, since she was one of the players. 2. Jean knew that another eruption could be expected at any moment. 3. The noise grew faint. Dyson strained his ears. It couldn't possibly be ... The engineer couldn't possibly be at work yet... 4. My husband managed to interest him in Egyptology, and it was his money that was so useful in financing the expedition. 5. At this period of his life he never stopped to ask himself whether he was happy. 6. He knew they were coping with the storm as well as any organization could. 7. He was very rude to Arthur, and since then Arthur won't hear a good word for him.

Translate paying attention to the words underlined

1. wonder Don't you wonder at her refusing to marry him? I shouldn't wonder if he came to live here. It's no wonder that she lost her temper. I wonder why he is late. He wondered if she would keep her promise.

Интересно, придет ли она. Неужели тебя удивляет, что его нет. Уж не заблудились ли они – лениво подумал Джефри. Интересно, он действительно большой ученый?

2. idle We spent many idle hours during the holidays. When men cannot find employment they are idle. Don't listen to idle tales. He is an idle, worthless fellow.

В немногие свободные часы он любил слушать музыку. Не трать попусту время. В голове бродили ленивые мысли. Ненавижу праздную болтовню.

3. pattern I like the pattern of your carpet. He is a pattern of all the virtues. Married women go out to work nowadays - that has become a new pattern of family life.

Пожалуйста, взгляните на эти образцы ткани. Мне нравится этот цветочный узор на обоях. В средние века образование по всей Европе следовало одной модели.

4. be up to He is not up to his job. She is not up to it now - she is too old. The child is very quiet - what is he up to? He is up to no good. What tricks has she been up to?

Чем он там занят? Решение за вами.

5. prove I shall prove to you that he doesn't understand the case properly. The exception proves the rule. The typist proved (to be) useless. Our food supply proved (to be) insufficient.

Он говорит, что может это доказать. Его вина доказана. Все удивились, что этот человек оказался трусом. Будем надеяться, что переводчик не окажется неопытным.

TEXT 15

A cool wind blew drowsily on our eyelids as we went down into the yard. The grey light was uncertain and murky, as though we saw the whole place under water; it looked larger than 1 had imagined it last night, and must have covered a good half-acre. Set down in the midst of decaying brick buildings, gaunt and crooked against the dawn, with their blind windows staring into it, this yard was uncanny in its desolation. You felt that no churchbells, or street-organs, or any homely, human sound could ever penetrate it.

A brick wall perhaps eighteen feet high closed it round on three sides of a rough oblong. There were a few dying plane-trees straggling beside it, with an ugly coquettish appearance like the wreaths and cupids on the cornice of the big house, as though they were dying in the mopping, mincing postures of the 17th century. In one corner was a disused well, and the crooked foundations of what might once have been a dairy. But it was the little stone house, standing out in the centre and alone towards the rear wall, that carried the most evil suggestion.

It was blackish grey and secret, gaping with its smashed door. On the pitch of the roof were heavy curved tiles that might once have been red; the chimney was black, with a toppling chimney-pot like a rakish hat. Not far away grew the dead crooked tree.

In silence we walked all around the house, keeping to the man gin of the yard. The puzzle grew more monstrous and incredible as we stared at every blank side. Yet I had not overlooked, omitted, or misstated anything, and all was exactly as it seemed to be: the stone box of a house, with door and windows solidly inaccessible, no tricks of secret entrances, and no footprints near it anywhere. In silence we came round again to the front. The house kept its secret. In that drugged hour of the morning, it was as though we were not three practical men out of a sharp-eyed age; but that the old house had been recreated again, and that, if we looked over the see the doors of houses painted with a red cross below the words, 'Lord have mercy upon us.'

There were pinkish hints in the sky now, and the dome of St Paul's was looming out purple-grey against thin shreds of light. A motor-horn hooted raucously in Newgate Street, and the milk-carts were already bumping down below the gilt figure of Justice on the cupola of the Old bailey.

/Carter Dickson/

Translate into Russian

A. what-clause (parenthetic)

1. With great care he walked to within what appeared a safe distance. 2. First of all I was taken aback by what seemed to me the clumsiness of his technique. 3. During the early part of June, 1947, a small party of sightseers found itself trapped in what was then the newly discovered labyrinth of Cefalu, in the island of Crete.

B. as (tempor. and proport.)

1. The women wept, as they carried away bundles of brushwood. 2. As Stormgren talked, it seemed to him that his mind was operating on two levels

simultaneously. 3. They were beating off snow from their clothing, as they came in. 4. A sob broke from him as with a rapid glance he took in the place where he had been so happy. 5. As the sun mounted higher, the clouds dispersed.

C. Emphatic it is ... that.

1. It was in the quadrangle, a huge asphalt playground, that they met. 2. Of my grandparents, it is to ray father's father that I feel the closest now. 3. It was with lively curiosity that Mackintosh looked forward to his first meeting with Tom. 4. It was at this time, when the frustrating sense of unresolved conflict was making him unhappy, that he ran into Campion again. 5. It was as they took the final gradient and mounted the hillock that they saw, below them. a stranger. 6. It was Tom who already knew all the Masters' nicknames, it was he who already knew all Tanbury High's unwritten rules (not that there were many)

D. a box of a house

1. He was a clumsy giant of a man. 2. The small box of a room -yes, this is what she would choose. 3. He stood in the centre of the room, gasping for breath and swabbing the lunarscope of his face with a great handkerchief. 4. In the mirror Kate saw a thin monkey of a woman inside a good yellow dress.

Translate paying attention to the words underlined

1. cover The floods covered a large area on both sides of the river. She laughed to cover her nervousness. You can cover the distance in an hour. The book does not fully cover the subject.

Девушка закрыла лицо руками. Снег укрыл весь двор. Его наглое поведение скрывает смущение. Он сделал это, чтобы скрыть ошибку. Он хорошо осветил эти события в вашей газете. Он преодолел этот путь за два дня.

2. round I'd like two rounds of ham and one of beef. He paid for the first round of drinks. The night watchman makes his rounds every hour. Somehow she managed to live through the daily round of chores.

Не удивляйтесь, это начало докторского обхода. Я верю, что этот боксер победит в третьем раунде. Вчера я встретил Брауна во время моего полицейского обхода. Их соперничество пошло по новому кругу. Отрежьте мне два кружка колбасы, пожалуйста.

3. stand out The troops stood out against the enemy until their ammunition was exhausted. His work stood out from that of others. He stood out for better terms.

Памятник резко выделялся на фоне бледного осеннего неба. Он выступает за немедленную забастовку. Наш народ выстоял против многих нападений врагов.

4. Set down The bus stopped to set down an old lady. How should I set myself down in the hotel register as a journalist or as an author? We may set his success down to hard work.

Я высажу вас на углу улицы. Запиши этого приезжего представителем служащих. Успех его романа объясняют новизной темы.

TEXT 16

Dyson had expected to find the television studios a blaze of activity in the middle of the evening viewing hours, and humbly anticipated that he would himself be treated as a completely unimportant part of the machine - jostled indifferently in the corridors by actors, musicians and cameramen, sighed at offensively in the studio by the technicians and professionals. But when he stepped out of the Humber Snipe which had been sent to pick him up he found that the building was in darkness and apparently deserted. The only light he could see was in the lobby, and the only person in the lobby was an anxious girl with a clipboard who was waiting to greet him personally, and who seemed personally grateful for his skill in getting himself found and driven there by the company chauffeur. She led him along deserted, echoing corridors; nothing was happening in the whole enormous building, he realized, but the tiny preparations for this one tiny programme. All the rest of the evening television was pre-filmed, pre-taped, or provided by other companies.

The preparations for "The Human Angle", Dyson discovered, were going forward in a room on the first floor furnished with a sea-blue carpet, a number of discreetly abstract paintings, and a walnut sideboard. A dozen or so well-bred men in dark suits were standing about drinking gin and smiling agreeably at each other's jokes. A selection of them pressed forward upon Dyson deferentially, introducing themselves, fetching him drinks and salted peanuts like the girl with the clipboard they seemed consumed with gratitude and admiration for his skill in getting there. 'You got here all right, then?' they asked anxiously. "The driver found you all right? You found your way upstairs without any difficulty?". The only person in the room Dyson recognized was de Sousa, the producer, and he seemed to be the least important of them all.

They moved into the next room, and sat down to dinner. White-jacketed waiters tip-toed reverently around them, pouring hock with the frozen scampi, a claret with fruity, full-bodied label to go with the reheated roast lamb. 'Thank you' murmured Dyson with heartfelt respect to a waiter at his elbow. 'Thank you, sir,' said the waiter. 'Thank you', said Dyson.

The meal went by like a dream. Dyson felt as though that small room, surrounded by the dark emptiness of the studios, was the one speck of warmth and life in an unpeopled universe.

'Norman,' said de Sousa as the coffee and brandy were being poured, 'I wonder if we ought perhaps to have just a tiny natter about the programme.'

'I think that would be an awfully good idea, Jack,' said Westerman. He took some cyclostyled papers out of his pocket and looked at them.

'Well, as I understand it, Jack - tell me if I'm wrong, -we open with the credits on telecine. Right?'

'Right.'

'Then we come up on me in the studio. I say "Good evening. The film you're about to see is the record of a remarkable experiment in blah, blah, blah...'

'All on Autocue.'

'All on Autocue.'

'Then we have the film. Then we come back to me in the studio and I say, "The film you have just seen was an attempt to blah, blah, blah.' Then I turn to you, Frank and say, "Lord Boddy, what do you think of the experiment we have just seen?"

'I say blah, blah, blah,' said Lord Boddy.

'You say blah, blah, blah. Then we all join in blah, blah, blah. Then when I get the sign from the studio manager I wind up and say. "Well, then, the conclusions we seem to have reached tonight are blah, blah, blah."'

'All on Autocue,' said de Sousa.

'All on Autocue.'

Michael Frayn

Translate into Russian

A. wonder

1. She wondered if he would manage to be in time. 2. George wondered whether to commiserate with Jan for his newly acquired relative. 3. She wondered what they would think if they really knew how unromantic the life of a successful actress was, the hard work it entailed, the constant care one had to take of herself. 4. I wonder what he thought of the whole business. 5. Was this, Golds wondered, another of the many human customs that Karellen had copied with such skill? 6. This was a large planet -larger than Earth. Yet its gravity was low, and Jan wondered why it had so dense an atmosphere. 7. Every penny was accounted for. Julia wondered why servants stayed with them. 8. Far off were the mountains, where power and duty dwelt. And they could only watch and wonder: they could never scale those heights. 9. It was quite obvious that he just hadn't understood. It could hardly be wondered at.

Translate paying attention to the words underlined

1. treat(meat) Don't treat him as if he were a child. We had better treat it as a joke. The problem has been treated by numerous experts. I shall treat myself to a good weekend holiday. If we are to treat with you it must be on equal terms. It's a great treat for her to go to the opera. He has tried many treatments for skin diseases. The dog has suffered from cruel treatment. They are discussing a new treaty.

Он ужасно обращается со своими родителями. Лектор серьезно рассмотрел поднятые им проблемы. Его интересует, как это лечить. Он хочет угостить всех шампанским. Какое удовольствие вдруг очутиться в этой тишине и покое. Наконец, первый торговый договор был подписан. В статье рассматриваются методы обработки металлов разными кислотами.

2. pick I was lucky to pick his brains that morning- I hate this habit of picking your teeth while speaking to me. She only picked at her food. This woman is always picking at the poor child. He's marrying a girl he picked up on the street. He stopped the car to pick up a young man who was hitchhiking across Europe.

Не имею представления, где ребенок подхватывает такие слова. Он постарался собрать все сведения у каждого, кто попадался ему на глаза. Его жена все время к нему придирается. Наверное, у отца неприятности, он ест без всякого аппетита.

3. only Smith was the only person able to do it. We were the only people wearing hats. She says holidays abroad are the only thing these days. He is an only child. The news was only too true.

Гарри был единственным ребенком. Единственный человек, которому можно рассказать все, далеко. Молчание – вот все, чего от него добились. Я буду очень рад снова попасть в этот город. Он сказал, что это известие к сожалению верно.

4. personal I have something personal to discuss with you. She reads only the personal column. The Prime Minister made a personal appearance at the meeting. I object to such highly personal remarks. He conducted me personally through the mansion. Personally I see no objections to your proposal.

Вас не должны волновать мои личные дела. Вы черпаете все сведения из светской хроники. Он сам надписал конверт. Давайте не будем касаться личностей. Лично я готов встретиться с ними. Он оказал мне личную услугу.

5. skill Learning a foreign language is a question of learning new skills. Everybody admires his skill in avoiding disputes.

Поразительно ее умение незаметно исчезать. У него хорошие профессиональные навыки. Эта работа требует большого мастерства.

PART III
HOW TO WRITE A TECHNICAL REPORT

1. The title

Hello,

This morning I want to take up with you the question of the report. Most scientific experiments, most scientific experimental activities finish up as a technical report of one kind or another....Now, what does a technical report consist of? Well, the first item is the title. This is perhaps the most important single part of the report. This is important because it acts as a sorting mechanism. All those people who shouldn't be reading the report are hereby warned to stay away and all those, who should be reading the report, are told, "Come and get it! This is the kind of thing that you ought to be looking at."

Now there are lots of mistakes that people make in *titles* — they make them so *general* that it doesn't act as the filtering mechanism that it should be acting. Some of them are so *long*that people who have to quote the title repeatedly — and in many situations one does have to put the title of the report — well, these people can be driven to madness at a title that's about seven lines long as some might be. Some of them are *irrelevant;* often when you write a paper, a report, you're first asked to supply a title and then three months later, the actual report or paper itself. And by that time your views may have changed, you may be stuck with a title that you now don't find suitable. Well, change it by all means. Don't ever produce a title that doesn't fit the paper — that's not productive for anybody.

Then the other kind of mistakes, for example, this might be a typical title that somebody might come up with: "A Preliminary Report on an Experimental Investigation of the Refractive Index of Martini." Well now, what's wrong with that? This may describe the report perfectly. But actually often after you have produced a title, it's worthwhile starting at the beginning and going through the title towards the end to see how far you can go, and how far you can chop before you hit some real hard wood. In this case, the fact that the report is "preliminary" is usually not of any particular consequence to anybody. So far it's the best report that there is, may be there won't ever be a further report, if there is it's clear that the second one supersedes the first. I think it's very seldom that warning words like *preliminary* are helpful in a report. It'll turn out quite clear eventually that it's going to become superseded. To say it's a report is pretty redundant — it's obvious that the thing's a report. So why say it? Experimental investigation — I suspect, by what comes later, it's fairly clear that it's not a theoretical investigation. So *experimental*can go out. And I suppose it's fairly clear that the thing is investigation as well. Let's take that out as well. Well, now we've really whittled ourselves down to nothing — now the thing is: "The Refractive Index of Martini." Now that we have shortened it to that extent, we can start to shape the report. And this is perhaps one of the most important functions of a good title and one that people often make a mistake on. And that is, try to indicate something about why you are doing it, what the purpose is. Now, this doesn't necessarily influence the experimental data but it often helps the reader to know the context in which you did the work, in which he might read the work and this often tells him whether the thing is actually in his interest to pursue further. For example, you might make the title "The Refractive Index of Martini as a Measure of Alcohol Content." Now, that tells the reader something: you've got a new method of finding out how strong Martinis are or it might be "The Refractive Index of Martini as Influenced by Biological Contamination" - this might be a method of detecting Martini that isn't safe to drink.

I mean, there're all sorts of things one can put in but the point is, if you take up too much of the title by this "preliminary" stuff, then you don't have the space to put in the important things, the purpose of the investigation. Well, anyway, this is highly important and I think people who produce titles very casually should sit down and perhaps really say, "I'm not going to write down a title in less than ten minutes". I think that's ten minutes is well spent or maybe half an hour is a more suitable time. Make sure that that's the best title you can find that really describes the work that you've done and will really help the reader decide whether to go ahead. Well, I suppose that of the thousands of people, who may read this title, most of those who should be deterred, for whom the report isn't intended, will decide that after they've read the title, this isn't their bag, they'll turn the page to the next report.

2. Abstract Writing

However, we always provide, or we should provide, an additional mechanism for telling people whether to go ahead, and that is the *abstract.* Now, an abstract, as you know, is something that's about anywhere, between, say fifty and two or three hundred words long, a description of the work, really to supplement the title in telling people whether this is something that they ought to be pursuing further. One mistake that people often make is they don't give the results. They'll tell what was done — an experiment was carried out to measure this, that and the other, and to test some theory — but they'll never mention whether in fact the theory was true or not. So always make sure that your abstract does include the results that you've actually achieved. Don't give afterthoughts. The nature of things is such that abstracts are usually written right at the end of the paper, and often people who've written the paper and then a couple of days later they think of something they should have said but didn't, will stick it in the abstract. Now that's not appropriate, rewrite the paper but the abstract should correspond to the paper and not be a further extension of it.

Abstracts are frequently published by themselves in Abstracting journals, so that a person may read the abstract who doesn't have the paper before him. Hence, you can't use undefined symbols like this Greek thing - I don't know, zeta, I don't even know what it is. But often you'll see somebody stick in "a zeta value of 3.8 was obtained". Well, if you don't define what this zeta is — I'm assuming it is a zeta by the way — this doesn't help the reader at all who doesn't have the paper before him. And similarly, often people use some very pompous terms which I'm sure are perfectly well defined in the paper but if you don't have the paper it doesn't help. "A compound beneficient quotient of 3.7 was established in category A". Well, you know, if this isn't the standard term and if the reader doesn't know it, it doesn't help. And the final comment I might make is that often abstracts are read by very simple people - laymen, controllers, lawyers, directors — so try and keep the technical level of the abstract just a notch below that of the paper. I don't mean to say that, you know, make it such that a sevenyear-old can read it. But don't make it as fiercely technical as you know how. I don't think that's appropriate in an abstract.

Well, these are the shorting mechanisms — by these means we reduce the readers down to the number who ought to be reading the paper. It does no good to have a man read your paper who shouldn't be reading it. It just makes him angry and it retards the progress of science. So try and don't use it as a come on so much but make it a device to deter people who've no interest in what follows. However, those who ought to be reading it then are going to be with us and we're going to have to take them further.

3. The Structure of a Technical Report

And now we have a fairly standardized line-up of things that happen after this point on. First of all there's going to be an *introduction.* In this section we outline why we did the work, what the state of knowledge is before we undertook our work — just put the reader in the picture what this is all about. How elaborate you make it, of course, depends on circumstances. You know, some reports have to be, like a thesis would be, very lengthy; some reports to your boss on continuing an experiment that you started in the previous reporting period would be half a page, you know. But in any case this sets the stage for what is to follow.

In experimental studies there is not generally a section called theory — the theory that is needed to understand what happens is usually put in as part of the introduction. But where a study is both theoretical and experimental in nature there might, very appropriately, be a section entitled *theory,* in which the whole theory that is to be tested is developed at some length and evaluated and discussed. I've put a bracket round that to indicate that this is often omitted in experimental thesis, in experimental report.

Well, then there's a *description of the apparatus,* in which you discuss the equipment that you used. Here I want to put in two pleas: in all the years I've been reading reports — and I must have read a thousand, ten thousand, I don't even know how many — I don't think I've ever seen a picture, a photograph of a piece of apparatus that I' ve really understood. Photographs are very hard to interpret, or maybe I'm just slow about this. On the other hand, I've very seldom seen a line diagram I didn't understand. So my general comment is: don't put in photographs of apparatus. It simply isn't worthwhile. By all means draw a line diagram in which you point out the appropriate features because anybody can understand a line diagram. But photographs have beauty only to the guy who took them, the man whose equipment it is. But otherwise they don't do much good. And secondly, by all means point out the general weak- ness of the equipment, the features that make it less than ideal because this often helps the reader interpret what follows. Point out the equipment worked very well except when a truck passed outside, in which case there seemed to be a very severe vibration, or the equipment could not be operated when the room humidity was above 70 % because something leaked. But, you know, the reader's entitled to know to what extent this isn't a perfect piece of apparatus and this is the place to tell him.Well, let's carry on. We next come to the *results section.* Well, this is actually the important section of the paper describing experimental investigation because the results, of course, are the truly significant thing. This is what you did it for. The results are maybe valuable even if the rest of the paper is completely wrong, inappropriate. So perhaps this is the one that you really have to concentrate your attention on. Present your data. What do you present? I suppose one ideal is to present every data point that you ever took. Sometimes this is inappropriate, this may be far too lengthy. You have to then do some selecting — we'll discuss in the next lecture some of the problems involved in selecting. You have to display your results, you have to produce tables, diagrams. All in all, you have to give the reader a flavour of the results that you obtained and really an appropriate description as to what happened when you undertook the experiment. This is often the most difficult, in the sense that if you write the paper at the very end, you then may find a gap in the results section which by now you can no longer fill because you dismantled the equipment. So my general comment is that it's often appropriate to start writing up the results section of a report while you still got the equipment there, you're still taking data and then it often becomes clear that there's a gap and then you can go back and fill the gap. Once the equipment is gone, there's nothing much you can do about it. But this is usually the section that is worth writing first, at least that's my own particular opinion.

And lastly there's a *discussion section* in which you relate the results that you've obtained both in terms of the theory and the state of knowledge at the time that you started the work. Discuss whether what you did was technically or basically a success or failure. Discuss how you, you know, how your results fit in with work of others, with earlier results of yourself, and in general, you know, give the reader an impression as to your evaluation of the experiment. Again, the question as to how simple or complex to make this section depends a little bit on just what the purpose of this report is anyway.

Well, in a sense this is the end of the report. On the other hand, we haven't finished yet, we come to a few parts that are often rather tedious but often very important. The first one is *recommendation.* You don't generally make recommendations in a paper intended for the general public, like a published paper, but you very frequently put in recommendations when you are producing a report that's to be read by a limited number of people, perhaps in your own organization. This recommendation or recommendations are usually what is to be done next. And the time is really important is that if you know that you're going to continue to work in this particular area. Because if you don't make a recommendation then your boss is going to make a recommendation, and unless you tell him what you think ought to be done, don't be surprised if you finish up doing something which you feel is useless. So a recommendation is always an opportunity for you to make things easier for yourself the next time around. So, by all means put in a recommendation when it's a private report.

4. Acknowledgements

Acknowledgements is the most important thing in a published report, a published paper and probably also in privately circulated reports. For reasons that I do not fully understand, scientists are amazingly, incredibly sensitive about having their contributions acknowledged. It's psychotic in many cases. I've known quarrels of thirty years duration arise because somebody didn't acknowledge the fact that somebody else said something that may have helped him or that had written an earlier paper in this particular field. I remember this kind of issue of acknowledgement came up in my very first major paper — my doctoral thesis — I wrote it together with my thesis supervisor and along comes back a review from, you know, the unknown reviewer of the paper, "There ought to be some reference made to the wonderful work of X." X clearly was the reviewer in this particular case. Well, I was going to fight it and I said, "My God! He didn't do anything for us. His paper didn't help me one bit!" And my thesis supervisor, an old and far wiser man, said, "Look Ernie. You know, it's a trivial issue — you've got forty-three references already. Put in forty-four and you'll keep this guy happy and so what?" And I think that's a wise attitude, I've met it a number of times — sense of people who've held up publication of a paper because they weren't acknowledged, which, by the way, I regard as being an almost indecent attitude to take. But it is a very common one, but I think I've tried to point out to you the intensity of feeling that people have and the general rule is: don't go round and say to yourself: " Did this guy help me or not? If so, I'll acknowledge him." The real attitude is: "Does he think he helped me?" If he does stick, it in the word of acknowledgement for him. It's so easy. It's a trivial thing. It takes up about five lines in a text and it's generally wiser to make this list of acknowledgements a little larger than you think it really ought to have been.

5. References

Well, now we come to the *references.* The two aspects of that — the first one is, you know, you really ought to put in as many references as are appropriate in the paper. In terms of information the references are the most concentrated part of the paper. You can supply the reader with more information by a page of references than you can by a page of almost any other part of the paper. I hate to see a paper with no references whatever. It makes me think the author's trying to give the impression that he invented this field all by himself. It doesn't make it easy to go back and, you know, and learn a little more about this particular field. On the other hand, a well-chosen list of references can really help a reader who wants to pursue a subject further, he can find out what the author knew when he started, what earlier work there's been in the area and it really can be awfully helpful.

How these references are listed is a standing dispute. Every journal, every organization has one method of listing references and no other is accepted. You know, like do you put the initials before the author? Do you put the date or the year right after the author or right at the end?

You'd be surprised how many combinations of methods there are. I think that I worked out the other day that there are at least two thousand generally accepted methods of producing references. And for each journal or each organization that produces reports, there's generally only one correct method. Well, don't fight it! Join it! I mean nothing is gained by starting a campaign that your method of producing references is better. The only thing where I think some initiative is allowed, for example, on whether to cite the title of an article - some organizations give you certain leeway on that. On that I'm convinced that you always want to put in the title of an article, it helps the reader a lot in deciding whether to go on with it or not. Another place, where you often have leeway when you cite a book, is whether you're going to cite the whole book or whether you're going to refer a single section or a single chapter — here again, if you're just referring to a little section of a book like Chapter 7 or pages153 to 158, by all means do that and save the reader the bother of trying to hunt through to find the proper place for himself. If you're citing a foreign paper you often have a choice. You can display your erudition by giving the title in whatever foreign language the paper was in and leaving it that way, and then that leaves all the readers who don't know that foreign language just saying, "Gee, this guy's obviously smart but so what?" I think the only appropriate method is to give a translation of the title into English and then at the brackets comment to the fact that the original paper was in Russian or German or Hindustani — whatever language it was in. But, I don't think it helps, for scientists, anyway, maybe different, to give the title in Spanish say, and just leave it at that and hope that something will happen, 'cause nothing will happen.

6. Bibliography and Appendices

In some report writing system, like theses, there is an item called *bibliography* which refers to background reading that the author of the report has produced, background reading that is not reflected in an actual citation, took place in the paper. Generally, in published papers this is omitted but there you just have to go along with what's customary.

Appendices. If you have information, as often is the case, that's of a very specialized nature, for example: the individual data themselves, possibly a derivation of a formula which is fairly lengthy, rather abstruse and not of general interest, then it often helps to put in an appendix or a couple of appendices where the specialized material is put in the back for those who really want it not to impede the others. **A** little semantic mistake that people often make is they don't realize that the appendix is deep cut from the paper itself. For example, they refer to the appendix on page 3 and page 7, they say," We, as shown above..." but actually appendix isn't above or below. It's just in a separate location. You can't locate it in any part of the paper. It stands by itself.

7. The Style of a Scientific Report

I've left one item out — the general question of *style.* I ought to say something specifically as I close. Try and make your paper, your report as interesting as possible. You gain no browny points by producing a dull report or a dull paper. Now actually, the tradition used to be different. The idea was that this wasn't Joe Blow writing a report — this was science acquiring a new bit of information and there was a tendency, perhaps fifty years ago, to make reports very pompous and very dull. "The test tube was taken and a quantity of liquid was, you know, poured into it." Well, these days I think we're becoming more informal and I think that reports are becoming more readable. Sometimes people nowadays allow the active tense "We did this and we did that, and we feel this and we feel the other." There's still a few places where this isn't allowed and you have to use *the passive tense.* I think that's bad because, for one thing, it isn't obvious when you say, "It is believed." That may mean I believed or the scientific world as a whole believes. So it's ambiguous and besides I think it makes reading very bad. I think the aim ought to be to say, "Look, the readers of my report are to have lots of other things to do. At least let them not groan every time they see my report and say," Oh God! There's another report from Joe Blow. God! Let me get a cup of coffee!" The feeling ought to be: I'm producing the report, I've got readers, I'm going to make it a bit as interesting as I can. I'm not going to be entertaining and produce silly jokes or something like that. I mean, you know, this is a fairly serious business, but on the other hand, I'm going to try and avoid dullness and make the paper what it ought to be and that is a method of selling myself and my work in as appropriate way as, in as good a way as possible.

Well, I've come to the end of this lecture. I've given you more or less the run-through of the report, the simple one, the surface approach. These are all obvious things that are involved. However, there are lots of more things involved in report writing: the subconscious, the subtlety, the things that are there although you don't always think of them as being there, which in fact often make or break the report. They determine whether the report is, I don't mean a well-written report — that's this part — but whether the report really represents the experiment, really does justice to the work that was done. That's the topic we'll take up next time.

ЗАКЛЮЧЕНИЕ

Окончившие курс обучения по данной программе должны владеть орфографической, орфоэпической, лексической, грамматической и стилистической нормами изучаемого языка в пределах программных требований и правильно использовать их во всех видах речевой коммуникации, в научной сфере в форме устного и письменного общения.

При обучении различным видам речевой деятельности (чтению, говорению, письму) использован принцип их совокупности и взаимной связи с учетом специфики каждого из них. Управление процессом усвоения обеспечивается четкой постановкой цели на каждом конкретном этапе обучения. Определяющим фактором в достижении установленного уровня того или иного вида речевой деятельности является требование профессиональной направленности практического владения иностранным языком.

Текстовый материал пособия носит профессионально-ориентированный характер. В качестве учебных текстов и литературы для чтения была использована оригинальная монографическая и периодическая литература по тематике широкого профиля вуза, по узкой специальности аспиранта (соискателя), а также статьи из журналов, издаваемых за рубежом.

Авторы надеются, что предложенное пособие окажет реальную помощь аспирантам и соискателям в плане коммуникации в различных областях профессиональной деятельности.

GLOSSARY

Aa

absorb поглощать
accelerate ускорять
access подход
accommodate вмещать; размещать; приспосабливать
accomplish выполнять, достигать
accompany сопровождать
according to *prep* в соответствии с
accuracy точность accurate *a* точный, правильный
achieve достигать, добиваться
achievement достижение, подвиг
acquire приобретать
action действие, воздействие
activity деятельность, активность
acute острый
adapt приспособляться), прилаживать
add прибавлять; присоединять
addition прибавление; in addition to кроме того, в дополнение к
adequate отвечающий требованиям, соответствующий, достаточный
adjacent примыкающий
adjust пригонять, прилаживать
admit признавать, допускать
adopt принимать; заимствовать
advance прогресс
advantage преимущество, выгода; удобство
advocate узаконить
aesthetically *adv* эстетически
affect влиять, воздействовать
afford позволить себе *(что-л.);* предоставлять
aggregate заполнитель
age возраст; век, эпоха
agree соответствовать
aim (at) предусматривать, иметь целью
air-conditioning кондиционирование воздуха
allow позволять; делать возможным
alone *adv* только
alter переделывать
alternate чередующийся; on
alternate days через день
ambient окружающий

amenities удобства
amount количество; величина
analysis исследование
angle угол
annual ежегодный; годовой
apart *adv* отдельно
appear казаться, возникать
appearance появление; внешний вид
application применение
apply применять
area район; площадь
arise возникать
arrange располагать, устраивать
art искусство, умение
artificial искусственный
assembly. скопление людей
associate соединять, ассоциировать
assume предполагать
assumption предположение
assure обеспечивать, гарантировать
attain достигать
attempt попытка
attention внимание; to pay attention to обращать внимание
auxiliary вспомогательный
available доступный, имеющийся в наличии
availability наличие
average средний; обычный
average равняться в среднем; составлять в среднем
avoid избегать

Bb

backactor (=backhoe) экскаватор
basement подвал *(здания)*
basic основной, главный
basin бассейн, водоем; акватория порта
beam балка
beauty красота
behaviour поведение *(металла),* режим работы *(машины и т. п.)*
believe полагать
bending load (stress) изгибающая нагрузка (напряжение)
benefit выгода; to be of benefit выгодный
beneficial выгодный

berth *n* причал; причаливать
besides *adv* кроме, в добавление к
bind связывать
blast furnace доменная печь
branch отрасль
break down разрушать(ся)
breakwater волнорез
bridge мост
brick кирпич
brittle хрупкий
body of water водный массив
boom стрела
bucket ковш
bulk масса, объем
built-up составной, сборный; *зд.* застроенный
built-in встроенный
burn гореть

Cc
calculate вычислять; рассчитывать
calculation вычисление; расчет
call for требовать, предусматривать
capable of способный к
capacity мощность; пропускная способность
per capita на человека
careful тщательный
cargo груз
carry out перевозить; выполнять
case случай
cast отливать; заливать *(бетон)*
cathodic катодный
cause причинять, вызывать
cement цемент
century век, столетие
certain определенный; уверенный
chain цепь
challenge угроза
chance случайность; случай;
by chance случайно
change изменение; изменяться)
charge загрузка (порция);загружать
cheapest самый дешевый

chemicals химикаты
chief главный, основной
choice выбор
circulation переход; перемещение людского потока
circumstances обстоятельства
claim требовать, заявлять; to
claim to be считать
clamshell грейфер
clarified осветленный
clear ясный
close тщательный; близкий, непосредственный
closely тесно
coating покрытие
coexistence сосуществование
coil змеевик
collapse крах; разрушение
collect собирать; улавливать
combination сочетание; when
combined with в сочетании с
common общий; распространенный; заурядный
commercial торговый; экономический
communal общественный
communication связь; коммуникация
community общество
comparatively сравнительно
compare сравнивать; as compared to по сравнению
comparison сравнение
complementary дополняющий
complete завершать
completely *adv* полностью
complex сложный, комплексный
comply (with) подчиняться; действовать согласно правилам
comprehensive обширный
composition состав; произведение
compression сжатие compressive *a* сжимающий
computation вычисление
computer ЭВМ
conceal скрывать
conceive задумывать
conceivably предположительно
concentrate сосредоточивать, концентрировать
concentration сосредоточение

concept понятие; концепция
conception понятие; замысел
concern забота; касаться;
быть связанным с
concrete бетон
concrete конкретный
condition условие; under conditions в условиях
condition обусловливать
conductivity проводимость
conduit водовод
confine ограничивать
confuse приводить в беспорядок
confusion путаница, смятение
congestion перенаселенность
connect связывать
consider считать, учитывать
considerable значительный
consideration рассмотрение; соображение; учет; to take into
consideration принимать   во внимание, учитывать
consist of состоять из
consequences последствия
consequently *adv* следовательно
constitute составлять
constituent составляющий
construct' строить
construction строительство; конструкция
consume о потреблять
consumption потребление
contain содержать
contamination загрязнение; заражение
contemporary современный
content(s) суть, содержание
continuity непрерывность; беспредельность
continuous непрерывный; замкнутый, сплошной
contrary to в отличие от
contribute способствовать
contribution вклад
control контроль, регулирование; контролировать, регулировать
convenience удобство
convenient удобный
conventional обычный, традиционный
convert преобразовывать; обращать

cool охлаждать
cooling охлаждение
cope (with справиться, совладать
core ядро
correspondingly *adv* соответственно
corrosion коррозия
cost стоимость, цена
costly дорогостоящий
counterpart прототип
couple соединять; спаривать
crack щель; трещина
crane кран
create создавать
creation создание
creative творческий
crime преступление
crush дробить, раздавливать
current современный; циркулирующий, находящийся в обращении
cut срезать, резать
cycle цикл

Dd
dam плотина
damage повреждение; разрушение
danger опасность
deadweight полная грузоподъемность *(судна)*
deal with иметь дело с
decade десятилетие
decide решать
decomposable подверженный разложению
decorate украшать
decoration отделка
deep глубокий
define определять
definition определение
degree степень; градус; уровень
deliver доставлять
delivery доставка, поставка
demand потребность; требование
demolish разрушать, сносить
density плотность
departure отбытие, отправление

depend on зависеть от; depending on в зависимости от
deposits залежи; месторождение
deposit накопить(ся)
depth глубина
derive *v* извлекать
description. сорт
desert пустыня
deserve заслуживать
design проектировать; предназначать
designer проектировщик
designate определять; называть
designation предназначение
desired требуемый, желаемый
despite *prep* несмотря на
destroy разрушать
determination определение
determine определять
develop развивать, разрабатывать
development развитие; застройка; разработка;
waterpower development гидроузел
device прибор; устройство; механизм
differ отличаться; различаться
different различный
dig рыть, копать
dimension размеры; объем; соблюдать нужные размеры
direct направлять
disadvantage недостаток; ущерб
disaster бедствие
disastrous гибельный
discharge спуск воды ,сброс; расход
discharge спускать, сливать ,сбрасывать (паводок)
discover обнаруживать
disposal удаление
distance расстояние
distant отдаленный
distribute распределять
distribution распределение
diverse разнообразный
divert отводить
divide подразделять
dock док, порт
domestic жилой *(дом),* бытовой

double удваивать
dragline канатно-скребковый экскаватор; драглайн
drain(s) канализационная труба
drainage канализация *(сток)*
dream мечта
drill бурить
drilled пробуренный
drilled well скважина, артезианский колодец
drive приводить в движение; *зд.* двигать(ся)
drought засуха
dry сухой; высушивать
dual совместный, двойной; *зд.* совместного рассмотрения
due to *prep* благодаря
durable прочный, долговечный
durability прочность, долговечность
dwelling жилище, жилой дом

Ee
earth земля; грунт
economy хозяйство; экономика, экономия;
national economy народное хозяйство
edge острие, лезвие; кромка
education образование
educational учебный
effect действие, воздействие, эффект;
to this effect для этой цели
effective действенный, эффективный
efficiency эффективность; КПД
efficient эффективный; целесообразный; продуктивный
enclose огораживать, окружать
enclosure загороженное место
endanger подвергать опасности
energy энергия
energy carrier энергоноситель
engineering техника; civil engineering гражданское строительство
enlarge увеличивать *(размеры)*
enlargement увеличение
ensure обеспечивать
entail влечь за собой; вызывать
enterprise предприятие
entire полный, целый
entry вход

envisage рассматривать *(вопрос)*
environment окружающая среда; окрестность, местность
equip оборудовать
equipment оборудование
equal равняться
erect возводить
erection возведение
escape выходить *(о воздухе)*
essentials основное; предметы первой необходимости
essential существенный, важный
essentially существенно; существенным образом
establish устанавливать
estimate оценивать, определять
evaporate испаряться
event событие
evident очевидный
evolve разрабатывать
evolution развитие
examine рассматривать; исследовать, изучать
excavate копать, рыть
excavation выемка грунта
excess избыток, излишек
exclusive исключительный
exceed превышать
execute выполнять, осуществлять
execution выполнение
exhaust истощать
exist существовать
expand расширять(ся)
expansion распространение,
expensive дорогой
experience опыт
exploration исследование
expression выражение; изображение
expressive выразительный
extend расширять
extensive обширный
extent пространство, протяжение, степень;
to the extent (to ... extent) до такой степени
extraction извлечение; добывание; добыча
extravagant непомерный
extreme крайний, чрезвычайный

extremely чрезвычайно, крайне
either любой *(из двух);* in
either case в любом случае;
either ... or или ... или
elaborate разработанный тщательно
elevate поднимать
elevation подъем; отметка *(уровня)*
eliminate устранять
elsewhere (где-нибудь) в другом месте
embed заделывать
embodiment воплощение
emit испускать
emphasize подчеркивать
employ использовать, применять
empty выливать; впадать *(о реке)*
enable давать возможность

Ff
fabric ткань
face стоять лицом к (перед)
facilitate облегчать
facilities оборудование
failure авария; разрушение
fan вентилятор
faulty ошибочный
favour благосклонность
favourable благоприятный
feature особенность, черта
feed снабжать; питать
find out разузнавать, выяснять
fix устанавливать, закреплять
fort усилие, попытка
fixed неизменный, установленный
flexible гибкий
float. быть на плаву
float in. вводить на плаву
flood паводок
flourish разрастаться
flow поток
fluid жидкость; жидкая среда
flushing поток; street-flushing
follow *v* следовать

(the) following следующее
foot per minute фут в минуту
force сила; заставлять; стимулировать
forecast предсказание; прогноз; предсказывать; прогнозировать
foreign инородный
forget забывать
form создавать; составлять, образовывать
formation система
former (the former) первый *(из двух)*
formerly ранее, прежде
fortress крепость
foul загрязняться)
fraction доля
frame каркас
freedom. свободное пользование
frequency частое повторение
frequently часто, обычно
fresh свежий
fuel топливо; fossil fuel ископаемое топливо
fume сильный, резкий запах; дым
function назначение, деятельность; действовать; работать
fund фонд *(денежный);* капитал
further дальнейший; дополнительный
further содействовать
furthermore к тому же, кроме того

Gg
gate ворота; шлюзные ворота
generate вырабатывать, производить
generation поколение; генерирование *(энергии)*
generator генератор, источник энергии
goods товары
gravel гравий
gravity сила тяжести
ground грунт; площадка; testing ground испытательная площадка
grow расти
growth рост
guarantee обеспечивать
guide. быть руководителем
gypsum гипс

Hh
handle обрабатывать
handling обработка грузов
happen происходить
harbour гавань, порт
harden затвердевать, твердеть
rapid-hardening быстро твердеющий
harm наносить ущерб
harmful вредный
harmonious гармоничный
harness использовать как источник электроэнергии
hazardous опасный
head напор *(воды)*
health здоровье
heat теплота; нагревать
heater радиатор
heating отопление; нагревание
height высота
hence следовательно
high высокий
hoist поднимать
hold занимать
hole отверстие; water-hole колодец
hollow пустотелый
housing жилищное строительство
human человеческий
humanity человечество
humidifier ft увлажнитель
humidity влажность
hydraulic гидравлический, гидротехнический
hydropower энергия воды

Ii
i.e. *лат.* то есть, а именно
ignore отвергать, пренебрегать, игнорировать
indispensable необходимый
indicate указывать
inevitably *adv* неизбежно
inherent неотъемлемый
influence влияние; влиять
ingredients составные части
inland материковый

inquire расследовать, исследовать
iron железо
insignificant несущественный
install устанавливать
installation установка
instance пример;
for instance например
insufficient недостаточный
intake водозабор
integral неотъемлемый
integrate составлять единое целое
intelligence ум, интеллект
Intend намереваться
interaction взаимодействие
intercourse общение
interior внутренний
internal внутренний
interrelate взаимосвязывать
introduce вводить
investigation исследование
investment капиталовложение
involve вовлекать, включать
issue спорный вопрос; проблема
inch (per square Inch) дюйм (на кв. дюйм)
imagination воображение
imagine воображать
imitate подражать
immediate немедленный, безотлагательный
immediately немедленно
impervious непроницаемый
imply значить, подразумевать
impound запруживать (воду)
impressive впечатляющий
improve улучшать
improvement улучшение, совершенствование
inaccuracy неточность
include включать
income доход
incorporate включать (в состав)
increase увеличивать(ся), возрастать

Jj
jack домкрат
jetty причал;
oil jetty нефтяной причал
joint совместный
junction узел *(дорог);* соединение
justice справедливость; to do
justice отдать должное
justification оправдание, обоснование

Ll
labour рабочий;
labour force рабочая сила
lack (полное) отсутствие; недостаток; испытывать недостаток;
for lack of из-за недостатка
land причаливать
landslide оползень
lake озеро
last сохраняться; быть достаточным
latter последний *(из* двух *названных)*
law закон
layer пласт, слой
layout планировка
lay down прокладывать
lead вести; приводить *(к чему-л.)*
leakage утечка
(at) least по крайней мере
leave free освободить
length длина
level уровень;
level of living жизненный уровень; выравнивать
lift подъем; поднимать
likewise также
like подобно
lime известь
limit ограничивать
limited *p.p.* ограниченный
link связывать
liquid жидкость
list вносить в список
load нагрузка, груз; нагружать
locality местность

location местоположение; расположение
lock шлюз
long-range = long-term долго срочный
loss потеря

Mm
main главный
maintain поддерживать, сохранять
maintenance поддержание; эксплуатация;
maintenance costs эксплуатационные расходы
major основной, главный
management управление
managerial управленческий
mankind человечество
manufacture производить, изготовлять
map карта
marine морской
marked заметный, значительный
master plan генеральный план
masonry каменная *или* кирпичная кладка
matter as a matter of fact фактически; на самом деле;
no matter what несмотря ни на что
mean иметь в виду, значить
means средства
by means of при помощи, посредством
meaningful многозначительный
measure измерять
medieval средневековый
medium среда
meet requirements удовлетворять требованиям
mention упоминать
mere простой, только лишь
mind ум
in public mind по мнению общественности;
to smb's mind по чьему-л. мнению
mix смесь
mixture смесь
mode (of operation) метод, режим, способ
motion движение
move движение; двигаться, передвигаться
movement движение; перемещение
mould форма; формовать

mount монтировать, устанавливать
mutually взаимно
modify изменять
moisture влага
moreover более того
mortar строительный раствор
most в *гран. знач. сущ.* большинство
mostly *adv* главным образом

Nn
namely а именно
navigation судоходство
necessity необходимость
need потребность, нужда; нуждаться (в *чём-л.);*
to meet the needs удовлетворять потребности
neglect запущенность
neighbourhood микрорайон, жилой район (*работы)*
neighbourly добрососедский
noble благородный
nuclear ядерный
number некоторое количество; ряд
note отмечать

Oo
object цель; предмет; элемент
objectionable нежелательный
objective цель
obstruction помеха, препятствие
obtain получать, приобретать; достигать
obvious очевидный
ocean океан
occupant житель
occur происходить, случаться, иметь место
odour запах
offensive неприятный; отвратительный
offshore находящийся в открытом море
off site вне строительной площадки (заводской)
oil нефть
only единственный
operate работать; приводить в действие
operation работа; действие
opportunity возможность

in order to для того, чтобы
ordinary простой, обыкновенный, обычный
origin re происхождение
original первоначальный
otherwise иначе, в противном случае
outlet водовыпуск, сброс
outline наметить в общих чертах
output производство, выпуск
overcrowding перенаселенность
overflow переливаться own *a* свой, собственный
owing to *prep* благодаря, вследствие
operations поливка улиц

Pp
palatable вкусный; приятный
panel панель
part деталь; часть
particle частица
particular особый, особенный; отдельный
particularly *adv* особенно, в особенности
pass проходить; быть принятым, получать одобрение *(о законе и т.п.)*
paste тесто; тестообразная масса
pattern образец, модель; схема
penetrate проникать
percolate просачиваться; фильтровать
perform выполнять, исполнять
permanent долговременный
permanence прочность
permit позволять, разрешать
pier пирс, пристань
pipe труба
pipeline трубопровод
place место;
to take place случаться, иметь место
place помещать
plain простой; неармированный
plant завод; парк строительных машин; установка
plant растительный
plaster штукатурка
plastics пластмассы
pollute загрязнять
precipitator электрофильтр

precise точный
predict предсказывать
prediction предсказание
prefabricated заводского изготовления; сборный
prefabrication заводское изготовление
prefer предпочитать
preference преимущество, предпочтение
preliminary предварительный
premises сооружения, здания
to be preoccupied заниматься
prepare изготовлять
preparation приготовление; подготовка
preservation *n* сохранение
pressing неотложный, настоятельный
prestressed предварительно напряженный
prevail преобладать
prevent предотвращать
primary первичный; первостепенный
prime первостепенный, основной
previous предыдущий
private частный, личный
process процесс
processing обработка; food
processing обработка пищевых продуктов
pollution загрязнение
pool водоем; бассейн
population население
possess обладать, владеть
possible возможный
potential возможный
power мощность; энергия;
power station электростанция
power приводить в действие
precast предварительно изготовленный, сборный
precede предшествовать
precipitate осаждаться, выпадать в виде атмосферных осадков
produce производить, вырабатывать
production производство
project проект; проектировать; выступать
prominent выдающийся
properly должным образом, правильно
promote способствовать, содействовать

proper должный; правильный
property свойство
proposal предложение
prospect перспектива
protect охранять, защищать
protection защита; охрана
prove to be оказываться
provide обеспечивать; предоставлять, давать
provision обеспечение
proximity близость
pump насос; качать
pure чистый
purification очистка
purity чистота
purpose назначение; цель

Qq
quality качество
quantity количество
quay пристань; набережная
quiet тихий, спокойный

Rr
radiant лучистый
raise поднимать
range предел, диапазон
rank относить к какой-л. категории
rapid быстрый
rapidly быстро
rapid-hardening быстротвердеющий
rate скорость; темп;
at a rate со скоростью
raw сырой, необработанный
ray луч
reach размах, взлет; доставать, достигать
readily легко
realize ясно понимать; реализировать
reason причина; основание
receive получать, принимать
recent последний, недавний
recently недавно
recognize признавать

recreation отдых
reduce уменьшать, понижать
refer to иметь отношение, относиться
with reference to с учетом, со ссылкой на
refinement усовершенствование; уточнение
refrigeration охлаждение
refrigerator холодильник
refuse мусор; отбросы
regard рассматривать, считать
with regard to в отношении; что касается
regardless независимо от, не взирая на
reinforced армированный; усиленный
reinforced concrete железобетон
reinforcement арматура
reinterpretation новое толкование
to be related быть связанным
relation отношение; in relation to относительно
relationship отношение
relative относительный
relatively относительно
reliable надежный
rely полагаться, надеяться
remain оставаться
remember помнить, вспоминать
remote отдаленный
removal устранение, удаление
remove удалять
render исполнять, приводить в какое-либо состояние
renew возобновлять, обновлять
repair ремонт
repetition повторение
replace заменять; возвращать на место; вытеснять
represent представлять
require требовать
requirement потребность; требование
requisite необходимый, требуемый
research исследование, изыскание
research исследовать
reservoir водоем; водохранилище
residential жилой
resistance стойкость; сопротивление
resistant стойкий; прочный

resources ресурсы, возможности
respect уважать; соблюдать; иметь отношение;
with respect to = In respect to в отношении, что касается
responsibility ответственность
result результат, исход; to
result in приводить к, давать в результате
retaining wall подпорная стена
retract втягиваться
reveal открывать, обнаруживать
reverse обратное направление (реверс)
revolve вращать(ся)
rigid жесткий; строгий
rise подъем;
to give rise to давать повод
road дорога
rock-like камнеподобный
rod стержень; прут
rope канат; трос
rotate вращать(ся)
route путь; маршрут
run off сток (воды)
run out истощаться
rural сельский

Ss

safe надежный; безопасный
safety надежность; безопасность
(the) same тот же самый
sanitary гигиенический
sanitation оздоровление; улучшение санитарных условий
satisfaction удовлетворение
satisfactory удовлетворительный
satisfy удовлетворять
saturate насыщать
saturated насыщенный
save экономить
scale масштаб;
large-scale широкомасштабный
search поиск; исследование
security безопасность; надежность
select выбирать
selection выбор

scientific научный
semi- полуsemi-rigid полужесткий
sense смысл, значение; In
any sense в любом смысле; In
the same sense в том же самом смысле
scope размах; объем (использования)
separate разделяться), отделяться)
serve служить, обслуживать
set схватываться (о бетоне)
settle out осаждаться, давать осадок
settle on опускаться на
sewage сточные воды
sewerage канализация
sewer канализационная труба
shape форма; очертание; to
take shape принять определенную форму
shadow тень
shelter укрытие, кров; защита; убежище
shelter давать приют, служить убежищем; защищать
shipbuilding судостроение
shopping centre торговый центр
shortage недостаток, нехватка
shore берег (морской)
shovel лопата; совок
significant важный, значительный
significance важность, значение
signify значить, означать
single a один, единственный
simultaneously одновременно
simulate воспроизводить; походить (на что-л.)
similar подобный, схожий
since с тех пор как; так как
site строительная площадка;
site planning планирование работ на стройплощадке
situated расположенный, находящийся в каких-л. условиях, обстоятельствах
size размер; величина
skill искусство, мастерство
skilled квалифицированный
skyscraper небоскреб
slab плита
slag шлак; окалина

slope наклон; клониться, иметь наклон
society общество
social общественный
soil почва; грунт
solve (раз)решать (проблему)
solar солнечный
solid твердый; сплошной; цельный
solution решение, разрешение (проблемы и т.п.)
somewhat indef. pron; ado что-то; кое-что; до некоторой степени
source источник
space пространство
speed скорость
speedy быстрый, скорый
spillage утечка (нефти)
spillway водослив
in spite of несмотря на
spring родник, ключ
stability устойчивость
stable устойчивый
standard типовой, нормальный;
standard of living жизненный уровень
standpoint точка зрения
state государство; состояние; заявлять
statement утверждение, заявление
supply подача (воздуха); снабжение
support опора; поддерживать, быть основанием
supreme. наиболее важный
survey топографическая съемка
survive уцелеть; продолжать существовать, выжить
survival выживание
suspended взвешенный (хим.)
surround окружать
surrounding(s) окружение

Tt
task задача
technique(s) метод(ы)
technology техника
tenant жилец, житель
tend иметь тенденцию
tensile растягивающий
tension растяжение
term срок; называть;

in terms of в смысле; с точки зрения
terminal порт приписки
test испытание
therefore поэтому
thermal тепловой
thorough тщательный
thoroughly тщательно
threaten угрожать
thus таким образом, так
tide отлив, прилив
tight плотный
timber дерево; лесоматериал
time-consuming отнимающий много времени
total общий, весь
tower башня
trade торговля
traffic дорожное движение, перевозки;
through traffic сквозное движение
training обучение, подготовка
transformation реконструкция, преобразование
transmission передача
transmit передавать
treat обрабатывать
treatment обработка; очистка
trench канава, траншея
trend направление, тенденция
true справедливый; истинный, настоящий
turbine турбина;
reversible turbine обратимая турбина (турбонасос);
reaction turbine реактивная турбина
turn (on, off) включать; выключать;
in turn в свою очередь
type вид, тип

Uu
ultimate предельный
undergo подвергаться, претерпевать
undersoil подпочвенный слой
uniform однородный; одинаковый
unifying объединяющий
unit элемент; установка; блок
unless если не, пока не

unlike в отличие от
urban городской
urgent срочный; крайне необходимый
urgently крайне важно
use применение, использование
utilize использовать

Vv

valley долина
value значение; ценность
valuable ценный
variable переменный
variation вариант; различив
variety разнообразие
various разнообразный, различный
vary различаться, изменяться
volume объем
valve вентиль
vapour пар
vast обширный
vehicle it машина; транспортное средство
(the) very самый; предельный
vessel судно
view цель;
with a view с целью;
from the point of view с точки зрения
violence интенсивность
visible зримый, очевидный
visually зрительно, наглядно
vital жизненно необходимый, важный
volume объем

Ww

want недостаток;
for want of из-за недостатка
running water водопровод
water-hole скважина (водоносная)
water sources водные источники
watertightness водонепроницаемость
waste отходы, отбросы; бесполезная трата
way путь; способ;
In such a way так; таким образом
well колодец;

drilled well артезианский колодец
as well as также, так же как я
as well также, кроме того
weigh   взвешивать;
weigh against сравнивать
weight вес
whatever какой бы ни
wheel колесо
whereby посредством чего
wherever где бы (то) ни было
(the) whole целое; все; as
a whole в целом
whole весь, целый
wholesome полезный
wide широкий
width ширина
will воля
winch лебедка
wise разумный
withstand выдерживать, сопротивляться
wood дерево; лесоматериал
workability обрабатываемость

Xx

x-rays рентгеновские лучи

Yy

yard площадка, завод для отливки железобетонных изделий

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APPENDICES

Appendix 1

Abbreviations Used in Science

A, amp.	ampere	Ампер (ед. силы тока)
ABC	plastics	пластмассы, состоящие из трех мономерных химикатов – акрилонитрила, бутадиена и стирола
abs.	absolute	абсолютный
	absolute value	абсолютное значение, абсолютная величина
a.c.	alternating current	переменный ток
amp-hr	ampere-hour	ампер-час
anhyd.	anhydrous	безводный
a.p.	atmospheric pressure	атмосферное давление
approx.	approximately	приблизительно
at.	atomic	атомный
arm.	atmosphere	атмосфера
aq.	aqueous	водный
b.p.	boiling point	точка кипения
B.T.U.	British Thermal Unit	Британская тепловая единица
c.c.	cubic centimeter	кубический сантиметр
c.g.	centre of gravity	центр тяжести
cgs	centimeter-gram-second (system)	система единиц сантиметр-грамм-секунда (СГС)
cfin	cubic feet per second	кубические футы в минуту
cfs	cubic feet per minute	кубические футы в секунду
c.m.	cubic meter	кубический метр
cm	centimeter	сантиметр
coeff.	coefficient	коэффициент, константа
conc.	concentration	концентрация
	concentrated	концентрированный
const.	constant	константа, постоянная величина
crit.	critical	критический
cryst.	crystalline	кристаллический
cu ft	cubic foot	кубический фут
cu in	cubic inch	кубический дюйм
cu m *or* m^3	cubic meter	кубический метр
d *or* dia	diameter	диаметр
d.	decomposed	расщепленный, распавшийся
db	decibel	децибел
d.c.	direct current	постоянный ток, прямой ток
decomp.	decomposition	разложение

deg	degree	градус
C	degree Centigrade	градусы по шкале Цельсия
F	degree Fahrenheit	градусы по шкале Фаренгейта
К	degree Kelvin	градусы по шкале Кельвина
R	degree Reaumur	градусы по шкале Реомюра
dil.	dilute	разбавлять
dist.	distilled	перегнанный
doz	dozen	дюжина
e.m.f.	electromotive force	электродвижущая сила
eq. *or* eqn.	equation	уравнение
expt.	experiment	эксперимент
fig.	figure (diagram)	иллюстрация, рисунок, чертеж
f.p.	freezing point	точка (t°) замерзания, затвердевания, кристаллизации
fpm	feet per minute	футы в минуту
fps	feet per second	футы в секунду
fps	foot-pound-second (system)	система фут-фунт-секунда
f.s.d.	full-scale deflection	отклонение на полную шкалу
ft	foot, feet	фут (около 30,5 см)
g	gram	грамм
gal	gallon	галлон (в Англии = 4,54 л, в США = 3,78 л)
G.L.C.	Gas Liquid Chromatography	газо-жидкостная хроматография
gpm	gallon per minute	галлон в минуту
H	henry *(electricity)*	генри *(ед. индуктивности)*
h. or hr	hour	час
hp	horsepower	лошадиная сила (ед. мощности)
Hyd.	hydrated	гидратированный
i.e.	insoluble circuit	интегрирующая цепь
i.e.	(id est) that is	то есть
insol.	insoluble	нерастворимый
ips	inches per second	дюймов в секунду
IR	infra-red	инфракрасный
i.r.	insoluble residue	нерастворимый остаток
j	Joule	джоуль
kc	kilocycle	килогерц
kg	kilogram	килограмм
kg-m	kilogram-meter	килограммометр
kg/m^3	kilograms per cubic meter	килограмм на кубический метр
km	kilometer	километр
kv	kilovolt	киловольт
kw	kilowatt	киловатт
kwhr	kilowatt-hour	киловатт-час

I	litre	литр
lb	pound	фунт
Ib-ft	pound-foot	фунто-фут
Ib-in	pound-inch	фунто-дюйм
liq.	liquid	жидкость; жидкий
m	meter	метр
M or mu	micron	микрон
μA	microampere	микроампер
ma	milliampere	миллиампер
max.	maximum	максимум
MeV	megaelectronvolt	мегаэлектронвольт
Mf	microfarad	микрофарада
mg	milligram	миллиграмм
min.	minimum	минимум
min	minute	минута
mm	millimeter	миллиметр
MMF	micromicrofarad	микромикрофарада
m.p.	melting point	точка (t°) плавления
mph	miles per hour	миль в час
mv	millivolt	милливольт
NR	natural rubber	натуральный каучук
oz	ounce	унция
p.d.	potential difference	разность потенциалов
ppm	parts per million	миллионные доли
ppt.	precipitate	осадок; осаждать
psi	pounds per square foot	t фунты на квадратный фут
psf	pounds per square inch	h давление в фунтах на квадрат
PVC	polyvinyl chloride	поливинилхлорид (ПВХ)
R.F.	radio frequency	высокая частота
r.a.m.	relative atomic mass	относительная атомная масса
r.d.	relative density	относительная плотность
r.h.	relative humidity	относительная влажность
r.m.m.	relative molecular mass	относительная молекулярная масса
r.m.s.	root mean square	среднее квадратичное
rpm	revolutions per minute	обороты в минуту
rps	revolutions per second	обороты в секунду
SBR	butadiene-styrene rubber	бутадиен, стирольный каучук
sec	second	секунда
sol.	soluble	растворимый

soln.	solution	раствор
sp.	specific	специфический, конкретный, точный, удельный
sq.	square	квадрат, площадь, прямоугольник
sq.ft.	square foot	квадратный фут
sq.in.	square inch	квадратный дюйм
s.t.p.	standard temperature and pressure	стандартные условия
temp.	temperature	температура
u.v.	ultra-violet	ультрафиолетовая область спектра, ультрафиолет; ультрафиолетовый
v.	volt	вольт
v. or V.	volume	том
va.	volt-ampere	вольт-ампер
vac.	vacuum	вакуум, разрежение; вакуумный
v.d.	vapour density	плотность пара
vol.	volume	объем
V.R.	velocity ratio	коэффициент скорости
W	watt	ватт
wt.	weight	вес
yd	yard	ярд
yr	year	год
z.	zero	ноль

Appendix 2

Latin Words and Abbreviations

a	acre	акр
A.D.	anno domini	нашей эры
a.m.	ante meridiem before noon	до полудня
apriori		заранее, независимо от нашего опыта
B.C.	before Christ	до нашей эры
cf.	confer = compare	сравни
c, ca	circa	приблизительно, около
e.g.	(exempli gratia) =for example	например
et al. [et 'ǽl]	et alii=and others	и другие
etc.	et cetera =and so on, and so forth	и так далее
et seq. or et seqq.	et sequentia =and the following	и далее
ib, ibid.	ibidem = in thesame place	там же
id	idem = the same	тот же
i.e.	id est = that is	то есть
in situ		на месте
N.B.	nota bene	примечание, отметка
op. cit.	opere citato (a work cited)	в цитируемом труде
p.a., per an.	per annum =yearly	ежегодно, в год
pct	per centum = percent	процент
p.m.	post meridiem =after noon	после полудня
pro et con	pro et contra =for and against	заи против
sc or scil	scilicet =namely	а именно
terra incongnita		незнакомая область
vice versa	the opposite of what has been said	наоборот
viz	videlicet - that is to say, in other words	то есть, а именно
vs.	versus	против
v.v.	vice versa =	наоборот

Appendix 3

Mathematical Symbols

+	plus	1) плюс 2) знак плюс 3) положительная величина добавочный, дополнительный
-	minus	1) минус, без 2) знак минус 3) отрицательная величина отрицательный
±	plus or minus	плюс-минус
X или □	multiplication sign	знак умножения
.	point	точка *(в десятичных дробях)*
/ (или:, или -)	division sign	знак деления
:	1) ratio sign	знак отношения
	2) is to	относится к
::	1) sign of proportion	знак пропорции
	2) equals, as	равняется, равно
÷	(is) divided by	поделенное на
=	1) sign of equality	знак равенства
	2) equals, (is) equal to	равняется, равно
≠	(is) not equal to	не равно
≈	approximately equal	приблизительно равно
≡	is equivalent to/ is identical with	тождественно-равный
>	greater than	больше (чем)
<	less than	меньше (чем)
≥	equal or greater than	больше (чем) или равно
≤	equal or less than	меньше (чем) или равно
∞	1) infinity 2) infinite	бесконечность, бесконечно удаленная точка бесконечный
∝	varies as/is proportional to	пропорционально чему-либо
3:9::4:12	three is to nine as four is to twelve	3 к 9 относится, как 4 к 12
ε	is an element of (a set)	эпсилон; является элементом множества
□	is not an element of (a set)	не является элементом множества
ø or {}	is an empty set	пустое множество
∩	intersection	знак пересечения (множества)
U	union	знак объединения (множества)
X^4	[eks] to the power four/to	*x* в 4-й степени

	the fourth power	
π	*Pi*	*пи* (число *gu)*
r	[a: (r)] = radius of circle	*р* (радиус)
πr^2	*pi r* squared (formula for area of circle	*пи р* квадрат
n!	*n* factorial	*н* факториал
a^*	a star	*а* со звездочкой
a'	*a* prime	*а* штрих
a''	*a* second prime *или* *a* double prime	*а* два штриха
a'''	*a* third prime *или* *a* triple prime	*а* три штриха
b_1	*b* sub one *или b* first	*б* один *(б* с индексом один)
b_2	*b* sub two *или b* second	*б* два *(б с* индексом два)
c_m	c sub *fn или с m-th*	*см (с* с индексом *м)*
a'_1	*a* first prime	*а* один штрих
a''_2	*a* second, second prime	*а* два штрих
a_m	a sub от *или а, т*-th	*а* эмтое
b'_c	*b* prime, sub *c или* *b* sub *c,* prime	*б* цетое штрих
log	logarithm	логарифм
sin	sine	синус
cos	cosine	косинус
tan,tg	tangent	тангенс
ctn,cot	cotangent	котангенс
sec	secant	секанс
csc	cosecant	косеканс
Σ	summation	знак суммирования
dx	differential of *x*	дифференциал *x*
dy/dx	derivative of *y* with respect to x	произюдная *у* по *х*
d^2y/dx^2	second derivative of *y* with respect to *x*	вторая производная *у по х*
d^nn/dx^n	*n-th* derivative of *y* with respect to x	*п-я* произюдная *у* по *х*
∫	integral of	интеграл от
∫ f(x) dx	integral of a function of *x* over *dx*	интеграл от функции *f(x)* по *dx*
$^m\int_n$	integral between limits я and *m*	интеграл в пределах от n до *m*
| x |	absolute value of *x*	абсолютное значение *x*
%	per cent	процент
√	square root (out) of	квадратный корень из
$^3\sqrt{}$	cube root (out) of	кубический корень из

$^{n}\sqrt{}$	n-th root (out) of	корень n-й степени из
[]	brackets pl square brackets pl.	квадратные скобки
()	parentheses *pl,* round brackets *pl*	круглые скобки
{}	braces *pl*	фигурные скобки
||	parallel to	параллельно
°	degree	градус
’	1) minute 2) foot, feet	минута фут, футы
’’	1) second 2) inch	секунда дюйм
n□	angle	угол
n	right angle	прямой угол
	perpendicular	перпендикуляр, перпендикулярный

Appendix 4

Numerical Expressions

	US	GB and other European countries
1 000 000 000 = 10^9	a/one billion	a/one thousand million(s)
1 000 000 000 000 = 10^{12}	a/one trillion	a/one billion
1 000 000 000 000 000 = 10^{15}	a/one quadrillion	a/one thousand billion(s)
1 000 000 000 000 000 000 = 10^{18}	a/one quadrillion	a/one trillion

VULGAR FRACTIONS	***DECIMAL FRACTIONS***
1/8 an/one eighth	0,125 (nought) point one two five
1/4 an/one quarter	0,25 (nought) point two five
1/3 an/one third	0,33 (nought) point three three
1/2 an/one half	0,5 (nought) point five
3/4 three quarters	0,75 (nought) point seven five

Notes:

1. In the spoken forms of vulgar fractions, the versions *and a half/ quarter/third* are preferred to *and one half/quarter/third* whether the measurement is approximate or precise. With more obviously precise fractions like 1/8, 1/16, *and one eighth/sixteenth* is normal. Complex fractions like 3/462, 20/83 are spoken as *three over four-six-two; twenty over eighty-three,* especially in mathematical expressions, e.g. *twenty-two over seven* for 22/7.

2. When speaking ordinary numbers we can use *zero, nought* or *oh* for the number 0; *zero* is the most common US usage and the most technical or precise form, *oh* is the least technical or precise. In using decimals, to say *nought point five* for 0.5 is a more precise usage than *point five.*

3. In most continental European countries a comma is used in place of the GJ3/US decimal point Thus 6.014 is written 6,014 in France. A space is used to separate off the thousands in numbers larger than 9999, e.g. 10 000 or 875 380. GB/US usage can also have a comma in this place, e.g. 7,500,000. This comma is replaced by a full point in continental European countries, e.g. 7.500.000. Thus 23,500.75 (GB/US) will be written 23.500,75 in France and Russia.

Appendix 5

Reading Mathematical Symbols

1/2	a (one) half
1/6	a (one) sixth
¾	three fourths
0	nought = zero
0.5	(nought) point five
0.004	(nought) point two naughts four = two oes four=point zero zero four
0.28	nought point twenty eight
2.50	two point five (nought)
53.46	fifty-three point four six = five three point four six
10,000	ten thousand
a^0	*a* to the power of zero
a^2	a squared
a^3	a cubed
10^{-5}	the minus fifth power of ten = ten to the minus fifth power
10^2	ten to the second (power) = ten squared
10^{-1}	ten to the minus first (power)
10^3	ten to the third (power) = ten cubed
a=b	*a* equals *b* = *a* is equal to *b*
a#b	*a* is not equal to *b*
a>b	*a* is greater than *b*
a<b	*a* is less than *b*
a>>b	*a* is much greater than *b*
a<<b	*a* is much less than *b*
a ≈ b	*a* is approximately equal to *b*
a_b	*a* sub *b* — *a* subscript *b*
a + b	a plus *b*
a – b	a minus *b*
a x b	*a* times *b* = *a* multiplied by *b*
a ÷ b	*a* divided by *b*
a / b	*a* over *b*
a b / c d	*a* times *b* over *c* times *d*
[a]	*a* in brackets
(a)	*a* in parentheses
()	round brackets
[ ]	square brackets

%	per cent
5 2 %	fifty-two per cent
d x	differential of *x*
$\int$	the integral of
$\iint$	double integral
$(x^2/y^3)^m$	*x* squared divided by *y* cubed in parentheses to the m-th (power)
$\sqrt{a}$	square root of *a*
$\sqrt[3]{a}$	third (cube) root of *a*
ln x	natural logarithm of *x*
Log x	common) logarithm of
$Log_{10}2 = 0.30103$	logarithm of two to the base ten is naught point three naught one naught three

Appendix 6

Measurements (Inantimate)

in	inch (es)	**sq**	inch (es)	**cu in**	cubic inch (es)
ft	foot/feet	**sq ft**	square foot/feet	**cu ft**	cubic foot/feet
yd	yard/ (s)	**sq yd**	square yard/ (s)	**cu yd**	cubic yard/ (s)
-	mile (s)	**-**	square mile (s)	**-**	cubic mile (s)
mm	millimeter (s)	$\mathbf{mm^2}$	square millimeter (s)	$\mathbf{mm^3}$	cubic millimeter (s)
cm	centimeter (s)	$\mathbf{cm^2}$	square centimeter (s)	$\mathbf{cm^{3/}cc}$	cubic centimeter (s)
m	metre (s)	$\mathbf{m^2}$	square metre (s)	$\mathbf{m^3}$	cubic metre (s)
km	kilometre (s)	$\mathbf{km^2}$	square kilometre (s)	**-**	cubic kilometre (s)

Appendix 7

Weights and Measures

length	***Metric***	***GBandUS***
10 millimetres (mm) 100 centimetres	=1 centimetre (cm) =1 metre (m)	0.3937 inches (in) 39.37 inches *or* 1.094 yards (yd)
1000 metres	=1 kilometre (km)	0.62137 miles *or* about 5/8 mile
surface		
100 square metres (m^2) 100 acres 100 hectares	=1 are (a) =1 hectare (ha) =1 square kilometre (km^2)	0.0247 acres 2.471 acres 0.386 square miles
weight		
10 milligrams (mg) 100 centigrams 1000 grams 1000 kilograms	=1 centigram (eg) =1 gram (g) =1 kilogram (kg) =1 tonne	0.1543 grains 15.4323 grains 2.2046 pounds 19.684 cwt
capacity		
1000 millilitres (ml) 10 litres	=1 litre (1) =1 decalitre (dl)	1.75 pints *or* 2.101 US pints 2.1997 gallons *or* 2.63 US gallons

Appendix 8

Quantities, Units and Symbols

QUANTITY	SYMBOL	SI UNIT	SYMBOL	DERIVATION
acceleration	a	m s-^{2}	-	velocity/time
acceleration due to gravity	g	m s-^{2}	-	velocity/time
amount of substance	n	mole	mol	mole fraction (n) used
Amplification factor	μ	a ratio	-	-
angle	$\theta_p\varphi_p a_1$	-	-	-
of incidence	i	degree or radian	°	-
of refraction	r	degree or radian	°	-
Bragg	θ	number	-	-
critical	c	degree or radian	°	-
anode slope resistance	R_A	ohm	Ω	$\Delta V_a/\Delta V_a$
area	A	metres square	M^2	l x b
atomic number	Z	a number	-	number of protons
Avogadro constant	L, N_a	number	-	-
breadth	b	metre	m	fundamental unit
capacitance	C	farad	f	charge/p.d
charge, electric	Q	coulomb	c	current x time
on electron	e	coulomb	c	$1{\cdot}6x10^{-19}c$
conductance	G	ohm^{-1}	**Ω^{-1}**	reciprocal of resistance
current, electric	I	ampere	a	fundamental unit
decay constant	λ	a ratio	-	
density	ρ	kg m^{-3}	-	m/V
distance along path	s	metre	m	fundamental unit
efficiency	η	a ratio	-	work output/work input
Electrochemical equivalent	**Z**	g C^{-1}	-	mass/charge
Electromotive force	E	volt	V	energy/charge
electron	e			
energy	E	joule	J	N m
kinetic	E_κ	joule	J	N m. E_k=Smv^2
potential	E_p	joule	J	N m.E_p=mgh
Faraday constant	F	coulomb mol^{-1}	C mol^{-1}	96 500 C mol^{-1}

field strength, electric	E	V m^{-1}	-	potential gradient: p.d./dist.
magnetic	H	ampereturns	-	current x no. of turns
flux, magnetic	Φ	weber	Wb	e.m.f./rate of change of flux
flux density	B	tesla	T	flux/area
focal length	f	metre	M	-
force	F	newton	N	kg m s^{-2}
free energy	ΔG	joule	J	-
frequency	f	hertz	H_z	oscillations/time
gas constant	r	joule	J	energy
half-life, radioactivity	$t_{1/2}$	second	s	fundamental unit
heat capacity	C	J K^{-1}	-	quantity of heat/ temp, rise
heat of reaction	ΔH	joule	J	heat energy
heat capacity, specific	c	J K^{-1} kg^{-1}	-	heat capacity/mass
heat, quantity of	q	joule	J	energy
height	h	metre	m	fundamental unit
image distance	v	metre	m	fundamental unit
inductance, mutual	M	henry	H	induced e.m.f./rate of change of current
self	L	henry	H	-
intensity of radiation	I	a number	-	-
latent heat	L	joule	J	quantity of heat
–, specific	l	J kg^{-1}	-	quantity of heat
–, molar	L_m	joule mol^{-1}	J	quantity of heat
length	l	metre	m	fundamental unit
magnetizing force	H	ampereturns	-	-
magnetic moment	m	Wbm	-	torque in unit magnetic field
magnification, linear	m	a ratio	-	-
mass	m	kilogramme	kg	fundamental unit
– number	A	a number	-	number of neutrons +protons
molar volume	V_m	(dm^3)	-	volume of 1 mole
molar solution	M	a ratio	-	moles/dm^3
moment of force	-	N m	-	force x perp. distance
neutron number	N	a number	-	number of neutrons
number	n	-	-	-
of molecules	N	-	-	-
of turns on coil	n	a number	-	-
order of spectrum	p	a number	-	-
object distance	u	metre	m	fundamental unit
peak current	I_0	ampere	A	see current
peak e.m.f.	E_0	volt	V	see e.m.f.
period	T	second	s	fundamental unit

permeability	μ	H m^1	-	henry/metre
of vacuum	μ_0	H m^1	-	-
relative	μ_r	a ratio	-	$\mu = \mu / \mu_0$
permittivity	ε	F^{m-1}	-	farad/metre
of vacuum	ε_0	F^{m-1}	-	farad/metre
–, relative	ε_r	a ratio	-	$\varepsilon_{r=} \varepsilon / \varepsilon_0$
Potential, electric	V	volt	V	energy/charge
Potential difference	V	volt	V	energy/charge
power	P	watt	W	J_s^{-1}
pressure	P	pascal	P_a	N_m^{-2}: force/area
Radius	r	metre	m	fundamental unit
Reactance	X	ohm	**Ω**	E_0/I_0
Refractive index	n	a ratio	-	-
Resistance	R	ohm	**Ω**	p.d./current
Resistivity, electrical	p	ohm-metre	-	resistance x length
Relative density	d	a ratio	-	P_{sub}/P_{water}
r.m.s. current	I_{rms}	ampere	A	see current
r.m.s.voltage	V_{rms}	volt	V	see e.m.f.
slit separation	S	metre	m	fundamental unit
tension	T	newton	N	see force
temperature, Celsius	θ	degree C	°C	from kelvin
Temp.,interval	θ	degree	°or K	-
Temp., absolute	T	kelvin	K	fundamental unit
thickess	d	metre	m	fundamental unit
Time	t	second	s	fundamental unit
Torque	T	N m	-	see moment
Tirns ratio	T	a ratio	-	nn_{sec}/n_{prim}
(unit of electricity)	-	k Wh	-	kilowatt x hour
Velocity	u, v	m s^{-1}	-	distance/time
-, angular	ω	second $^{-1}$	s^{-1}	angle/time
- of e.m. waves	c	m s^{-1}	-	-
- of sound	v	m s^{-1}	-	-
Volume	V	metre cubed	m^3	I x b x h
Wavelength	λ	metre	m	fundamental unit
Work	w	joule	J	force x distance (N*m)
weight	W	newton	N	kg m s^{-2} or mg

Appendix 9

Letters Used as Symbols for Quantities

Letter	Quality
A	area, mass number
a	acceleration
B	magnetic flux density
b	breadth
C	capacitance, heat capacity
c	specific heat capacity, velocity of e.m. waves in vacuum, critical angle
d	relative density, thickness, distance apart
E	energy, electric field strength, electromotive force. E_k kinetic energy, E_p potential energy, E_0 peak e.m.f.
e	charge on electron (or proton), an electron
F	Faraday constant, force
f	frequency, focal length
G	free energy conductance
g	acceleration due to gravity
H	magnetic field strength, magnetizing force, heat of reaction
h	height
I	intensity of radiation, electric current
I_0	peak current
i	angle of incidence
k	a constant
L	self-inductance, latent heat, Avogadro constant
L_m	molar latent heat
l	length, specific latent heat
M	mutual inductance, molar solution
m	mass, electromagnetic moment, magnification
N	number of molecules, neutron number
N_a	Avogadro constant
N	a number, refractive index, number of moles, a neutron
P	power
p	pressure, order of a spectrum, a proton
Q	electric charge
q	quantity of heat
R	resistance
R_a	anode slope resistance, molar gas constant
r	angle of refraction, gas constant (nR), radius
s	distance along a path, slitseparation

T	period, thermodynamic (absolute) temperature, torque, tension, turns ratio
t	time
t_s	half-life
u	initial velocity, velocity of molecules, object distance
V	volume, electrical potential, potential difference
V_m	molar volume
V	velocity, image distance, velocity of sound
W	weight
w	work
X	reactance
Z	atomic number
z	charge on ion, electrochemical equivalent
a	an angle
Δ	an increment (finite)
ε	permittivity
η	efficiency
θ	temperature (Celsius), temperature difference, an angle, Bragg angle
λ	wavelength, decay constant

Appendix 10

Important Values, Constants and Standards

1. s.t.p. = standard temperature and pressure, expressed as 1.00 atm or 760 mmHg or 101 kPa (= kN m^2) (Pa = pascal) and 0°C or 273.15 K
2. Temperature of triple point of water, 273.16 K
3. Gas constant, 8.314 JK^{-1} mol^{-1}
4. Standard volume of a mole of gas at s.t.p., 22.4 dm^3
5. The Faraday constant, *F,* 9.65 x 10^4C mol^{-1}
6. The Avogadro constant, *L,* 6.02 x 10^{23} mol^{-1}
7. The Planck constant, *h,* 6.63 x 10^{-34}Js
8. Speed of light, *c,* 3.00 x 10^8 ms^{-1}
9. Mass of proton, $_1^1$ H 1.67 x 10^{-27} kg
   mass of neutron, $_0^1$ 1.67 x 10^{-27} kg
   mass of electron, e, 9.11 x 10^{-31} kg
   electronic charge, *e,* -1.60 x 10^{-19} C
10. 1 cal = 4.18 J
11. leV = 1.60x 10^{-19}J
12. Specific heat capacity of water, 4.18 J $^{g-1}$ K^{-1}
13. Ionic product of water, K_w = 1.008 x 10^{-14} mol^2 dm^{-6}, at 289 K (25°C)

Appendix 11

Greek Alphabeth

Capital, small		English equivalent	Russian equivalent
Αα	alpha	a	Альфа
Ββ	beta	b	Бета
Γγ	gamma	g	Гамма
Δδ	delta	d	Дельта
Εε	epsilon	e(short)	Эпсилон
Ζζ	(d)zeta	z	Дзета
Ηη	eta	e(long)	Эта
Θθ	theta	th	Тета
Ιι	iota	i	Йота
Κκ	kappa	k	Каппа
Λλ	lambda	l	Лямбда
Μμ	mu	m	Мю
Νν	nu	n	Ню
Ξξ	xi	x	Кси
Οο	omicron	o(short)	Омикрон
Ππ	pi	p	Пи
Ρρ	rho	r	Ро
Σσ	sigma	s	Сигма
Ττ	tau	t	Тау
Υυ	upsilon	u	Ипсилон
Φφ	phi	ph	Фи
Χχ	chi	ch	Хи
Ψψ	psi	ps	Пси
Ωω	omega	o(long)	Омега

Appendix 12

List of Chemical Elements

Ac	actinium	актиний
Ag	argentum= silver	серебро
Al	aluminium (US = um)	алюминий
Am	americium	америций
At	argon	аргон
As	arsenic	мышьяк
At	astatine	астат
Au	aurum = gold	золото
B	boron	бор
Ba	barium	барий
Be	beryllium	бериллий
Bi	bismuth	висмут
Bk	berkelium	беркелий
Br	bromine	бром
C	carbon	углерод
Ca	calcium	кальций
Cd	cadmium	кадмий
Ce	cerium	церий
Cf	californium	калифорний
Cl	chlorine	хлор
Cm	curium	кюрий
Co	cobalt	кобальт
Cr	chromium	хром
Cs	caesium	цезий
Cu	copper	медь
Py	dysprosium	диспрозий
Er	erbium	эрбий
Es	einsteinium	эйнштейний
Eu	europium	европий
F	fluorine	фтор
Ee	ferrum=iron	железо
Em	fermium	(ермий
Er	francium	франций
Ga	gallium	галлий
Gd	gadolinium	гадолиний
Ge	germanium	германий

H	hydrogen	водород
He	helium	гелий
Hf	hafnium	гафний
Hg	hydrargyrum = mercury	ртуть
Ho	holmium	гольмий
I	iodine	йод
In	indium	индий
Ir	iridium	иридий
К	kalium=potassium	калий
Kr	krypton	криптон
Ku	kurchatovium	курчатовий
La	lanthanum	лантан
Li	lithium	литий
Lr	lawrencium	лоуренсий
Lu	lutetium	лютеций
Md	mendelevium	менделевий
Mg	magnesium	магний
Mn	manganese	марганец
Mo	molybdenum	молибден
N	nitrogen	азот
Na	natrium = sodium	натрий
Nb	niobium = columbium	ниобий
Nd	neodymium	неодим
Ne	neon	неон
Ni	nickel	никель
No	nobelium	нобелий
Np	neptunium	нептуний
Ns	nilsborium	нильсборий
O	oxygen	кислород
Os	osmium	осмий
P	phosphorus	фосфор
Pa	protactinium	протактиний
Pb	plumbum=lead	свинец
Pd	palladium	палладий
Pm	promethium	прометий
Po	polonium	полоний
Pr	praseodymium	празеодим
Pt	platinum	платина
Pu	plutonium	плутоний
Ra	radium	радий
Rb	rubidium	рубидий

Re	rhenium	рений
Rh	rhodium	родий
Rn	radon	радон
Ru	ruthenium	рутений
S	sulpher/sulfur (US)	сера
Sb	antimony = stibium	сурьма
Sc	scandium	скандий
Se	selenium	селен
Si	silicon	кремний
Sm	samarium	самарий
Sn	stannum = tin	олово
Sr	strontium	стронций
Ta	tantalum	тантал
Tb	terbium	тербий
Tc	technetium	технеций
Te	tellurium	теллур
Th	thorium	торий
Ti	titanium	титан
Tl	thallium	таллий
Tm	thulium	туллий
U	uranium	уран
V	vanadium	ванадий
w	wolfram = tungsten	вольфрам
Xe	xenon	ксенон
Y	yttrium	иттрий
Yb	ytterbium	иттербий
Zn	zinc	цинк
Zr	zirconium	цирконий

Appendix 13

Thermal Expansion, Temperature

Temperature (n)	A property of an object that indicates in which direction heat energy will flow if the object is placed in thermal contact with another object. Heat energy flows from places of higher temperature to places of lower temperature.
Zeroth law of thermodynarnics	If two bodies Xand Fare each separately in thermal equilibrium with another body Z, then they are in thermal equilibrium with one another. In the most common case the body Zis a thermometer.
Temperature scale	A sequence of values which represent temperature. Such a sequence is usually obtained by choosing two fixed points (identified by specified properties of stated substances) between which there are subdivisions made on a chosen basis. The Celsius scale has 99 divisions between the melting point of pure water and the boiling point of pure water.
Celsius scale	A temperature scale for which the ice point is at 0° and the steam point is at 100°. One Celsius degree is denned as 1/100 of the temperature interval between the ice point and the steam point.
Centigrade scale	The name formerly used for the Celsius scale. The name is not now used in International System of Units (SI) but is often used by meteorologists.
Fahrenheit scale	A temperature scale for which the ice point is at 32° *F* and the steam point at 212° *F.* Originally the zero was obtained in a freezing mixture and another point was fixed at 96° for blood temperature.
Reaumur scale	A temperature scale in which the ice point is at 0° and the steam point at 80°.
ideal gas scale	A scale in which changes of temperature are measured either by changes of pressure, or changes of volume, for gases operating at pressure low enough for the gases to behave as ideal gases. The Celsius temperature *в* is defined on the scale by: $\theta = (PV)_0 - (PV)_0 /(PV)_{100} - (PV)_0 \cdot 100$
Thermodynamic scale	A temperature scale which does not depend upon the working properties of any substance. The ideal gas scale is identical with this scale.
Absolute scale	A thermodynamic temperature scale in which the lower fixed point is absolute zero of temperature and the interval is identic with that on the Celsius scale. The temperature on the absolute scale is obtained by adding to *u,* the Celsius temperature, // *a* where *a* is the coefficient of expansion of a gas at constant pressure. This gives a scale on which the ice point is 273.15°; *i.e.* °A = °C + 273.15. The absolute scale was often called the Kelvin scale and temperatures measured in °A or °K. In SI units temperature is measured in kelvins (K) by defining the triple point of water as 273.16 K. The ice point is then 273.15 K. The kelvin has the same size as the degree absolute.

Fixed points	Those points on a temperature scale which are fixed and which can be referred to a given property of a substance. The two main fixed points are the ice point and the steam point.
Ice point	That fixed point on a temperature scale at which pure solid water (ice) and pure liquid water are in equilibrium at 101 325 N m^2 (760 mm Hg). It maybe more simply described as the melting point of pure ice at standardpressure (101 325 N nr^2 or 760 mm Hg).
Steam point	That fixed point on a temperature scale at which pure water boils at standard pressure (101 325 N nr^2; 760 mm Hg). This is 100° on the Celsius scale.
Zinc point	A fixed point on an international temperature scale, fixed at the temperature at which zinc changes from liquid to solid (the freezing point of zinc) at standard pressure (101 325 N nr^2). This corresponds to 419.58 °C.
International temperature scale	A practical scale which is as near as possible to the thermodynamic scale but easily referable to a series of fixed points. Triple point of hydrogen -259.34 °C Boiling point of neon -246.048 °C Triple point of oxygen -218.789 °C Boiling point of oxygen -182.962 °C Triple point of water 0.0 ГC Boiling point of water 100.0 *°C* Freezing point of zinc oil 419.58 °C Freezing point of silver 961.93 °C Freezing point of gold 1064.43 °C Below 630°C platinum resistance thermometer; up to 1064°C a thermocouple or special platinum resistance thermometer; above 1064 °C a radiation pyrometer.

Appendix 14

List of International Words

abberation
abiotic
abscissa
abstract
accelerate
accumulate
acetate
acre
acyclic
adequate
aeration
aerobe
agglomerate
aggregate
allomorph
amalgam
ammonia
amorphism
amphibian
anabolism
anaerobe
androgenesis
anode
anomalous
antioxidant
apical
apparatus
Archimedus
Aristotel
artesian
asphalt
associate
atmosphere
attribute
autoclave
automorphous
autotrophic
axiom
azimuth
bacterium
barrier
biatomic
bifurcation
binary
binominal
biochemistry
biogenetic
bio mass
biophysics
biosphere
bomb
boolean
briquette
buffer
bushel
calcic
calculate
caliber
calibrate
calorie
camphor
canal
capillary
capsule
carat
carbide
carbon
carburettor
carotene
catalysis
category
cathode
cellulose
cement
centigrade
ceramic
centrifugal
chemical
chemist
chicory
chlorophyll
chromosome
chord
chrome
circulation
coagulation
coefficient
collapse
colloid
compact
component
compost
concentric
conglomeration
conjunction
coordinate
copernican
corpuscle
corrode
cosecant
cosine
cotangent
covalence
crater
criterion
crystallize
cube
cultivate
cybernetics
cyclic
cyclone
cylinder
cytology
date

deactivation
degenerate v
deposit
derivative
design
destruction
deviation
diagonal
diagram
diameter
differentiate
diffuse
discrete
divergence
drainage
effect
ejection
electrify
electrode
electron
ellipse
embryo
emission
empirical
endocrine
epicentre
epithelium
equator
equilibrium
equivalent
erosion
ethylen
Euclidian
eulerian
evolution
explicit
exponent
extreme
fauna
fibre
figure
fluctuation
focus
formula
fundamental
fungicide
galaxy
Galilean
Gaussian
genotype
glucose
gradient
granulation
graph
gravel
gynogenesis
hectar
heterogeneity
homogeneity
horizon
hormone
humus
hybrid
hydroponic
hyperbola
hypotenuse
hypothesis
idea
identity
ignore
immunology
impulse
incidence
index
inertia
injection
innervation
insecticide
instinct
integral
integration
intense
interference
interpret
intrusion
invariance
ion
irrational
irregular
isobar
isolate
juvenile
latent
linear
locomotion
logarithm
machine
magma
maize
marginal
median
meridian
membrane
metabolism
metamorphosis
meter
element
micrograph
microorganism
migrate
minus
minute
modify
module
molecule
mollusc
momentum
muscle
Naperian
negative
nerve
neuron
neutral
Newtonian
null
operate

ordinary
ordinate
oscillation
osmotic
oval
packet
parabola
parallelepiped
parallelogram
parameter
percent
period
peripheral
perpendicular
perspective
perturbation
pesticide
phase
phenomenon
phial
phosphate
photograph
photosynthesis
phylum
physiology
phytogrome
plus
polycilinder
polynomial
positive
postulate
potential
press
primary
primitive
principle
prism
problem
procedure
process

product
profile
project
proportion
protein
protozoan
pyramid
Pythagorean
quadrant
quantum
quartz
quasi-
radar
radial
radiant
radiate
radius
rational
reason
receptor
reflex
regime
regulate
relief
remark
reptile
resistance
resource
resume
rhesis
rhythm
ribonuclease
ribosome
rotation
satellite
scheme
secretion
segment
separate
service

special
specific
spectrum
sphere
spiral
spontaneous
sporophyl
stationary
sterile
structure
substance
substratum
sulphate
summation
superphosphate
symmetry
synthesis
tangent
technique
temperature
tendency
termite
texture
thermal
topography
trachea
transduction
transpiration
unbalanced
uniform
unique
utilize
valence
variable
vegetative
vermiculate
vernier
vibration
virus
volcano

Appendix 15

Irregular verbs

VERB	PAST SIMPLE	PAST PARTICIPLE	ПЕРЕВОД
be [bi:]	was [w□z], were [wз:]	been [bi:n]	Быть
beat [bi:t]	beat [bi:t]	beaten ['bi:tn]	Бить
become [bi:k□m]	became [bi:keim]	become[bi:k□m]	Становиться
begin [bi'gin]	began [bi'gæn]	begun [bi'g□n]	Начинать
bleed [bli:d]	bled [bled]	bled [bled]	Кровоточить
blow [blou]	blew [blu:]	blown [bloun]	Дуть
break [breik]	broke [brouk]	broken ['brouk(e)n]	Ломать
bring [briŋ]	brought [br□:t]	brought [br□:t]	Приносить
build [bild]	built [bilt]	built [bilt]	Строить
burn [bз:n]	burnt [bз:nt]	burnt [bз:nt]	Гореть
burst [bз:st]	burst [bз:st]	burst [bз:st]	Разразиться
buy [bai]	bought [b□:t]	bought [b□:t]	Покупать
catch [kæt□]	caught [k□:t]	caught [k□:t]	Ловить, хватать, успеть
choose [t□u:z]	chose [□əuz]	chosen [t□əuz(ə)n]	Выбирать
come [k□m]	came [keim]	come [k□m]	Приходить
cost [c□st]	cost [c□st]	cost [c□st]	Стоить
creep [kri:p]	crept [krept]	crept [krept]	Ползать
cut [k□t]	cut [k□t]	cut [k□t]	Резать
do [du:]	did [did]	done [d□n]	Делать
draw [dr□:]	drew [dru:]	drawn [dr□:n]	Рисовать, тащить
dream [dri:m]	dreamt [dremt]	dreamt [dremt]	Мечтать, дремать
drink [driŋk]	drank [dræŋk]	drunk [dr□ŋk]	Пить
drive [draiv]	drove [drouv]	driven ['drivn]	Водить
eat [i:t]	ate [et]	eaten ['i:tn]	Есть
fall [f□:l]	fell [fel]	fallen ['f□:lən]	Падать
feed [fi:d]	fed [fed]	fed [fed]	Кормить
feel [fi:l]	felt [felt]	felt [felt]	Чувствовать

fight [fait]	fought [f□:t]	fought [f□:t]	Бороться
find [faind]	found [faund]	found [faund]	Находить
fit [fit]	fit [fit]	fit [fit]	Подходить по размеру
fly [flai]	flew [flu:]	flown [floun]	Летать
forget [fə'get]	forgot [fə'g□t]	forgotten [fə'g□t(ə)n]	Забывать
forgive [fo'giv]	forgave [fo'geiv]	forgiven [fo'givn]	Прощать
freeze [fri:z]	froze [frouz]	frozen ['frouzn]	Замерзать
get[get]	got [g□t]	got [g□t]	Получать
give [giv]	gave [geiv]	given [givn]	Давать
go [gou]	went [went]	gone [g□n]	Идти
grow [grou]	grew [gru:]	grown [groun]	Расти
hang [hæŋ]	hung [h□ŋ]	hung [h□ŋ]	Вешать
have [hæv]	had [hæd]	had [hæd]	Иметь
hear [hiə]	heard [hɜ:d]	heard [hɜ:d]	Слышать
hide [haid]	hid [hid]	hidden ['hidn]	Прятать
hit [hit]	hit [hit]	hit [hit]	Попадать в цель
hold [hould]	held [held]	held [held]	Держать
hurt [hɜ:t]	hurt [hɜ:t]	hurt [hɜ:t]	Ушибить
keep [ki:p]	kept [kept]	kept [kept]	Содержать
kneel [ni:l]	knelt [nelt]	knelt [nelt]	Стоять на коленях
know [nou]	knew [nju:]	known [noun]	Знать
lay [lei]	laid [leid]	laid [leid]	Класть
lead [li:d]	led [led]	led [led]	Вести
lean [li:n]	leant [lent]	leant [lent]	Наклоняться
learn [lɜ:n]	learnt [lɜ:nt]	learnt [lɜ:nt]	Учить
leave [li:v]	left [left]	left [left]	Оставлять
lend [lend]	lent [lent]	lent [lent]	Занимать
let [let]	let [let]	let [let]	Позволять
lie [lai]	lay [lei]	lain [lein]	Лежать
light [lait]	lit [lit]	lit [lit]	Освещать
lose [lu:z]	lost [l□st]	lost [l□st]	Терять

make [meik]	made [meid]	made [meid]	Производить
mean [mi:n]	meant [ment]	meant [ment]	Значить
meet [mi:t]	met [met]	met [met]	Встречать
mistake [mis'teik]	mistook [mis'tuk]	mistaken [mis'teik(e)n]	Ошибаться
pay [pei]	paid [peid]	paid [peid]	Платить
prove [pru:v]	proved [pru:vd]	proven [pru:vn]	Доказывать
put [put]	put [put]	put [put]	Положить
quit [kwit]	quit [kwit]	quit [kwit]	Выходить
read [ri:d]	read [red]	read [red]	Читать
ride [raid]	rode [roud]	ridden ['ridn]	Ездить верхом
ring [riŋ]	rang [ræŋ]	rung [r□ŋ]	Звенеть
rise [raiz]	rose [rouz]	risen ['rizn]	Подниматься
run [r□ŋ]	ran [ræŋ]	run [r□ŋ]	Бежать
say [sei]	said [sed]	said [sed]	Говорить
see [si:]	saw [s□:]	seen [si:n]	Видеть
seek [si:k]	sought [s□:t]	sought [s□:t]	Искать
sell [sel]	sold [sould]	sold [sould]	Продавать
send [send]	sent [sent]	sent [sent]	Посылать
set [set]	set [set]	set [set]	Ставить
sew [sou]	sewed [soud]	sewn [soun]	Шить
shake [□eik]	shook [□uk]	shaken ['□eik(ə)n]	Встряхивать
show [□əu]	showed [□əud]	shown [□əun]	Показывать
shrink [□riŋk]	shrank [□ræŋk]	shrunk [□r□ŋk]	Уменьшать
shut [□□t]	shut [□□t]	shut [□□t]	Закрывать
sing [siŋ]	sang [sæŋ]	sung [s□ŋ]	Петь
sink [siŋk]	sank [sæŋk], sunk [s□ŋk]	sunk [s□ŋk]	Тонуть
sit [sit]	sat [sæt]	sat [sæt]	Сидеть
sleep [sli:p]	slept [slept]	slept [slept]	Спать
slide [slaid]	slid [slid]	slid [slid]	Скользить
sow [sou]	sowed [soud]	sown [soun]	Сеять
speak [spi:k]	spoke [spouk]	spoken ['spouk(e)n]	Говорить

spell [spel]	spelt [spelt]	spelt [spelt]	Произносить по буквам
spend [spend]	spent [spent]	spent [spent]	Тратить
spill [spil]	spilt [spilt]	spilt [spilt]	Проливать
spoil [sp□il]	spoilt [sp□ilt]	spoilt [sp□ilt]	Портить
spread [spred]	spread [spred]	spread [spred]	Расстилать
spring [spriŋ]	sprang [spræŋ]	sprung [spr□ŋ]	Прыгать
stand [stænd]	stood [stu:d]	stood [stu:d]	Стоять
steal [sti:l]	stole [stoul]	stolen ['stəulən]	Красть
stick [stik]	stuck [st□k]	stuck [st□k]	Колоть
sting [stiŋ]	stung [st□ŋ]	stung [st□ŋ]	Жалить
sweep [swi:p]	swept [swept]	swept [swept]	Выметать
swell [swel]	swelled [sweld]	swollen ['swoul(e)n]	Разбухать
swim [swim]	swam [swem]	swum [sw□m]	Плавать
swing [swiŋ]	swung [sw□ŋ]	swung [sw□ŋ]	Качать
take [teik]	took [tuk]	taken ['teik(ə)n]	Брать, взять
teach [ti:t□]	taught [t□:t]	taught [t□:t]	Учить
tear [t□ə]	tore [t□:]	torn [t□:n]	Рвать
tell [tel]	told [tould]	told [tould]	Рассказывать
think [θiŋk]	thought [θ□:t]	thought [θ□:t]	Думать
throw [θrəu]	threw [θru:]	thrown [θrəun]	Бросать
understand [□ndə'stænd]	understood [□ndə'stud]	understood [□ndə'stud]	Понимать
wake [weik]	woke [wouk]	woken ['wouk(e)n]	Просыпаться
wear [w□ə]	wore [w□:]	worn [w□:n]	Носить
weep [wi:p]	wept [wept]	wept [wept]	Плакать
wet [wet]	wet [wet]	wet [wet]	Мочить
win [win]	won [w□n]	won [w□n]	Выигрывать
wind [waind]	wound [waund]	wound [waund]	Извиваться
write [rait]	wrote [rout]	written ['ritn]	Писать

LANGUAGE REVIEW

VERB TENSES

PRESENT SIMPLE

Positive	Negative	Question
I work here.	I don't work here.	Do I work here?
You/We/They work here.	You/We/They don't work here.	Do you/we/they work here?
He/She works here.	He/She doesn't work here.	Does he/she work here?

In this book, the present simple is used to:

give personal details	I live in Madrid.
describe present situations	He works in London.
talk about likes and.dislikes	I like washing up.
talk about routines	I.get up late.
talk about frequency	I hardly ever buy Newsweek.
describe places	The university has thirty-five colleges.

PAST SIMPLE

Positive	Negative	Question
I worked here.	I didn't work here.	Did I work here?
You/We/They worked here.	You/We/They didn't work here.	Did you/we/they work here?
He/She worked here.	He/She didn't work here.	Did he/she work here?

The past simple is used to talk about:

past events	1 went to the cinema last night.
past consequences	I was lonely so I joined a club.
narrative events	The teacher grabbed my pencil and shook his finger at me.
biographical events	He left Holland and joined his brother.
historical events	Van Gogh was born in Holland in 1853.
reported statements	You said (that) be lived in Oxford.
reported questions	He asked if 1 lived in London.

PRESENT CONTINUOUS

Positive	Negative	Question
I'm working now.	I'm not working now.	Am I working now?
You/We/They're working now.	You/We/They aren't working now.	Are you/we/they working now?
He/She's working now.	He/She isn't working now.	Is he/she working now?

The present continuous is used to;	
- express present activities	I'm writing a letter.
- describe future arrangements	She's going to Ireland next week.
- talk about temporary situations .	I'm staying with my German penfriend.

Some verbs are not normally used in the continuous tenses, e.g. think, believe, understand like, know, want, hear, see, smell, feel, sound, taste. They are only used in the present continuous when they become deliberate, e.g. What are you doing? I'm thinking.

GOING TO FUTURE

Positive	Negative	Question
I'm going to work tomorrow.	I'm not going to work tomorrow.	Am 1 going to work tomorrow?
You/We/They're going to work tomorrow.	You/We/They aren't going to work tomorrow.	Are you/we/they going to work tomorrow?
He/She's going to work tomorrow:	He/She isn't going to work tomorrow.	Is he/she going to work tomorrow?

the going to future is used to:	
talk about plans and future intention	I'm going to stay at home this weekend.
make predictions from present evidence	We're going to have a lovely autumn.

VERB HAVE GOT

Positive	Negative	Question
I've got a car.	I haven't got a car.	Have I got a car?
You/We/They've got a car.	You/We/They haven't got a car.	Have you/we/they got a car?
He/She's got a car.	He/She's got a car.	Has he/she got a car?

have got is used to talk about:

family	I've got two sisters and a brother.
qualifications	Have you got a driving licence?
possessions	I haven't got a car.

PRESENT PERFECT SIMPLE

Positive	Negative	Question
I've worked in France. You/We/They've worked in France. He/She's worked in France.	I haven't worked in France. You/We/They haven't worked in France. He/She hasn't worked in France.	Have I worked in France? Have you/we/they worked in France? Has he/she worked in France?

The present perfect simple is used to:

talk about experience	I haven't been to Scotland but I've been to Ireland.
talk about length of time up to the present with for and since	How long have you lived there? I've lived therefor Ave years/since 1988.
talk about events which have happened recently with just, already, still, yet	They've just arrived. I've already seen it.

PAST CONTINUOUS

Positive			Negative			Question			Short answer . Positive			Short answer . Negative		
I	was	working	I	wasn’t	working	Were	you	working?	Yes,	I	was.	No	I	wasn’t
He			He				we			we	were.		we	weren’t
She			She				they			they			they	
We	were		We	weren’t		Was	I			you	were.		you	weren’t
You			You				he			he	was.		he	wasn’t
They			They				she			she			she	

The past continuous is used:

in contrast with the past simple	We were camping in France when forest fires broke out.
to describe events happening at a specific time	What were you doing at ten o'clock last night?
to give the background to events	I was having coffee with a friend. Some men were playing ‘b

PAST PERFECT

Positive	Negative	
I'd (had) gone.	I hadn't gone.	Short answer Negative
Question	Short answer	No, you hadn't.
Had I gone?	Positive	
	Yes, you had.	

The past perfect is used:

to describe an event which occurred before another in the past ,	When he arrived at the station, the train had left,
in reported statements,	She said (that) she had met him a year ago.
in reported questions .	They asked her why she had gone to the grocer's.

IMPERATIVE

Positive	Negative
Go past the church.	Don't worry.

The imperative is used for:

directions	Tarn tight at the bank.
warnings and advice	Never take a lot of money with you.
	Don't forget to lock your door.
commands.	Talk to Bob.
	Don't phone

.

PASSIVE FORM

Present simple passive
It is made in Britain.
They are made of wood.
The passive is used when we are interested in the process or the events rather than the person who is/was responsible for them, e.g. You are fined is more common than The police fine him because we are not interested in who fines the person. It is formed by combining a tense of the verb to be with a past participle of' the main verb.

The passive is used to:

describe processes	The dogs are trained in two stages.
Talk about legal procedures with impersonal you	You are sent to prison.

GERUND -ING FORM

The gerund or - ing form is used: after verbs like: love, like, enjoy, don't mind, hate	1 like cooking./ I don't mind cleaning.
to express sequence of time with before and after	After leaving school, 1 went to university. Before becoming a painter, he was a teacher

With before, and after + gerund the subject must be the same in both clauses.

QUESTION TAGS

With a positive sentence, you use a negative tag.	He's late, isn't he?
With a negative sentence, you use a positive tag.	He isn't late, is he?

The tag uses the auxiliary verbs, e.g. is, are, was, were, have, can, do, does, did.
1 In questions beginning with I'm, the negative tag is aren't I . e.g. I'm late, aren't I?
2 Question tags are often used in remarks about the weather, e.g. It's a lovely day, isn't it?
Question tags are used to:

check and confirm facts	He comes from Brazil, doesn't he? He isn't married, is he?
express surprise	He wasn't, was he?

MODAL VERBS
The following modal verbs are used in this book:
can, could, shall, should, ought to, must, may, might, will would, need

1. The form of the modal is the same with each pronoun, e.g. I/you/he/they can't sing.
2. Modals always come before the main verb in positive and negative sentences, e.g. I must go.
3. Questions are formed by inverting the subject and the modal, e.g. Where shall we go?
4. The negative is formed by putting not (n't) immediately after the modal verb, e.g. I mustn't/couldn't/ shouldn't. The exception is the modals will (negative = won't) and shall (negative = shan't).

Have to is used instead of must in future and past tenses, e.g. she'll have to, she had to.

CAN

In this book can is used to:

express ability	(throughout)
make requests	Can 1 use the phone, please?
offer help	Can I help you?
refuse help	I'm sorry. I'm afraid I can't
draw conclusions	He can't be Italian.

The infinitive of can (ability) is to be able to, e.g. If you go sailing, you must be able to swim.

COULD

In this book could is used to:

make requests	Could 1 have a brochure, please?
make suggestions.	We could show her some folk dancing.
draw conclusions	He could be Spanish.

SHALL

In this book shall is used to:

offer help	Shall I fake that for you?
ask for suggestions	What shall we do this evening?
	What shall I buy?

SHOULD and OUGHT TO

Positive	Negative	Question
I should go.	I shouldn't go.	Should I go?
You ought to go.	You oughtn't to go.	Ought I to go?

Should and ought to are used to:

ask for advice	What should I do?
	Should I take a sleeping pill?
give advice	He shouldn't work so late.

MUST

Must is used to

express obligation	(throughout)
draw conclusions	They must be English.

MAY and MIGHT

Positive	Negative	Question
I may come late.	I may not arrive on time.	May I use the phone?
She might come late.	She might not arrive on time.	(May here = polite request)

May is used to;	
make polite requests ,	May I use the phone?
talk about possible future events.	I may/might give her a ring.
draw conclusions	She might be American.

WIL/WON'T

Positive	Negative	Question
There'll be a lot of traffic.	There won't be much traffic.	Will there be much traffic?

Will/won't are used:	
- to talk about future predictions,	There'll be a lot of traffic on the M25.
- to make promises	We'll send you a postcard.
- in predictions and promises combined with time clauses beginning with when and as soon as,	I'll phone as soon as we get to France.
- to accept warnings and advice	O.K. I will.
- in first conditional if clauses	Don't worry, I won't.
	If you come up too fast your lungs will hurt.

VERB HAVE TO

Present Positive You have to meet them at the station.	Negative You don't have to meet them at the airport.	
Question Do you have to meet them?	Short answer Positive Yes, I do.	Short answer Negative No, 1 don't.
Past Positive I had to meet them at the station.	Negative I didn't have to meet them at the airport.	Short answer Negative No, I didn't.
Question Did you have to meet them?	Short answer Positive Yes, I did.	

1 Have to is used to talk about duties and obligations.
2 Note that we use do/does/did to make the negative and question forms of have to, e.g. He doesn't have to go. Do they have to go? You cannot say: ~~he hasn't to go~~, or ~~have they to go~~.
3 Don't have to/Doesn't have to mean the same as needn't, i.e. there is no obligation to do something..
4 Had to is the past tense form of have to. have got to and must.
5 The use of have to often suggests that someone else is telling you what to do.

VERB ALLOWED TO

Positive	Negative	
You're allowed to smoke.	You're not allowed to smoke./You aren't allowed to smoke.	
Question	Short answer Positive	Short answer Negative
Are you allowed to smoke?	Yes? you are.	No, you aren't

1 Allowed to is used to talk about permission, rules and laws.
2 To be allowed to is the passive form of the verb to allow.
3 Allowed to cannot usually be used with the impersonal pronoun it, i.e. you cannot say: ~~It is allowed to smoke~~ but it can be used with the impersonal pronoun you, e.g. You are allowed to smoke.

VERB USED TO

Positive	Negative	
I used to live in that house.	I didn't use to live here.	
Question	Short answer Positive	Short answer Negative
Did you use to live there?	Yes, I did.	No, I didn't.

Used to is used to:

talk about past habits	I used to speak Punjabi at home but 1 don't now.
talk about past situations	We didn't use to have a washing machine.

REPORTED STATEMENTS

Direct speech	Reported speech
'I'm thirty-five.' (Present simple)	He said that he was thirty-five. (Past simple)
'I'm working this evening.' (Present continuous)	She said that she was working this evening. (Past continuous)
I've been here before.' (Present perfect)	She said that she had been there before. (Past perfect)
'I met him last year.' (Past simple)	She said that she had met him a year ago. (Past perfect)
but	
I want to go home.' (Present simple)	He says he wants to go home. (Present simple)

1.When the tense of the main reporting verb is in the past, the tense of the reported speech is changed.
2.When the tense of the main reporting verb is in the present, there is no change of tense in the reported speech.
3.That can be used after the main reporting verb, e.g. He said (that) he wanted to go home.

REPORTED QUESTIONS

Direct speech	Reported speech
'How old are you?'	She asked (him) how old he was.
'Are you coming?'	She asked (him) if he was coming.
'Do you work in London?'	She asked me if I worked in London.

1 Tense changes in reported questions are the same as in reported statements.
2 The word order of the question in reported questions always changes, e.g. 'Where are you going?' - He asked me where I was going.
3The auxiliary verbs do/does/did are not used in reported questions.

INDIRECT REQUESTS AND INSTRUCTIONS

Positive
(Can/Could you) ask/tell her to phone back later (?)
Negative
(Can/Could you) ask/tell her not to phone me at work (?)
In this type of sentence, ask and tell are followed by an object plus an infinitive.

REPORTED REQUESTS AND COMMANDS

Direct request

Direct request		Reported request			
Can Could	you come and see me?	She	wants would like asked	me you him herus them	to go and see her

'Please don't phone me.' — She asked me not to phone her.

Direct command — Reported command

'Talk to Bob.' — She told me to talk to Bob.

'Don't phone me.' — She told me not to phone her.

1 Reported requests and commands are made by using verbs like: want, would like: ask and tell with an object and an infinitive.

2 You cannot say: ~~She wants that you. come.~~

3 Note that tell must be followed by a personal direct object, e.g. / told her to go home.

You cannot say: ~~I told to go home~~.

TIME CLAUSES IN THE PAST WITH WHEN, WHILE, AFTER AND BEFORE

When

When he arrived, he made a phone call.

In time clauses with while, after and before, the gerund with -ing can be used if the subject of both clauses is the same.

While

While we were camping in France, we saw a forest fire, or

While camping in France, we saw a forest fire, but

While we were camping in France, he arrived.

After

After driving/After he drove all night, he spent the day in bed. but

After they left, he went to bed.

Before

Before going to bed/Before she went to bed, she had a shower, but

Before they arrived, she made some coffee.

TIME CLAUSES IN THE FUTURE WITH WHEN AND AS SOON AS
When he arrives, I'll ask him.
As soon as she phones, I'll let you know.

Although the main verb is expressed by a will future, the verb in the time clause stays in the present simple tense.

CONDITIONAL CLAUSES WITH IF (First conditional)
If it rains, I'll take my umbrella.
If it rains, I won't come.
If it doesn't rain, we'll go to the beach.

In this book, the first conditional is used to:

- describe possible consequences	If you come up too fast, your lungs will hurt:
- threaten or warn people	If you don't go away, I'll call the police.

1.The first conditional is similar to time clauses in the future with when and as soon as. The main verb is expressed by a will future but the verb in the if clause stays in the present simple.
2.If ... not is sometimes replaced by unless, e.g. / won't come unless you really need we.

CLAUSES OF CONTRAST WITH ALTHOUGH AND LINKING WORD HOWEVER
Two contrasting sentences and ideas can be linked with although, e.g. Although some still live in the outback, many now live in cities and towns.
The same idea can be expressed by using the linking word however at the beginning of the second sentence, e.g. Some still live in the outback. However, many now live in cities and towns.

CLAUSES OF RESULT WITH SO/SUCH . . . THAT
I was so tired (that) 1 fell asleep.
It was such an amazing sight (that) I took a whole roll of film.
1.So and such are often followed by a clause of result beginning with that.
2.Sometimes the word that is omitted.
3.For differences between so and such see the Degree section of this Language review.

RELATIVE CLAUSES

Non-defining relative clauses

Louisa, who's a nurse, lives in Oxford.
Merton College, which was founded in 1264, is one of the oldest Oxford colleges.
Isabel is at a language school, where she is studying for her FCE.
1.A non-defining relative clause adds more Information to that in the main clause.
2.If the relative clause is in the middle of a sentence, there are usually commas around it. If it is at the end, there is usually a comma before it.

Defining relative clauses with who, which and where

Robert Burns was a Scottish poet who wrote Auld Lang Syne.
Tartan is a cloth which has a special criss-cross pattern.
Harris is an island where they make tweed.
1.A defining relative clause defines the person, thing or place we are talking about.
2.There is no comma before a defining relative clause.

Relative clauses without who, that and which

A German girl (whom/that) I know went to India for a holiday last year.
1 Who. that and which can be omitted if they are objects of the verb in the defining relative clause.
Whom is the object form of who. It is used in written English but rarely in spoken English.

COMPARISON OF ADJECTIVES

1. Comparative adjectives are formed:
   - by adding -er to the end of shorter adjectives, e.g. high - higher.
   - by putting more or less in front of longer adjectives, e.g. polluted - more polluted, expensive - less expensive.
2. Comparative adjectives can be modified by adding intensifiers such as much and a bit, e.g. much higher, a bit cheaper.

COMPARISON OF ADVERBS

Most comparative adverbs are formed by adding more to the adverb, e.g. more often, more frequently, more slowly. However, with short adverbs like hard, early, late, fast, the comparative is formed by adding -er, e.g. harder/earlier, later.

FREQUENCY

		Adverbs	
Once	a week	always	occasionally
Twice	a fortnight	usually	hardly ever
three times		often	
four times	a month	sometimes	never
	a year		

1. Adverbial phrases of frequency are usually positioned at the end of the relevant clause or sentence.
2. Adverbs of frequency are usually positioned before the main verb but after the verb to be.

STATIVE VERBS

Certain verbs (stative verbs) can be used before adjectives and combined with like before a noun.

It sounds nice.	It sounds like sizzling sausages.
It looks delicious.	It looks like juicy fruit.
It feels good.	It feels like home.
It tastes disgusting.	It tastes like sour milk.
It smells strange.	It smells like fish.
It seems long.	It seems like a year.

QUANTITY

Adjectives		Pronouns	
All Most Many Some A few Both No	young people like big cities.	All Most Many Some A few Both	of them) like big cities.
		None(of them) likes big cities.	

Quantity words with countable nouns		Quantity words with uncountable nouns	
too many not many a lot (of) plenty (of) (not) enough	people	too much not much a lot (of) plenty (of) (not) enough	food

DEGREE

Adverbs of degree I'm very/rather/quite/fairly/a bit/ not at all shy	1 Most adverbs of degree go before the words they modify. 2.-ly intensifiers can be used in place of very. e.g. She's terribly kind
So/Such a . . . It's such a beautiful beach. They're such beautiful animals. It's so beautiful.	1 Such is used before an adjective plus a noun. 2 So is used before an adjective or an adverb. 3.Both so and such can be linked to a clause of result or consequence, e.g. It was such ah amazing sight (that) I took a whole roll of film.

PREPOSITIONS

During He died during the war. During a fit of madness, he cut off his ear.	During is used with a noun which says when something happened, hot how long. It cannot be used in the same way as for.

ADJECTIVES WITH PREPOSITIONS

Of	I’m frightened/afraid of the dark. I’m proud/ashamed of what I did.
About	I’m angry/annoyed/upset about breaking the glass. I’m worried about Jenny.
With	I’m pleased/disappointed with my exam results. I’m bored/fed up with this book. I’m angry/annoyed with her.
At	I’m surprised/shocked at the news.

I’m good/bad/hopeless at cooking.

REFLEXIVE PRONOUNS

myself yourself herself himself itself	ourselves yourselves themselves	Reflexive pronouns are used when the subject and the object are the same person, e.g. 1 had to live in conflict with myself. He shot himself.

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