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ELECTRICAL ENGINEERING

Учебное пособие

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Ставит целью обучить студентов читать литературу по специальности и осуществлять коммуникацию на профессиональные темы.

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СТРУКТУРА ПОСОБИЯ

Составлено в соответствии с программными требованиями ФГОС ВО и учебным планом по разделу дисциплины «Английский язык для специальных целей» в Тверском государственном техническом университете и рассчитано на обучаемых, имеющих начальную и среднюю языковую подготовку.

Ставит своей целью развитие навыков поискового и просмотрового чтения по данной тематике, аннотирования и реферирования текстов, а также накопления словарного запаса, необходимого для чтения специализированных текстов и осуществления коммуникации на профессиональные темы.

Состоит из 8 разделов и построено по тематическому принципу. Охватывает темы: электричество, электротехника, электростанции, принцип действия электрических механизмов, известные ученые.

Также содержит раздел с текстами для индивидуального чтения по специальности для закрепления навыков самостоятельной практики перевода.

Материалы, составляющие пособие, отобраны из оригинальной литературы по данной отрасли.

Тематические разделы включают словарь активной лексики, содержащий наиболее употребительные для данной специальности термины и слова общетехнического значения, вводно-описательный текст, систему заданий к основному тексту, дополнительные тексты, в том числе для подготовки монологических высказываний на темы: «Известный ученый» и «Моя будущая профессия». Пособие строится на базовых явлениях английской грамматики, синтаксиса, словообразования и включает ряд упражнений, помогающих активизировать их использование. Приводятся также задания на тренировку и запоминание разных фразеологических единиц, моделей, что способствует расширению словарного запаса.

Кроме чтения текстовых материалов разной понятийной и языковой сложности, представлены упражнения на развитие навыков диалогической речи по темам профессиональной направленности с учетом культурных норм английского языка. Навыки письменной деловой речи отрабатываются на примере составления письма-запроса и резюме при оформлении на работу.

Включает задания и итоговый тест для подготовки к сдаче федерального интернет-экзамена в сфере высшего образования.

PART I. ELECTRICITY

TEXT 1. THE NATURE OF ELECTRICITY

Pre-text exercises

Ex. 1. Прочитайте следующие слова, обращая внимание на буквы, которые не произносятся.

gh – high, right, weight, though
l – should, would, could, half
h – when, which, why, where, while
w – who, whom, wrong, write
k – know, knew, known, knowledge

Ex. 2. Проанализируйте модели образования слов, прочтите и переведите слова, созданные на их основе.

a) Основа глагола + -tion, -sion, -ion → существительное

to include – включать	inclusion – включение
to continue – продолжать	continuation –
to produce – производить	production –
to absorb – поглощать	absorption –
to consider – рассматривать	consideration –

b) Основа глагола + -er / or → существительное со значением лица, производящего действия, или орудия действия

to generate – генерировать	generator – генератор
to distribute – распределять	distributor –
to consume – потреблять	consumer –
to cool – охлаждать	cooler –
to operate – оперировать	operator –

c) Основа прилагательного + ly→ наречие

free – свободный	freely – свободно
possible – возможный	possibly –
deep – глубокий	deeply –
safe – безопасный	safely –
easy – легкий	easily –
simple – простой	simply –

d) Основа существительного + -ic →прилагательное

cube – куб	cubic – кубический
atmosphere – атмосфера	atmospheric –
history – история	historic –
metal – металл	metallic –
base – основа	basic –

e) Основа глагола + -ment → существительное

to attach – прикреплять	attachment – прикрепление
to assess – оценивать	assessment –
to move – двигать	movement –
to establish – устанавливать	establishment –
to develop – развивать	development –

f) Основа прилагательного + -(i)ty →существительное

regular – регулярный	regularity – регулярность
similar – сходный	similarity –
popular – популярный	popularity –
viscose – вязкий	viscosity –

Ex. 3. Определите, к каким частям речи относятся следующие слова.

Dynamic, notion, negatively, conduction, insulator, necessity, inevitably, pavement, commodity, creator, recession, reality, master, simultaneously, reality, regiment, abolition, detachment, provision, precarious, vicinity, stimulation, development, conductor, capacity, oppositely, attraction, repulsion, condition, polarity, electric, application, magnetic, easily, solution.

Ex. 4. Переведите следующие словосочетания на русский язык.

Electric phenomena, closely related to electricity, attract one another, repel one another, for light and power purposes, flow of charges, gaseous or liquid conductors, a magnetic effect, a direct current, an alternating current, a pulsating current, loosely bound valence-ring electrons, the force of attraction or repulsion, power supply.

Part I.

The ancient Greeks knew that when a piece of amber is rubbed with wool or fur it achieves the power of attracting light objects. Later on the phenomenon was studied, and, the word electric, after the Greek word "electron", meaning amber was used.

Many scientists investigated electric phenomena, and during the nineteenth century many discoveries about the nature of electricity, and of magnetism, which is closely related to electricity, were made. It was found that if a sealing-wax rod is rubbed with a woolen cloth, and a rod of glass is rubbed with a silken cloth, an electric spark will pass between the sealing-wax rod and the glass rod when they are brought near one another. Moreover, it was found that a force of attraction operates between them. An electrified sealing-wax is repelled, however, by a wax rod, and also an electrified glass rod is repelled, by a similar glass rod.

As a result of those experiments, two kinds of electricity were developed, with opposite kinds of electricity attracting one another, and similar kinds repelling one another.

The study of electricity may be divided into three classes or branches: magnetism, electrostatics, and electrodynamics. Magnetism is the property of the molecules of iron and certain other substances through which they store energy in a field of force because of the arranged movement of the electrons in their atoms. Electrostatics is the study of electricity at rest, or static electricity. Examples of this type of electricity are charges on condenser plates. Rubbing glass with silk produces static electricity.

Electrodynamics is the study of electricity in motion, or dynamic electricity. The electricity which flows through wires for light and power purposes is a good example of latter type of electricity.

Thales' experiments with amber rods were the first studies into the production of electrical energy. While this method, now known as the turboelectric effect, is capable of lifting light objects and even generating sparks, it is extremely inefficient. It was not until the invention of the voltaic pile in the eighteenth century that a viable source of electricity became available. The voltaic pile, and its modern descendant, the electrical battery, store energy chemically and make it available on demand in the form of electrical energy. The battery is a versatile and very common power source which is ideally suited to many applications, but its energy storage is finite, and once discharged it must be disposed of or recharged. For large electrical demands electrical energy must be generated and transmitted continuously over conductive transmission lines.

Electrical power is usually generated by electro-mechanical generators driven by steam produced from fossil fuel combustion, or the heat released from nuclear reactions; or from other sources such as kinetic energy extracted from wind or flowing water. The modern steam turbine invented by Sir Charles Parsons in 1884 today generates about 80 percent of the electric power in the world using a variety of heat sources. Such generators bear no resemblance to Faraday's homopolar disc generator of 1831, but they still rely on his electromagnetic principle that a conductor linking a changing magnetic field induces a potential difference across its ends. The invention in the late nineteenth century of the

transformer meant that electrical power could be transmitted more efficiently at a higher voltage but lower current. Efficient electrical transmission meant in turn that electricity could be generated at centralized power stations, where it benefited from economies of scale, and then be dispatched relatively long distances to where it was needed.

Since electrical energy cannot easily be stored in quantities large enough to meet demands on a national scale, at all times exactly as much must be produced as is required.

Part II.

There are several methods of producing electricity for practical purposes. The battery of a pocket torch may be contrasted with the source of enormous energy represented by a larger power station. Both are examples of the application of electrical energy to a particular purpose, and in general the purpose determines the nature of the method used to produce the energy. Practical methods of producing electricity may be enumerated as follows:

Chemical, as represented by the various types of batteries or primary cells in which the electricity is produced by purely chemical actions.

Electromagnetic, forming the basis of operation of rotating generators in which the electricity is produced by conductors moving through a magnetic field. This is the method employed in practice for generators of various sizes.

Thermo-electric, in which the heating of the junction between two different metals produces a very small voltage which may be used for purposes of temperature measurement and as a source of power.

Piezo-electric, in which a very small voltage is produced across certain faces of a crystal by application of mechanical pressure. This effect is used, for example, as a means of frequency control in radio oscillators or fox gramophone pick-ups, but it is not suitable for power supply.

Electronic, characterized by the flow of electrons through evacuated or gas-filled tubes, and having the following forms.

a) Thermionic emission, in which the electrons are produced by the heating of special materials.

b) Photo-electric emission, in which electrons are liberated at the surface of certain substances by the action of light.

c) Secondary emission, in which electrons are driven from a material by the impact of electrons or other particles on its surface.

d) Field emission, in which electrons are drawn from the surface of a metal by the application of very powerful electric fields.

e) Demand for electricity grows with great rapidity as a nation modernizes and its economy develops and people are still searching other ways of its producing.

Vocabulary
electrical engineering – электротехника
amber – янтарь, окаменелая смола
sealing-wax – сургуч
rod – палочка
spark – искра
to repel – отбрасывать, отклонять
magnetism – магнитные свойства, магнетизм (раздел физики, изучающий магнитные явления
property – свойство
to store – накапливать
arranged movement – упорядоченное движение
charge – заряд
wire – электрический провод
to detect – замечать, открывать, обнаруживать
stopper – пробка
gold leaf – золотая фольга
determine – определять, устанавливать
to induce – вызывать, стимулировать; приводить (к чему-л.),индуктировать
flow of charges – поток заряженных частиц
at random – беспорядочно
to cause – послужить причиной для чего-л.; мотивировать что-л.
circuit – цепь, контур, схема
e.m.f. (electromotive force) – электродвижущая сила
current – течение, поток, скорость потока, (электрический) ток
direct current (d.c.) – постоянный ток (antonym: alternating current (a.c.))
pulsating current – прерывистый (пульсирующий) ток
insulator – диэлектрик, изолятор, изоляционный материал
nucleus – ядро
semiconductor – полупроводник (syn: transistor, semi-co)
unit – единица измерения
copper plate – медная пластина
capacity – мощность
to increase – возрастать, увеличиваться, расти
to remain – оставаться
artificially – искусственно
branch – фаза
torch – фонарь
thermionic emission – термоэлектронная эмиссия

Text-based assignments

Ex. 1. Прочтите текст.

Ex. 2. Ответьте на вопросы.

1. What classes may the study of electricity be divided into?
2. What do you know about them?
3. How does the current flow through a wire?
4. What does the magnitude of the difference of potential depend upon?

Ex. 3. Найдите в тексте предложения, которые содержат ответы на следующие вопросы.

1. От чего зависит ёмкость проводника?
2. Чем измеряется ёмкость проводника?
3. Какие есть типы электрических цепей?
4. Как могут классифицироваться практические методы выработки электричества?

Ex. 4. Закончите предложения.

1. Electrostatics	a) is repelled, however, by a wax rod.
2. An electrified sealing-wax	b) is a versatile and very common power source.
3. Rubbing	c) is employed for generators of various sizes.
4. The electromagnetic method	d) produces static electricity.
5. The battery	e) is the study of electricity at rest.

Ex. 5. Прочитайте о трансформаторах электрического тока. Составьте три вопроса и задайте их в группе.

Current Transformers

Current transformers are used for operating ammeters, wattmeters and other measuring devices. They produce in the meters a current lower than the measured current but proportional to it.

Current transformers also insulate the instrument from which is being measured. This is necessary for high voltage circuits.

Ex. 6. Закончите диалог между начальником (a chief) и новым сотрудником (a new employee) компании и разыграйте его в парах.

E.: How do you do, Mr. M? Let me introduce myself. My name is K. I have

arrived here to install electrical equipment supplied by the corporation MOTOR.

Ch.: Здравствуйте, г-н К.! Рад познакомиться с Вами. Садитесь, пожалуйста.

E.: Thank you.

Ch.: У Вас, конечно, высшее образование?

E.: Yes, of course.

Ch: What did you graduate from?

E.: Машиностроительный факультет Тверского государственного технического университета.

Ch.: What is your profession?

E.: Инженер-электрик.

Ch.: And what do you specialize in?

E.: Я специалист по установке электрооборудования (I'm an expert in…).

Ch.: What is your current position?

E.: Начальник цеха (a foreman).

Ch: How long have you worked as a foreman?

E.: Three years.

Ch.: What other activities were you engaged in?

E.: Да. Я был инженером в цехе (as a shop engineer).

Ch.: Have you been engaged in other professional tasks besides installing electrical equipment?

E.: Да. Сборкой электродвигателей.

Ch.: Good.

TEXT 2. ELECTRICAL ENERGY AND ELECTRICAL MACHINES

Pre-text exercises

Ex. 1. Определите значение следующих терминов, не обращаясь к словарю.

Alternating current, direct current, armature, electromagnet, field coil, pole, winding, brush, brush holder, commutator, generator, motor, communication, carbon, reversible, operate, convert, electrical energy, mechanical energy.

Ex. 2. Определите к каким частям речи относятся следующие слова.

Reliable, application, development, nearly, momentous, variety, rapidly, visible,

basic, armature, excitation, magnetic, commutator, generator, invention, simultaneously, creation, probably, electricity, century, practical.

Ex. 3. Переведите следующие словосочетания на русский язык.

Pioneering work, major uses, an electric power system, "electrified lives", provide electric service, the direct-current machine, the excitation field, the rotating part of the machine, the external circuit, electric light bulb.

Volta made his experimental cell in 1800, producing for the first time a steady reliable electric current. During the nineteenth century, the development of practical applications of electrical energy advanced rapidly.

The first major uses of electricity were in the field of communications first for the telegraph and the telephone. They used not only electric current but also electromagnetic effects.

Thomas Edison's invention of the electric light bulb was perhaps the most momentous development of all, but not because it was such a unique invention. It was momentous because it led to the creation of an electric power system which has since reached into nearly every corner of the world. Actually, other people were working simultaneously on the same problem, and Edison's claim to the invention was disputed. Perhaps Edison's most important claim to fame is his pioneering work in engineering, which helped to provide electric service for New York City in 1882.

The application of electricity has grown to the point where most of us lead "electrified lives", surrounded by a variety of devices that use electric energy. Less visible, but probably more important, are the thousands of ways industry has put electric energy to work. The direct-current machine is one of the most important ways.

Electrical machines are divided into alternating current (a. c.) and direct-current (d. c.) machines. The basic parts of a d. c. machine are the armature and electromagnets (or field coils). Coils wound on the pole cores form the excitation field of the machine. The armature is the rotating part of the machine. In its insulated slots is placed a winding connected to the commutator. Carbon brushes are placed in brushholders and contact the rotating commutator.

There are two electric circuits in the d. c. machine, the armature circuit and the excitation circuit. A d. c. machine is reversible: if the machine is rotated and the magnetic field is excited the machine sends a direct current into the external circuit through the commutator brushes: the machine operates as a generator. If the armature excitation winding are joined to a d. c. circuit the armature runs and the machine operates as a motor and converts electrical energy into mechanical energy.

Text-based assignments

Ex. 1. Ответьте на вопросы, используя информацию текста.

1. What did Volta invent in 1800?
2. In what field and for what purposes were the first major uses of electricity made?
3. What was Thomas Edison's invention?
4. How can you prove that the application of electricity has grown to the point where most of us lead "electrified lives"?
5. What classes can electrical machines be divided into?
6. How can you describe the principles of work of a a. c. and d. c. machines ?
7 Most of us lead "electrified lives", surrounded by a variety of devices that use electric energy, don`t we?

Ex. 2. Выделите во второй части текста предложения, описывающие устройство электрической машины и принцип действия электрического мотора.

Ex. 3. Составьте *на русском языке* аннотацию к тексту. Выберите и используйте при работе следующие клише:

1. Статья (текст) посвящается проблеме / вопросу…

2. В начале статьи
– речь идет о…

– дается определение…

– обосновывается значимость…

– привлекается внимание к…

3. Далее

– описывается…

– рассказывается…

– рассматривается…

– излагается…

4. В частности

– отмечается, например…

– подробно излагается…

– описывается схема…

– указывается…

– доказывается мысль…

5. Наконец

– раскрывается…

6. В заключение

– приводятся примеры

7. Подводя итог сказанному, следует отметить…

8. Как мне кажется, статья может представлять интерес для…

9. Я считаю, статья может оказаться полезной для…

Ex. 4. Прочитайте о частоте электрического тока. Составьте три вопроса и задайте их в группе.

Frequency

The number of cycles per second is the frequency of an alternating current. There are two frequencies: the standard for Europe is 50 cycles per second while the standard for the USA is 60 cycles per second. A standard frequency has a great advantage since different systems can be interconnected.

Ex. 5. Закончите диалог между инженером-электриком (an electrical engineer) и молодым специалистом (a young specialist) и разыграйте его в парах.

E.: We have many devices, tools and other appliances for installing electrical equipment. However, I'm not quite sure that all the necessary appliances are available at the construction site you belong to.

S.: О, не беспокойтесь, г-н Иванов. Я уже осмотрел все имеющиеся приспособления (we have at our disposal), предназначенные для установки электрооборудования.

E.: Do you mean we can supply you with all the essential tools?

S.: В общем, да. Одно из отсутствующих здесь портативных приспособлений (a missing portable appliance) я привез с собой. Это современное приспособление. Оно очень хорошего качества и надежно в эксплуатации.

E.: Is it of modern design?

S.: Да, но оно состоит из многих частей (units), использовавшихся в старой модели.

E.: And what are the main advantages of the new appliance?

S.: Почти все операции выполняются автоматически или полуавтоматически. Больше сведений о преимуществах этого приспособления Вы можете найти в “Техническом описании” (The Technical Specification). Вот, пожалуйста!

E.: Thanks a lot. And what about the disadvantages?

S.: В “Техническом описании” сведений о них нет.

GRAMMAR REVISION

Таблица времен Indefinite (Simple), Continuous (Progressive), Perfect, Perfect Continuous (Progressive)

The Active Voice (активный залог)				
	Indefinite (Simple) **V, Vs** (регулярные, повторяющиеся действия, факты)	Continuous (Progressive) **be + Vз** (процесс, в определенный момент)	Continuous (Progressive) **be+Ving** (результат к определенно-му моменту)	Perfect Continuous (Progressive) **have+been+Ving** (незаконченное действие)
Present	I translate. He translates. Do you translate? Does he translate? I don’t translate. He doesn’t translate.	I am translating. He is translating. We are translating. Are you translating? I am not translating.	I have translated. He has translated. Have you translated? I haven’t translated.	I have been translating. He has been translating. Have you been translating? I haven’t been translating.
Past	I translated. Did you translate? I didn’t translate.	I was translating. We were translating Were you translating? I wasn’t translating.	I had translated. Had you translated? I hadn’t translated.	I had been translating. He had been translating. Had you been translating? I hadn’t been translating.
Future	I shall/will translate. He will translate Will you	I shall/will be translating. He will be translating.	I shall/will have translated. He will have	I shall/will have been translating. He will have been translating.

	translate? I shan't/won't translate	Will you be translating? I shan't/won't be translating.	translated. Will you have translated? I shan't/won't have translated.	Will you have been translating? I shan't/won't have been translating.

The Passive Voice (пассивный залог)

	Indefinite (Simple) **be+ V3**	Continuous (Progressive) **be+being+ V3**	Perfect **have+been+V3**	Perfect Continuous (Progressive)
Present	The letter is translated. Is the letter translated? The letter isn't translated.	The letter is being translated. Is the letter being translated? The letter isn't being translated	The letter has been translated. Has the letter been translated? The letter hasn't been translated.	-
Past	The letter was translated. Was the letter translated? The letter wasn't translated.	The letter was being translated. Was the letter being translated? The letter wasn't being translated.	The letter had been translated. Had the letter been translated? The letter hadn't been translated.	-
Future	The letter will be translated. Will the letter be translated? The letter won't be translated.	-	The letter will have been translated. Will the letter have been translated? The letter won't have been translated.	-

1. Степени сравнения прилагательных и наречий.

Сравнительные конструкции

а) Односложные и часть двусложных прилагательных и наречий, оканчивающихся на **-y**, образуют сравнительную степень при помощи

суффиксов **-er**, **-est**.
loud – louder – (the) loudest
thin – thinner – (the) thinnest

б) Многосложные и большинство двусложных прилагательных и наречий, оканчивающихся на -1y, образуют степени сравнения с помощью **more** больше, **less** меньше, **most** наиболее, **least** наименее.

interesting – more interesting – (the) most interesting
beautiful – less beautiful – (the) least beautiful

в) Некоторые прилагательные образуют степени сравнения от других корней.

Положительная	Сравнительная	Превосходная
good (хороший)	better	(the) best
bad (плохой)	worse	(the) worst
little (маленький)	less	(the) least
many/ much (много)	more	(the) most
far (далекий, дальний)	farther, further	(the)farthest, furthest

Положительная степень прилагательных и наречий также используется при сравнении качества предметов в следующих моделях сравнительных конструкций:
Model 1: as…as (такой же… как)
Model 2: not so (as/such)… as (не такой… как)
Model 3: the… the (чем ... тем)

EXERCISES

Ex. 1. Сравните по следующему образцу.

Model: Steel is expensive.
Silver is more expensive.
Gold is the most expensive.
1. Три вещества с точки зрения их значения в промышленности: water, coal, gas (important).
2. Три металла с точки зрения их твердости: steel, copper, aluminium (hard).
3. Три вида транспорта с точки зрения скорости: a train, a plane ,a car (fast).

Ex. 2. Укажите, в каких словах *-er* суффикс степени сравнения прилагательных.

Driver, other, darker, easier, never, writer, weather, under, teacher, faster, deliver, summer, bigger.

Ex. 3. Заполните таблицу по образцу. Вспомните значения приведенных здесь прилагательных.

small old broad high full thick thin great	smaller	the smallest
b) difficult specific modern personal practical effective theoretical typical	more difficult	the most difficult

Ex. 4. Изучите таблицу, обращая внимание на существительные, образованные от прилагательных. Переведите существительные на русский язык.

Прилагательные	Существительные
deep long high strong warm true	depth length height strength warmth truth

Ex. 5. Изучите модели сравнительных конструкций по таблице.

Iron	is	**as** useful almost **as** useful almost **as** useful a material	**as**	steel.
Iron	is	not **so (as)** expensive **not** quite **so (as)** expensive **not** quite **such** an expensive material **not** quite **such** an expensive material to produce	**as**	steel.

Ex. 6. a) Постройте предложения, употребив конструкцию *as... as*.

Model: This car is the same size as that.
This car is as big (small) as that.

1. This device is the same price as that. 2. This machine is the same as that. 3. This tyre is the same height as that. 4. This suspension is the weight as that. 5. This tyre is the same width as that. 6. These materials are the same hardness as those. 7. This road is the same length as that.

б) Переделайте предложения, употребив отрицательную конструкцию *not so (as)... as*.

Model: This problem is hardly as important as that.
This problem is not so (as) important as that.
This method is hardly as effective as that. 2. These results are hardly interesting as Petrov's. 3. Mr. Smith's research is hardly as important r. Black's. 4. This device is hardly as useful as that. 5. This apparatus hardly as cheap as that. 6. Comrade Klimov's knowledge in physics is as deep as Comrade Ivanov's.

Ex. 7. Предложения, полученные в упр. 1, переделайте в новые, употребив конструкцию *less... than*.

Model: This problem is not so (as) important as that.
This problem is less important than that.

Ex. 8. Изучите следующую таблицу сравнения с количественными данными. Обратите внимание на место слов, обозначающих количество, в конструкциях сравнения.

This plant	is	25 years older than twice more efficient than, twice as old as 3 times as old as half as old as half the size of	that plant.

Ex. 9. Соедините два предложения в одно, используя одну из моделей сравнения.
Models: A is larger than B.
B is not so (as) large as A.
B is smaller than A.
A is not so small as B.

1. The British engine weighs 3 tons; the French engine weighs 4 tons. 2. The temperature in this room is 28°C; the temperature outside the room is 22°C. 3. Alcohol boils at 78°C; water boils at 100°C. 4. The journey takes 4 hours by day; it takes 5 hours at night. 5. Our car moves fast. Their car moves faster. 6. Your experiment is difficult. Our experiment is more difficult.

Ex. 10. Закончите предложения, используя сравнительную степень в

конструкции the ... the (чем ... тем) по модели.

Model: The more you read the more you enlarge your vocabulary.
1. The earlier the problem's solution is found the ... . 2. The greater the efforts of scientists and engineers the... . 3. The better the experimental design the ... . 4. The more accurate the calculations the ... . 5. The clearer the definition of a task the ... . 6. The better the experimental technique the ... . 7. The more reliable the results the ... .

2. Слова-заместители

В английском языке очень часто во избежание повторения одного и того же слова в предложении употребляются слова-заместители: **one (ones) –** используются для замещения существительных без предлогов, **that (those)** – употребляются с существительными с предлогами. Слова-заместители занимают в предложении позицию замещаемого слова.

one

This complex of plants is the biggest **complex** in the world. —► This complex of plants is the biggest **one** in the world.

Этот комплекс заводов – самый большой в мире.

ones

He does all the easy **jobs** and leaves the hard jobs for me. —► He does all the easy jobs and leaves hard **ones** for me.

Он выполняет все легкие работы, а тяжелые оставляет для меня.

that

This engine is more powerful than the **engine** of the old type. —►This engine is more powerful than **that** of the old type.

Этот двигатель более мощный, чем двигатель старого типа.

those

These motors are more powerful than the **motors** in our shop. —►These motors are more powerful than **those** in our shop.

Эти моторы более мощные, чем моторы в нашем цехе.

EXERCISES

Ex. 1. Переведите предложения, определяя слова-заместители.

1. A complete test set is that of tests that test every point that can be tested.
2. These times should be compared with those in Table 3.

3. One should use a new method, not the old one.
4. Our values are not in accord with those obtained by previous workers.
5. No structure is possible other than that indicated in formula XVII.
6. Overflow from one plate to the one below is by no means by the side arm.
7. The problem is one of allocating frequencies to a desired number of channels.
8 As a result, the remaining variables then become subdivided into those which do and do not affect the output.
9. This system is satisfactory, when one is studying the catalogue.

Ex. 2. Переведите предложения на русский язык. Укажите, в каких предложениях слово *that* употребляется как слово-заместитель, а в каких – как указательное местоимение или союз.

1. This hardware equipment is more modern than that one.
2. It is known that air has pressure.
3. There are many shops in that plant.
4. Trucks are getting larger and so are the tyres that move them.
5. The speed of a passenger car is higher than that of a bus.
6. There are many interesting stories in this book, read that one on the system of education in Canada.

Ex. 3. Прочитайте следующие предложения и замените, где возможно, существительные словами-заместителями. Переведите полученные предложения на русский язык.

1. One group of courses serves the Industrial Engineering stream and the other group serves the Engineering Science stream.
2. Students of the Industrial Engineering Department are interested in the design and production engineering and students of the Electrical Engineering Department study the electrical supply.
3. The courses of study are supported by laboratory exercises and drawing office exercises.
4. During the summer vacation students are engaged in practical work with engineering firms.

3. Неопределенные местоимения

Местоимения	-thing	-body,-one	-where	Употребление
+ some некоторый, какой-то, какой-нибудь, несколько	something что-нибудь, что-то	everything всё	somewhere где-то, куда-то, где-нибудь, куда-нибудь	В утвердительных предложениях

+ - ? any? какой-нибудь? любой?	anything что-нибудь, что-то	anybody? anyone? кто-то? кто-нибудь?	anywhere где-то, куда-то, где-нибудь, куда-нибудь	В вопросительных предложениях
- no никакой, ни один	nothing ничто, ничего	nobody no one никто	nowhere нигде, никуда	В отрицательных предложениях
every каждый, всякий	everything всё	everybody everyone все, каждый	everywhere везде, повсюду	Во всех трех видах предложений

EXERCISES

Ex. 1. Переведите следующие предложения на русский язык.

1. Everything is ready for the experiment.
2. The students looked for this book everywhere, but couldn't find it anywhere.
3. Do you know anything about the history of the machine-building industry of Russia?
4. There is some reference-book on your table.
5. Everybody knows Professor Petrov.
6. The old plant had no modern facilities.
7. Everybody can do this.
8. Is there anybody there?
9. I left my text-book somewhere.
10. We read nothing about this type of computer.
11. If you discover any faults (дефекты) in the detail, tell the engineer about them.

Ex. 2. Задайте общие вопросы к нижеприведенным предложениям.

Model 1: There are **some** interesting inventions at this research centre.– Are there **any** interesting inventions at this research centre?

1. This plant employs some highly efficient equipment.
2. There are no specialized plants in this town.
3. This scientific research institute has some specific features in its work.
4. Our laboratory makes no researches in the field of automation control.
5. They carry out some interesting experiments.

Model 2: Somebody saw this engineer. – Did anybody see this engineer?

1. I read something about this apparatus last month.
2. You will find no one at the office tomorrow.

3. There is somebody in the laboratory.
4. The students wanted to go nowhere.

Ex. 3. Дополните предложения, переведя русские слова на английский язык. Запомните: some of you, none of us, each of them, any of you.

1. Does (кто-нибудь) of you know this engineer?
2. (Никто) of our students receives this newspaper.
3. (Любой) of us can help you with your work.
4. Is (все) ready for the test work?
5. I'll try to read (что-нибудь) on this problem.
6. You are allowed to choose (любую) of these books.
7. She knows (ничего) about this experiment.
8. Do you see (кого-нибудь) of your friends in the hall?
9. (Каждый) of us is ready to take this difficult examination.

Ex. 4. Раскройте скобки и поставьте глагол в нужную форму.

1. I know she (to prepare) for a difficult experiment now.
2. What you (to do) when I came in? – I (to read) an article on the British educational system.
3. I thought you (to do) this work yesterday. – Yes, and I still (to do) this work yesterday. – Yes, and I still (to do) it.
4. Tomorrow at 6 6 o'clock I (to report) the results of this analysis.
5. Our laboratory will be provided with new equipment. These two engineers (to mount) a new electronic system.

4. Общие, специальные, альтернативные и разделительные вопросы

1. ОБЩИЙ – задается ко всему предложению, требует ответа YES/NO, начинается со вспомогательного глагола

1	2	3	4
Впомогат. глагол (модальный глагол-связка)	Подлеж.	Сказуемое в I форме (или именная часть сказ.)	Второстепенные члены предложения
Does	he	learn	French?
Were	the exams	passed	in winter?
Can	you	translate	this text?

2. СПЕЦИАЛЬНЫЙ – задается к одному члену предложения, начиная с

вопросительного слова

0	1	2	3	4
What When Why Where How many	Вспом. глагол (модаль- ный, глагол- связка)	Подлеж.	Сказуемое в I форме (или именная часть сказ.)	Второст. члены предлож.
Why How What	does were can	he the exams you	learn passed translate	French? in winter?

ВОПРОС К ПОДЛЕЖАЩЕМУ – разновидность специально вопроса. Прямой порядок слов, вместо подлежащего употребляем Who/What (гл. в 3 л. ед. ч.) Who learns French? What exams were passed in winter?

3. АЛЬТЕРНАТИВНЫЙ – начинается как общий, предлагает выбор (…or…)

Does	he	learn	French	*or*	Englsh?
Were	the exams	passed	in winter *or* in summer?		
Can	you	translate	this *or* that text?		

4. РАЗДЕЛИТЕЛЬНЫЙ – «не так ли ? не правда ли?»
Повторяем все предложение без изменения + запятая + вспом. гл. с противоположным знаком + местоимение вместо подлежащего
He learns French, doesn’t he?
The exams were passed in winter, weren’t they?
Jon can’t translate this text, can he?

EXERCISES

Ex. 1. Поставьте к предложениям общие, специальные (к выделенным словам), альтернативные и разделительные вопросы.

1. *A new experimental minibus* was made *at the Likhachev Automobile Works* (3). 2. There are *many research institutes in our country* (2).
3. *The firm* will produce *new types of computers in a few years* (3).

Ex. 2. Закончите следующие предложения, чтобы получить разделительные вопросы.

1. You were born in Russia,...? 2. You know English,...? 3. James Watt improved the design of the car , ...? 4. You have read about Henry Ford, ...?

5. You couldn’t read about his invention in this book, ...?

Ex. 3. a) Изучите справку об известном ученом Вильяме Томсоне и задайте все типы вопросов по содержанию прочитанного.

1. William Thomson, born in Belfast but moved to Glasgow in 1932
2. Studied: The nature of heat
3. Laid the ground for the electromagnetic theory of light
4. Attempted to determine the age of the earth
5. Planned and supervised the laying of the first transatlantic cable
6. “The life and soul of science is its practical application”
7. A humble man, married twice but had no children
8. Buried at Westminster Abbey

б) Изучите справку о создании первой модели компьютера и задайте все типы вопросов по содержанию прочитанного.

Babbage’s Analytical Engine

1. In 1832, an English inventor and mathematician Charles Babbage commissioned by the British government to develop a system for calculating the rise and fall of the tides
2. A device, complete with punched cards for data input designed and called by Babbage as an analytical engine
3. The engine given the ability to perform different types of mathematical operations
4. The machine of Babbage’s dream never realized in his life and built by other scientists throughout the next century
5. In 1941, a relay computer built in Germany by Conrad Zuse

Ex. 4. Переведите текст, определите типы вопросов данных предложений.

The important capabilities concerning the communication mechanism are:
Error control. Does the communication mechanism detect errors, correct errors, notify the user of errors, or does it pass data with undetected bit errors?

Addressing. How is the destination of the message addressed? Is addressing only to a single address, a group address or is a complete broadcast possible?

Data flow and control. Can data be sent simultaneously in both directions? Is a metering of flow-rate technique available?

Priority. Are there any options for priority service, multiple levels of priority, and/or pre-emption?

Security. Does the communication service offer any security mechanisms?

Delivery guarantees. Does the mechanism guarantee delivery or inability to deliver a message?

Topology. Are there any restrictions based on location or topology? Who is addressable from a particular user?

Performance and reliability. Does the communication mechanism meet specific delay and through-put characteristics? How reliable is it in the face of hardware and physical link failures?

5. Модальные глаголы (Modal Verbs)

Модальные глаголы выражают не действие, а отношение к действию (возможность, долженствование, вероятность и необходимость его совершения), поэтому никогда не употребляются самостоятельно (кроме кратких ответов), а только в сочетании со смысловым глаголом в форме инфинитива.

Модальные глаголы	Эквиваленты модальных глаголов	Значение	Примеры
can (*наст. время*) а) могу, может, можете и т.д. б) умею, умеют и т.д. could (прош. время)	to be able (to) быть в состоянии, мочь to be unable to (в отрицательном предложении) быть не в состоянии, не мочь	а) физическая возможность б) умственная возможность	I can lift this unit. I can operate this device. He was able to do this work himself. Он мог сделать эту работу сам. This engineer will be unable to come. Этот инженер не сможет прийти.
may (наст. время) might (прош. время)	to be allowed (to), to be permitted (to) иметь разрешение сделать что-либо	а) разрешение, отсутствие запрета б) вероятность	You may take the book. She may come. The students were allowed to test the new device. Студентам разрешили испытать новый прибор. N. will be permitted to go on with his experiment. Н. будет разрешено продолжать свой эксперимент
must (наст. время)	to have (to) быть	долженствование, обязанность а) в силу	Every student must attend the lectures. Каждый студент

должен	вынужденным to be (to) быть должным to be supposed (to) быть обязанным to be obliged (to) быть вынужденным	обстоятельств б) по плану, договоренности в) в силу договоренности г) в силу морального обязательства	должен посещать лекции. He had to do it again. Ему пришлось сделать это заново. We are to meet at 6 p.m. Мы встречаемся в 6 часов вечера. You were supposed to prepare it.Ты должен был приготовить это. I am obliged to help him. Я обязан помочь ему.

Примечания:

1. Модальные глаголы не имеют форм инфинитива, не изменяются по лицам, не имеют многих форм, свойственных английскому глаголу. После модальных глаголов инфинитив употребляется без частицы *to*, кроме ought to).
2. Модальные глаголы образуют вопросительную и отрицательную формы без помощи вспомогательного глагола.
Can you do it? – No, I can't.
3. Эквиваленты модальных глаголов не только употребляются вместо соответствующих модальных глаголов, но они также восполняют недостающие временные формы модальных глаголов: в таблице эту функцию выполняют первые приведенные по списку эквиваленты.

EXERCISES

Ex. 1. Эквивалентами каких модальных глаголов являются следующие сочетания?

to be able to, to be obliged to, to have to, to be supposed to, to be to, to be permitted to, to be allowed to.

Ex. 2. Трансформируйте следующие предложения в прошедшее и будущее время, используя соответствующие указатели времени, и переведите их на русский язык.
Model:
The engineer must know all the properties of this material.
The engineer had to know all the properties of this material.
The engineer will have to know all the properties of this material.

1. You must use this equipment.

2. The scientists can test their new apparatus in the laboratory.
3. This plant can provide our research institute with a new type of fuel equipment.
4. This scientist may investigate new means of production.
5. Our scientific research laboratory must launch a new program this year.
6. New tyres of this plant can have the longer period of their durability.
7. He may use these reference books for his report.
8. Nobody can lift this heavy tyre.

Ex. 3. Переведите следующие предложения на русский язык.

1. The technologist is to solve practical problems.
2. The engineer is to integrate the work of the essential triangle.
3. The scientist has to design products, machines and production systems.
4. The technologist is to investigate the unknown.
5. The engineer must apply engineering tables and formulas in his work.
6. The pure scientist is to work in the area of applied science and research.
7. The engineer should apply his theoretical knowledge to practice.

Ex. 4. Прочитайте следующие предложения. Переспросите о происходящем действии и дайте отрицательный ответ на него. Обратите внимание на то, что модальный эквивалент *have to* образует вопросительную и отрицательную форму с помощью вспомогательных глаголов *do / does /did / will /.*

Model:

He had to meet this delegation of engineers from the Tver plant.
Did he have to meet the delegation of engineers from the Tver plant?
No, he didn’t have to meet this delegation from the Tver plant.

1. Our laboratory has to launch a new program this month.
2. The program should be debugged (отлажена) by our top specialists.
3. The scientist was allowed to take part in the conference on computer designing.
4. Everybody must be present at the lecture of Prof. Ivanov.
5. Student Smirnov is to defend his diploma project next month.
6. This new plant is to build only body fixtures.

PART II. ELECTRICAL ENGINEERING

TEXT 1. ELECTRICAL ENGINEERING AS A FIELD OF ENGINEERING

Pre-text exercises

Ex. 1. Переведите и запомните следующие словосочетания.

Fiber optics, distinctive features, direct current, alternating current, be concerned with, at high voltages, power losses, run at variable speeds, generate/ transmit / distribute power.

Ex. 2. Найдите в тексте английские эквиваленты следующих словосочетаний.

Быть связанным с, разработка и проектирование, системы генерации, передачи и распределения электрического тока, очень высокое напряжение, постоянный / переменный ток, частота электрического тока.

Electrical engineering is the largest and most diverse field of engineering. It is concerned with the development and design, application, and manufacture of systems and devices that use electric power and signals.

Among the most important subjects in this field are electric power and machinery, electronic circuits, control systems, computer design, superconductors, solid-state electronics, medical imaging systems, robotics, lasers, radar, consumer electronics, and fiber optics.

The field of electric power is concerned with the design and operation of systems for generating, transmitting, and distributing electric power. Engineers in this field have brought about several important developments since the late 1970s. One of these is the ability to transmit power at extremely high voltages in both the direct current (DC) and alternating current (AC) modes, reducing power losses proportionately.

Another is the real-time control of power generation, transmission, and distribution, using computers to analyze the data feedback from the power system to a central station and thereby optimizing the efficiency of the system while it is in operation.

A significant advance in the engineering of electric machinery has been the introduction of electronic controls that enable AC motors to run at variable speeds by adjusting the frequency of the current fed into them. DC motors have also been made to run more efficiently this way.

Vocabulary

diverse –разнообразный, отличный
consumer – потребитель
despite – не смотря на

ability – способность
voltage – электрическое напряжение
to reduce – уменьшать
loss – потери
significant – выдающийся
advance – продвижение, опережение
frequency – частота
adjust – регулировать
enable – включать, запускать (в работу)
feed(fed) – подавать эл. питание
run – зд. работать, функционировать

Text-based assignments

Ex. 1. Прочтите и переведите текст.

Ex. 2. Составьте *на английском языке* план текста, выделив основные его темы. План можно составить в вопросной, назывной или тезисной форме. Познакомьтесь с образцами планов.

План в вопросной форме.
1. What is electricity?
2. What is the function of electricity?
3. What are performance characteristics of electricity?

План в назывной форме.
1. The definition of electricity.
2. The main function of electricity.
3. Performance characteristics of electricity.

План в тезисной форме

1. Electricity is…
2. The main function of electricity is…
3. Performance characteristics of electricity are…

Ex. 3. Прочтите текст еще раз, разверните пункты плана и составьте реферат на английском языке.

Ex. 4. Сделайте краткое сообщение / презентацию по теме «Электроэнергетика».

Ex. 5. Прочитайте о системе заземления. Составьте три вопроса и задайте их в группе.

Safety Earthing System

The strength of current depends on both the voltage and the resistance in a circuit. A current of 50 mA is dangerous for a man and a current of 100mA and higher is lethal. Earthing system serves to protect attending personnel from electric shocks when voltage appears on parts that are normally dead. The risk of an electric shock decreases with decreasing voltage. In wet and hot atmosphere the risk of electric shock increases. The danger of an electric shock disappears provided the metal parts of an installations under voltage are connected with ground by means of safety earthing.

Ex. 6. Прочитайте диалог по теме «Как добраться до…?», составьте свой собственный, ориентируясь на достопримечательности Вашего города.

Asking the Way

A: Excuse me, could you tell us the short way to the Recreational Science Museum? We went astray.

B: Sure, I can. We are near Tver State Technical University now. It is not very far from here. I think it will take you about thirty minutes to get there from here. If you are in a hurry, you can go by bus. The bus-stop is at Chaikovsky Prospect.

A: And how can we get to Chaikovsky Prospect?

B: Go straight on, and then turn right. In two minutes you are at Chaikovsky Prospect.

A: What bus must we take?

B: Your bus is the 20.

A: At what stop do we get off?

B: You have to get off at Zheliabova Street. This bus stop is in front of the Recreational Science Museum.

A: And how long will it take us to get to the Recreational Science Museum by bus?

B: I think about ten minutes. I think the bus you need arrives every 10-15 minutes.

A: Thank you very much!

B: Not at all. Have a good time.

A: Many thanks.

TEXT 2. ELECTRIC POWER PLANTS

Pre-text exercises

Ex. 1. Переведите и запомните следующие словосочетания.

Electric power plant, high capacity, solar generator, solid fuel, solar heat, combustion engine, prime mover, diesel-engine, water-power, wind-electric, piston-type.

Ex. 2. Прочитайте и переведите следующие словосочетания, уделяя особое внимание переводу цепочек определений.

Small capacity hydroelectric power plant, diesel internal combustion engine, steam turbine plant, modern wind-electric power plant, prime mover energy, steam engine plant, diesel-engine plant, local power supply.

Electric power is generated at electric power plants. The main unit of an electric power plant comprises a prime mover and the generator which it rotates. In order to actuate the prime mover energy is required. Many different sources of energy are in use nowadays. To these sources belongs heat obtained by burning fuels, pressure due to the flow of air (wind), solar heat, etc.

According to the kind of energy used by the prime mover, power plants are divided into groups. Thermal, hydraulic (water-power) and wind plants form these groups.

According to the kind of prime mover, electric power plants are classed as:

a) Steam turbine plants, where steam turbines serve as prime movers. The main generating units at steam turbine plants are the turbogenerators. Steam turbine plants belong to the modern, high-capacity class of power plants.

b) Steam engine plants, in which the prime mover is a pistontype steam engine. Nowadays no large generating plants of industrial importance are constructed with such prime movers. They are used only for local power supply.

c) Diesel-engine plants, in them diesel internal combustion engines are installed. These plants are also of small capacity, they are employed for local power supply.

d) Hydroelectric power plants employ water turbines as prime movers. Therefore they are called hydroturbine plants. Their main generating unit is the hydrogenerator.

Modern wind-electric power plants utilize various turbines; these plants as well as the small capacity hydroelectric power plants are widely used in agriculture.

Text-based assignments

Ex. 1. Прочтите текст.

а) Скажите, на каких станциях можно вырабатывать электроэнергию, начиная словами *I think, in my opinion, in my view, to my mind.*

б) Скажите, как называются станции, вырабатывающие электрическую энергию, исходя из источника движущей силы.

в) Расскажите, в чем состоит сходство и различие паротурбинных, паропоршневых и дизельных установок.

г) В чем состоит сходство и различие в принципах работы паротурбинных и гидроэлектрических установок?

д) Эксплуатация каких из упомянутых электростанций наиболее, по вашему мнению, благоприятна для окружающей среды? Обоснуйте свое мнение.

Ex. 2. Составьте аннотацию *на английском языке*, используя следующие клише:

The abstract / article is taken from…
The title of the text / article is…
The author of the article is…
The text / article under review… (gives us a sort of information about…)
The subject of the text is…
At the beginning (of the text) the author describes / explains / touches upon / analyses / comments / characterizes / underlines / reveals / gives account of…
The article begins with the description of / a review of / the analysis of …
The article opens with…
Then (after that, further on, next) the author passes on to / gives a detailed analysis (description) / goes on to say that…
To finish with…(at the end of the article / in conclusion) the author depicts / describes / underlines that… / the author sums it all up (by saying…)…

Ex. 3. Прочитайте об энергетических ресурсах. Составьте три вопроса и задайте их в группе.

Energy Resources of Today

People are energy-rich today. Solar energy is considered to be a potentially limitless source of clean energy. The waters of the world contain potential fuel – in the form of a special isotope of hydrogen- deuterium. It is sufficient to power fusion reactors for thousands of years.

Ex. 4. Прочитайте диалог. Используйте русский и английский варианты, чтобы осуществить обратный перевод.

– Hi, John, glad to see you. Where are you going with such a heavy bag?	– Привет, Джон. Рад тебя видеть. Куда это ты направляешься с такой большой сумкой?
– Hi, George, nice to meet you too. This heavy bag is full of books and I'm carrying them to the University library.	– Привет, Джорж. Я тоже рад тебя видеть. Эта большая сумка полна книг, и я несу ее в университетскую библиотеку.
–Well, on foot. Why not take a bus?	– Пешком? А почему ты не сядешь на автобус?
– It's a fine day today. And then I usually walk to the University. It takes me about 20 minutes to get there and I'm always in time.	– Сегодня прекрасный день. В такие дни я обычно хожу в университет пешком. Это занимает у меня около 20 минут, и я всегда прихожу вовремя.
– Oh, it takes me three quarters to get here by bus. And buses start getting on my nerves.	– Мне требуется 45 минут, чтобы добраться туда на автобусе. Так что автобусы начинают действовать мне на нервы.
– Why don't you go by metro?	– А почему ты не ездишь на метро?
– It's not very convenient for me as there's no station near my place.	– Это не очень удобно, так как около моего дома нет станции метро.

GRAMMAR REVISION

6. Причастие (Participle)

Причастие – это неличная форма глагола, сочетающая в себе свойства глагола, прилагательного и наречия, выполняющая в предложении функции составной части сказуемого, определения и обстоятельства.

Причастие	Активный залог	Пассивный залог
Participle I Indefinite выражает действие, одновременное с действием	**V-ing** using Употребление: а) в позиции	**being V3** being used Употребление: а) в позиции

сказуемого предложения	прилагательного (Adj); перевод: использующий, использовавший (определение); б) в позиции наречия (Adv); перевод: используя (обстоятельство)	прилагательного (Adj); перевод: используемый, использующийся, который используется (определение); б) в позиции наречия (Adv), перевод: будучи использованным; когда (его) использовали (обстоятельство)
Participle I Perfect выражает действие, предшествующее действию сказуемого предложения	**having V3** having used Употребление: в позиции наречия (Adv); перевод: использовав, когда (он) использовал (обстоятельство)	**having been V3** having been used Употребление: в позиции наречия Adv; перевод: когда (его) использовали (обстоятельство
Participle II	-	**V3** used Употребление: а) в позиции прилагательного (Adj); перевод: используемый, использованный (опред.); б) в позиции наречия (Adv) перевод: когда (его) использовали (обстоят.)

При переводе Participle I и Participle II на русский язык следует помнить об их различии и сходстве.

Различие:

а) Participle I (-ing) соответствует русскому причастию действительного залога (глагольные формы, имеющие суффиксы -ущ, -ющ, -ащ, -ящ и др.);

б) Participle II (-ed, 3-я форма глагола) соответствует русскому причастию страдательного залога (глагольные формы, имеющие суффиксы -енн, -ем, -ат, -ят и др.).

Зависимый причастный оборот – это такой оборот, в котором перед причастием нет слова, обозначающего действующее лицо или

предмет, поэтому в придаточном предложении при переводе на русский язык следует повторить подлежащее английского предложения (если оборот играет роль обстоятельства) или ввести слово-заменитель *который* (если оборот играет роль определения). Приведем примеры и напомним, что союз (если его нет перед причастием) подбирается по смыслу исходя из контекста:

The idea can be pronounced true *if tested* by experience
Идея может быть объявлена правильной, *если она проверена* на опыте.

When speaking about the new projects, the lecturer showed a map (причастный оборот в начале предложения в функции обстоятельства на письме всегда выделяются запятой).
Когда лектор говорил о новых проектах, он показывал карту.

Mercury is used in barometers, *having* a great specific gravity.
Ртуть используется в барометрах, *так как она имеет* большой удельный вес.

A barometer is *an instrument measuring* atmospheric pressure.
Барометр – это *прибор, который измеряет* атмосферное давление.

Независимый причастный оборот практически является самостоятельным предложением, имеет собственное подлежащее, всегда выделяется запятой. На русский язык переводится придаточным предложением с союзами. Если независимый причастный оборот стоит в начале предложения, то он вводится союзами: *так как, хотя, когда, если, после того как* и др. Если же он стоит в конце предложения, то в русском переводе такого оборота придаточное предложение присоединяется к главному сочинительными союзами типа *причем, а, и, но*.

The choice *having been made*, all the other alternations have been rejected.
После того как выбор *был сделан*, все другие возможности были отвергнуты.

These data must be taken into account, the effect of interconnections *being* by no means negligible.
Эти данные должны быть приняты во внимание, *причем* эффектом взаимосвязи ни в коем случае нельзя пренебрегать.

EXERCISES

Ex. 1. Переведите предложения на русский язык, обращая внимание на Participle I.

1. Designing new electrical supply systems we can use electronic computers.
2. We were demonstrated a new operating computer.
3. Having finished the experiment the electrical engineers started a series of new

tests.
4. This procedure was dropped, having given low yield of end products.
5. Algol is a system being developed and intended to become a universal programming language.
6. The experiment having been made, everybody was interested in the results.
7. The approach being based on mathematical methods is concerned with structural considerations.
8. Having introduced a purely mathematical definition of a system, let us now make precise another intuitive concept – that of a process.
9. Having taken everything into consideration he decided not to go there.
10. Having been employed abundantly in many industrial processes electronic computers show a notable example of progress contributing to the development of industry.

Ex. 2. Переведите предложения, обращая особое внимание на Participle II.

1. Error foreseen in the electrical supply systems is half avoided.
2. The results obtained by electrical engineers disagreed with earlier data.
3. Statements, in turn, are strings of symbols from a given alphabet, composed of letters, digits and special characters.
4. The set of basic operations provided is not, in general, suited to the execution of commonly needed procedures.
5. The strategies available in the dynamic situation are complicated functions of information received and actions undertaken in the preceding stages.
6. Syntax is another major difference, as indicated in the proceeding paragraphs.
7. Nearly all the assembly line problems as documented in the literature were solved by this method.
8. Science accumulates examples foreseen and verified through practice.
9. A natural consequence of such behavior should be decreased time for problem solution.
10. Once designed and if designed properly a relational database is very flexible.
11. The difficulties posed by this problem are generally recognized.
12. We also discuss experiments connected with some related questions.

Ex. 3. Переведите предложения, выделяя независимый причастный оборот.

1. A new technique having been worked out, the yields rose.
2. A very basic syntax is used with assembler language, with each line of coding being composed of two basic files.
3. There being an admixture in the parent compound, the overall yield proved to be low.
4. Equation 22 is simply a rearrangement of Equation 20, with summation substituted for integration.
5. Several extensions of the basic model having been made, we shall pursue the dynamic programming approach.

6. With the structure of various companies being different, the model is often inadequate in each particular case.
7. With the question of representing information settled, the major design question becomes one of logic operations.
8. Some scientists do not distinguish between pure and applied mathematics, the distinction being, in fact, of recent origin.
9. The process was over, with many aspects of the problem left unsolved.
10. Computers are considered as the answer to automatic production, with the other problems treated as peripheral in nature.

Ex. 4. Раскройте скобки и поставьте глагол в нужную видовременную форму.

1. He (*to like*) physics and mathematics when he (*to be*) at school.
2. Let's try to answer questions which you (*not to ask*) yet.
3. Several famous scientists (*to make*) reports at the conference yesterday.
4. I already (*to see*) this device at the exhibition.
5. When you (*to discuss*) this problem with our chief engineer? – We (*to discuss*) it a few days ago.
6. Radical changes (*to take place*) in this country since then.

PART III. INVENTORS OF THE WORLD

TEXT 1. JAMES WATT

Pre-text exercises

Ex. 1. Назовите значения следующих интернациональных слов.

Technical, practical, experimental, models, apparatus, condenser, patent, reaction, turbine.

Ex. 2. Найдите в тексте английские эквиваленты следующих слов.

Мастерство, прибор, веха, ремонтировать, регулятор, манометр (прибор для измерения давления), последовательность, планетарная передача, ввести термин, футо-фунтов в мин.

James Watt was born in Greenock, Scotland, and was taught at home. Later he went to Greenock Grammar School.

His technical expertise seems to have been obtained from his father's workshop

and from early in life he showed academic promise. His early formal training was as an instrument maker in London and Glasgow.

Watt combined the expertise of a scientist with that of a practical engineer, for later he was not only to improve the heat engine but also to devise new mechanisms.

Watt was interested in making experimental models of steam engines and this marks a historical milestone in engineering development, for they were the first experimental apparatus purposely constructed for engineering research. Watt's early interest in steam arose from experience in repairing a model steam engine in 1764, and in 1765 he invented the separate steam condenser. In 1769 he took out a patent on the condenser in which steam came into direct contact with cold water. That was a milestone by which steam engineering reached its practical and usable form.

In 1784 he took out a patent for a reaction turbine at a time when continental engineers were only considering similar approaches. An improved centrifugal governor was to follow in 1788 and a pressure gauge in 1790.

In the development of the steam engine James Watt represents the perfecting of a sequence of stages beginning with the Newcommen engine and ending with the parallel motion and sun/planet gearing.The latter is said to have been invented by W. Murdock but patented by Watt.

In the scientific field Watt's finest memorial, apart from steam engines, is his establishment of the unit of power – the rate of doing work. He coined the term horsepower (hp), one horse being defined as equivalent to 33,000 ft lb/ min.

James Watt died in 1819 in Heathfield, after a life of incomparable technical value. Later, a statue to Watt was placed in Westminster Abbey.

Text-based assignments

Ex. 1. Ответьте на следующие вопросы по содержанию текста.

1. Where was James Watt born and taught?
2. What was marked as a historical milestone in engineering development?
3. What kind of a condenser did he invent in 1769?
4. Who coined the term horsepower (hp)?

Ex. 2. Преобразуйте следующие предложения в предложения со сказуемым в страдательном залоге.

1. Watt started engine manufacturing in 1870.
2. The scientist named his device steam governor.
3. In 1781 Watt produced a rotary-motion steam engine.
4. Watt compared his device to a horse.

Ex. 3. Заполните следующую таблицу, используя полученную информацию из текста.

Time	Watt's activity and its results
1761	repairing a model steam engine
1765 1769 1784 1788 1790	

Ex. 4. Прочитайте о неисправностях электродвигателя и способах их устранения. Составьте три вопроса и задайте их в группе.

Faults of Motors and Ways of their Repair

Motors may have different faults. A faulty motor does not start, or, when it is started, it operates at an excessive speed. Its brushes may spark and its windings and the commutator may be overheated and burnt. Besides, a motor may produce an abnormal noise, etc. All these and other faults should be detected and repaired. In case the motor does not start it may have different faults (see the table).

Table 1. Faults of Motor.

Possible causes of faults	Ways of repair
Fuses are faulty.	Replace the fuses.
Motor is overloaded.	Reduce motor load.
Circuit in armature winding has an open.	Repair the armature winding.
In case the motor, when started, stops:	
Rheostat is shorted.	Check the rheostat and repair it.
Rheostat switches from one position to another.	Slow down operation of rheostat handle.

Brushes may spark in case:	
Motor is overloaded.	Check the rheostat and repair it.
Brushers are in poor condition.	Replace the brushes.
Pressure is low.	Adjust the pressure.
Pressure is excessive.	Adjust the pressure.
In case the armature winding is overheated	
Motor is overloaded.	Remove the overload.
Ventilation fails to operate properly	Check for slowing down the speed of the motor.
In case of abnormal motor speed	
Motor is overloaded.	Reduce the load.
Rotor circuit has poor contact.	Repair the shorting mechanism.
In case the rotor brushes against stator:	
Rotor brushes against stator.	Adjust air gap.

Ex. 5. Закончите диалог между начальником цеха (a foreman) и студентом Вашего факультета (a student from your department) во время летней производственной практики и разыграйте его в парах.

F.: Have you read the Operation Manual?

S.: Да. Теперь я знаю последовательность операций для приведения приспособления в действие (for putting the appliance into operations).

F.: Are you sure you can handle the appliance?

S.: Не вполне. Но мне кажется, что я могу включить его и выключить (switch it on and off) .

F.: Could you regulate it during its operation?

S.: Пожалуй, не смог бы (I doubt). Но я смог бы проверить правильность работы приспособления. Требует ли приспособление специального ухода (special maintenance)?

F.: No. Some parts require periodical cleaning. It is necessary to see to the prevention of overheating.

S.: Понятно. Это значит, что не требуется предпринимать специальные меры, чтобы обеспечить надлежащий уход за приспособлением.

F.: Right you are! The best maintenance is to adhere to the Operation Manual".

S.: О, да. Думаю, никто не повернет ручку по часовой стрелке (turn the

handle clockwise), если стрелка указывает, что ее нужно вращать против часовой стрелки (counter-clockwise).

TEXT 2. FARADAY PUTS ELECTRICITY TO WORK

Pre-text exercises

Ex. 1. Назовите значения следующих интернациональных слов.

Electrical, problem, motor, generator, dynamo, modern, starting motor, battery, electrolysis, telegraph, telephone, to start, to illuminate.

Ex. 2. Найдите в тексте все словосочетания с прилагательными electric и electrical и переведите их на русский язык.
Например: electric motor – электродвигатель.

Ex. 3. Найдите в тексте английские эквиваленты следующих словосочетаний.

Обобщить работу, привести работу в порядок, получать электрический ток, запустить двигатель, перезарядить аккумуляторную батарею, снабжать электроэнергией, открыть закон, изобрести электрическое освещение.

Ex. 4. Прочитайте текст и определите, в каком абзаце (1, 2, 3) обобщается значение работ Фарадея и каким образом значение его работ оценивается.

1. Michael Faraday, who was born in 1791 and died in 1867, gathered together and set in order all the work of the scientists who had worked on electrical problems before him.

2. In 1823, he discovered how to make an electrical motor. In 1831, he built the first generator, then called dynamo. The modern car has both a starting motor and a generator. The starting motor draws electric current from the car battery to start engine. The generator is driven by the engine to recharge the battery and to furnish electric power for all the electrical conveniences in the car. In 1833, Faraday discovered the laws of electrolysis.

3. The works of many other scientists were influenced by the discoveries made by Faraday. As a result of Faraday's work, Morse was able to invent the electromagnetic telegraph, Bell, the telephone and Edison the electric light. Their inventions have profoundly changed the lives of nearly everyone in the world. Thus, Edison's Congressional Medal of Honor certificate declared: “He illuminated the path of progress by his invention”.

Text-based assignments

Ex. 1. Выясните, соответствуют ли следующие предложения содержанию текста.

1. In 1823, he discovered how to make the first generator.
2. To start engine the electric current was drawn from the car battery.
3. The modern car has only a starting motor.
4. The electromagnetic telegraph was invented by A. Bell.
5. All the electrical conveniences in the car work with the help of the generator.

Ex. 2. Ответьте на следующие вопросы по содержанию текста.

1. When was Michael Faraday born?
2. Where does the starting motor draw electricity from?
3. How is the generator driven?
4. When did Faraday discover the laws of electrolysis?
5. Whose works are based on the discoveries made by Faraday?

Ex. 3. Прочитайте о ваттметре. Составьте три вопроса и задайте их в группе.

Wattmeter

A wattmeter is used to measure the value of power. It is connected to the circuit directly. A wattmeter consists of coils: two fixed coils and a coil which moves in the magnetic field produced by the fixed coils.

Wire used for the coils must have a high resistance; the fixed coils are in series with load, the moving coil is connected across the line in series with a resistance. When wattmeter is used, the readings on its scale show the value of power being used.

Ex. 4. Закончите диалог между студентом Вашего факультета Максимом и менеджером службы технической поддержки Антоном и разыграйте его в парах.

(Maxim calls) Secretary: Good evening, NewLink Company. My name is Anna. How can I help you?

Maxim: Hi! Could I speak with one of your support managers, Anton Razumovsky? Yesterday he promised me to solve the problem with my Internet connection, but it still doesn’t work.

Anna: Yes, just a second, I’ll put you through. Could you give me your name?

Maxim: My name is David, David Smith. My id number is #97327701.

Anna: Thank you for calling, Mr. Smith. Hold the line, please.

Anton: Anton speaking.

Maxim: Good evening, Mr. Razumovsky. My name is David Smith. I still have some problems with computer connection. Could you help me?

Anton: Good evening! Could you remind me some details of your problem?

David: Sure. About a week back, I just turned on my laptop and my Internet which usually connected automatically, just didn't work. My routing gateway was also turned on and all cables were perfectly in order, but, unfortunately, I couldn't go online. So, when I tried to connect the net, it became impossible again and again. And when I wanted to diagnose it, I just saw «The system couldn't find a failure». I took the power out for 10 minutes and plugged it back in. But it doesn't pick up a signal. Help me, please!

Anton: Ok, Mr. Smith. Plug the Internet cable into the laptop's connecter and check your Internet connection again by command in prompt: «ping site». Does it work now?

Maxim: Yes, it finally works! Oh, God! What was the matter?

Anton: I suppose that your routing gateway is broken and you should fix or change it. Can I do anything else for you?

Maxim: No, that's enough. I'll leave a positive feedback on your website. Thanks!

Anton: You are welcome! If you have any other problems with a new routing gateway, just call us and our support managers help you to rectify it. Have a nice time. Good bye.

GRAMMAR REVISION

7. Инфинитив (The Infinitive)

Инфинитив – это неличная форма глагола, называющая действие и сочетающая в себе свойства глагола и существительного. Формальным признаком инфинитива является частица *to*, которая в некоторых случаях опускается.

Значение	Форма	
Инфинитив	Активный залог	Пассивный залог
Infinitive Indefinite выражает действие, одновременное с действием сказуемого.	**to V** to use	**to be + V3** to be used
Infinitive Continuous выражает длительное действие, одновременное с	**to be + V-ing** to be using	

действием сказуемого		
Infinitive Perfect выражает, предшествующее действию сказуемого	**to have + V3** to have used	**to have been + to V3** to have been used
Infinitive Perfect Continuous выражает длительное действие, совершавшееся в течение отрезка времени, предшествовавшего действию сказуемого	**to have been + V-ing** to have been using	
Употребление	Функции	
1. В позиции существительного: а) перед глаголом; б) после глагола-связки; в) после глагола. 2. В позиции прилагательного 3. В позиции наречия	To study is important. (подлежащее) Our aim is to study. (именная часть сказуемого) He began to study at school. (часть глагольного сказуемого) He has the chance to study well. (определение) He went to Moscow to study at the University. (обстоятельство)	

Сложное дополнение (Complex Object)

После глаголов, выражающих желание, восприятие, предположение, приказание, просьбу, употребляется сложное дополнение (Complex Object). Существительное или местоимение в этом обороте обозначает лицо (или предмет), совершающее действие или подвергающееся действию, обозначенному инфинитивом. На русский язык сложное дополнение переводится дополнительным придаточным предложением.

Подлежащее	Сказуемое	Сложное дополнение (действующее лицо или предмет + его действие)
We	know	this student to translate technical literature
Мы	знаем,	что этот студент переводит техническую литературу
We	suppose	him to have worked in the library
Мы	полагаем,	что он работал в библиотеке.

He	wishes	the work to be done at once.
Он	желает,	чтобы работа была сделана тотчас же.

Сложное подлежащее (Complex Subject)

Сложное подлежащее состоит из существительного (или местоимения), выражающего субъект действия и инфинитива (с частицей to), обозначающего действие субъекта. Сказуемое в таких предложениях чаще всего употребляется в пассивном залоге, ряд глаголов употребляется в действительном залоге (seem / appear – казаться, prove / turn out – оказаться), также используются некоторые сочетания глагола *to be + прилагательное / наречие* (is likely – вероятно, is unlikely – маловероятно, is certain / is sure – несомненно, конечно, обязательно, наверняка). Перевод таких предложений, как правило, начинают со сказуемого безличным предложением.

Подлежащее	Сказуемое	Инфинитив
This student	is known	to translate special articles.
Известно,	что этот студент	переводит специальные статьи.
He	was said	to know several languages
Говорили,	что он	знает несколько иностранных языков

Модальные глаголы с инфинитивом в форме Indefinite и Perfect

1. Infinitive Indefinite. Если в составе сказуемого за модальным глаголом используется смысловой глагол в инфинитиве, имеющем форму Indefinite, то это значит, что действие этого смыслового глагола еще может или должно произойти, например:
Some corrections must be made in the program (be made – Indefinite Infinitive).
В программе должны быть сделаны некоторые исправления.

This route may be followed in reactions 4, 5, 6.
Этот метод можно использовать в реакциях 4, 5, 6

2. Perfect Infinitive. Если за модальным глаголом следует инфинитив в перфектной форме, то этот модальный глагол передает значение предположения, возможности, вероятности того, что какое-то действие уже произошло (об этом говорит перфектная форма инфинитива). В этих случаях модальные глаголы следует переводить словами *должно быть, возможно, вероятно*, а смысловой глагол ставить в прошедшем времени.

Some mistakes must have been made in the program (have been made – Perfect

Infinitive).
Должно быть (вероятно), в программе были допущены некоторые ошибки.

This route may have been followed in reactions 4, 5, 6.
Возможно, этот метод был использован в реакциях 4, 5, 6.

3. Если Perfect Infinitive стоит после глаголов could и might, то в этом случае выражается небольшая уверенность в том, что действие произошло, например:

Objects of stone might have been traded over considerble distances.
Возможно, что изделия из камня вывозились для продажи на значительные расстояния.

Judging from its position the lable could have belonged to level II.
Судя по его положению, возможно, что этот ярлык относился к уровню II.

4. Если инфинитив в форме Perfect следует за модальными глаголами should, ought, need, то это значит, что действие, которое должно было иметь место (в прошлом), не произошло, например:

He ought to have attended the meeting.
Ему следовало бы присутствоватъ на собрании (но он не присутствовал).

System problems that exist today should have been solved a year or two ago.
Системные проблемы, которые существуют сейчас, должны были быть решены год или два тому назад.

This line should have been put into operation long ago.
Эту линию давно нужно было сдать в эксплуатацию (но этого не было сделано).

They need not have carried out the test once more.
Им не нужно было проводить проверку еще раз (но они провели).

EXERCISES

Ex. 1. Переведите предложения, обращая внимание на функцию инфинитива.

1. A small computer company announced a computer small enough to set on a desktop and powerful enough to support high level language programming.
2. To construct an experiment of this kind seems nearly impossible.
3. We attempted to carry out this investigation.
4. To perform this work one must have all the necessary equipment.
5. Rotation spectra can be used to measure bond lengths.
6. With these conditions there are also opposing factors to be considered.
7. To judge by the results obtained, the postulate of these workers proved correct. 8. In order to demonstrate the effect Table 1 is given.

9. Our purpose here is to attempt to give an answer to the unsolved problem outlined at the outset.
10. Two numbers– latitude and longitude, for instance, are enough to fix your position.
11. The important thing is to understand what you are doing, rather than to get the right answer.
12. The operations are efficient enough to have little effect on the speed of the simulation.
13. Also, the programs to be verified will have to be well-constructed, to make the job easier.
14. To handle these conditions results as derived in section 1 are needed too.
15. He felt that the only thing to do was to study their methods and ideas.
16. These conflicting views suffice to indicate the complexity of the problem.
17. To solve the problem will justify all the costs.

Ex. 2. Переведите предложения, обращая внимание на глагол-сказуемое, оборот Complex Object и форму инфинитива.

1. It would be very nice if one could have a computer do the thinking, have a computer make the decisions and have a computer do the scheduling.
2. If you allow yourself to be victimized once, you will be victimized again.
3. You may lead a horse to the water, but you cannot make him drink.
4. He permitted the treasure to be returned to the people.
5. One intriguing approach is to get the computer play games against itself.
6. The pulse method enables thermodynamic equations to be formulated in a simple manner.
7. The technique permitted problems to be solved that had been regarded as intractable.
8. This sequence causes digitized images to be stored in core memory.
9. If we can get the student to ask, “Why?” instead of just “What?” we will have made an essential step in his education.
10. We are interested in forcing the student to make his own decisions from a wide range of choices.

Ex. 3. Переведите предложения, содержащие оборот Complex Subject.

1. The optimizer is expected to be the determining factor.
2. However, the common practice of designing such devices has been shown to be inadequate.
3. The conditions seem to have been poorly chosen.
4. The product has been proved to affect the overall yield.
5. This investigation is likely to produce good results.
6. The above decision making is certain to proceed smoothly.
7. He is apt to succeed in solving this problem.
8. This development of such a unit is unlikely to be a success.

9. Some solutions seemed promising but all were incomplete or fallacious.
10. Servo-loop instability has not proved to be a problem with a properly set-up system.
11. All parameters of the problem can be assumed known.
12. Hardly any aspect of economic life is likely to be unaffected, or is likely to remain unaffected by automation.
13. The concepts of presupposition thus seem to be being squeezed out of theoretical existence.
14. The rate constant does not appear to be much affected.
15. While seemingly trivial, this preliminary review proved of vital importance.

Ex. 4. Переведите предложения, обращая внимание на модальные глаголы с инфинитивом в перфектной форме.

1. The requirement may have been met in the previous experiment.
2. This intrinsic theorem may have been proved centuries ago.
3. His name might have been added to the list.
4.The host cells must have been growing in an appropriate physical and chemical environment.
5. This must have given rise to the molecule changing its configuration.
6. Sometimes he worked later than he ought to have done.

7. From the early times, the development of the mathematics of number must have given rise to philosophical puzzlement.
8. It should have been the duty of the Senate to hand the document at once.
9. For a start some delimitation, however tentative, must have been indispensable. 10. Failure to do this may have had unfavorable effects on growth in the past.

Ex. 5. Переведите предложения, обращая внимание на глагольные формы.

1. All means of production have been recently modernized in this field.
2. Sixteen specialized plants including the first section of a plant in Cieboksary for the manufacture of heavy-duty tractors for melioration and construction work had been put into operation by the end of 2015.
3 The development in all fields of science and technology has always been marked by a desire to advance man’s potentialities in all directions.
4. Of late great attention has been paid to have materials whose properties can be changed and controlled.
5. Every tool, machine and material used by the engineer to accomplish his purpose stems directly from machine-tools or has been evolved from machines which themselves were produced by machine-tools.
6. All these components have been developed into a complicated mechanism, detailed drawings have been made of all component parts.

Ex. 6. Составьте предложения, используя следующие формы глагола.

1. ...has worked out... 2. ...is studying... 3. ...was being developed... 4. .has been made... 5. ...works... 6. ...has manufactured... 7. ...will be produced... 8. had been finished... 9. ...will have discovered... 10. ...have been developed... 11. ...was referred to... 12. ...has been determined...

PART IV. MY SPECIALITY

TEXT 1. MY FUTURE PROFESSION

Pre-text exercises

Ex. 1. Определите части речи и назовите значения следующих слов.

Electricity, electrical, electrification; to practice, practical, practically; mechanical, mechanic, mechanics; efficient, efficiently, efficiency; to prefer, preference, preferable, preferably; agriculture, agricultural; to equip, equipment, to operate, operator, operation, to maintain, maintenance, to differ, difference, different; to vary, variation, various, to automate, automation, automatic, automatically, to install, installation; to transmit, transmission.

Ex. 2. Соотнесите английские и русские эквиваленты.

electrical engineering	электротехника
automated control systems	общетехнические предметы
electrical circuits	электроэнергия
general engineering subjects	автоматизированные системы управления
means of control	средства управления
automated electrical drive	автоматизированный электропривод
electrical power	электрические схемы
electrical supply	электроснабжение
electrical engineer	электротехника
automated control systems	общетехнические предметы
electrical circuits	электроэнергия
general engineering subjects	автоматизированные системы управления
means of control	средства управления
automated electrical drive	автоматизированный электропривод
electrical power	электрические схемы

electrical supply электроснабжение

Ex. 3. Прочитайте и переведите следующие словосочетания, уделяя особое внимание переводу цепочек определений.

The control system, energy production, energy programme, high voltage source, first-class quality, room temperature, power supply line, normal operation conditions, production process, six-cylinder engine, long-distance power transmission, 100 per cent efficiency, electricity supply net-work, load dispatch control centre, air circulation system, energy service, research institutes.

Electricity is now used for many purposes. Electrical power can be transmitted over great distances with practically negligible loss. It can be converted from mechanical form to electrical and backward with almost 100 per cent efficiency. These two facts explain the preference for electricity in industry today. Modern machine-building plants, factories, mines, agricultural enterprises are equipped with various machines and devices, such as means of control, electronic computers, automated control systems. The operation of all these machines requires energy.

Electrical engineers are trained at the machine-building faculty. In the course of studies they learn to design and maintain automated electrical drive and different kinds of industrial installations as well as to control the electrical and energy service of enterprises.

The students study not only general engineering subjects but also fundamentals of electrical supply of industrial enterprises, electrical circuits and systems. A future specialist must be well versed in electrical equipment of power stations and substations, automation of electrical supply systems and maintenance of electrical installations.

The would-be electrical engineers acquire know-how and develop skills in electrical drive, electrical engineering, electrical machines and equipment while studying at the University Laboratories and having practical training at various enterprises of our town. After the graduation young specialist will work at research and design institutes, at industrial enterprises.

Text-based assignments

Ex. 1. Выберите подходящее по смыслу выражение.

1. The operation of means of control, electronic computers requires (electrical energy, electrical engineering).
2. Electrical power can be (transmitted, converted) over great distances.
3. The machine-building faculty trains (electrical engineers, electrical supply).
4. Future specialists acquire know-how and develop skills in (practically negligible loss, electrical engineering).
5. The students study not only general engineering subjects, but also fundamentals of electrical supply, practical training).

Ex. 2. Согласитесь или опровергните следующие высказывания, используя в речи следующие выражения:
to my mind, as far as I know, I think that, as for me, I don't quite agree with you.

1. Electricity has a limited sphere of applications.
2. Electrical energy is preferred in industry today.
3. The future electrical engineers must have sound training in general engineering subjects.
4. Great attention is paid to practical training of the students at various plants.
5. Our speciality is very important for the country's economy.
6. Our speciality is the most popular in our university.

Ex. 3. Прочитайте о реостате и ответьте на следующие за текстом вопросы.

Rheostat

A rheostat is a resistor whose resistance value may be varied. Thus, a rheostat is a variable resistor.

It is used to change the resistance of circuits, and in this way to vary the value of current.

A rheostat consists of a coil and a switch. Take into consideration that wire used for the coil must have a very high resistance. When a rheostat is used its terminals are connected in series with the load. The switch is used to change the length of the wire through which the measured current passes. The resistance may be changed to any value from zero to maximum. The longer the rheostat wire used in the circuit, the greater is the resistance.

1. What type of resister is a rheostat?
2. What is a rheostat used for?
3. What is the function of the switch?

Ex. 4. Прочитайте об электрическом напряжении. Составьте три вопроса и задайте их в группе.

Voltage Values

Voltages up to about 250 V are called low. The common electric lighting circuit operates either at about 127 or 200 V, and the voltage used on the main circuit of large houses is usually the same. One can get an electric shock, when one touches an uninsulated wire of such a circuit.

Voltages above 250 V are high voltages. They are used in industry. Medium – powered motors are usually operated at 380 V. Large motors are supplied by voltages of from about 500 up to 6,000 V.

Ex. 5. Расскажите о своей специальности.

TEXT 2. APPLYING FOR A JOB

Pre-text exercises

Ex. 1. Определите части речи и назовите значения следующих слов.

Application, specific, qualification, employer, applicant, section, relevant, reader, competitive, excellence, exceptional, employment, signature, salutation, job seeker, advertisement, automation, previous, appropriate, fresher, enclosure.

Ex. 2. Изучите информацию текста, которая Вам будет полезна при приеме на работу.

Time flies, and one day you will have to look for a job. The following is an example of a letter of application sent with a resume to apply for a job. Use this example as a guideline when writing your own job application cover letters.

Your letter should detail your specific qualifications for the position and the skills you would bring to the employer. Also see below for how to email your application letter.

What to include in Your Letter

As with all cover letters, the body of this job application letter is divided into three sections: the introduction, which details why the applicant is writing; the body, which discusses relevant qualifications; and the closing, which thanks the reader and provides contact information and follow-up details.

A. Job Application Letter Sample for a Fresher.

Tom Bolton

Dutch Crosslink Society

59, Dennis Street

Parker Ville, USA

tom.bolton@e-mail.com

Contact Number - (111) 222 7777

10/07/2015

Kelly Hampton

Human Resources Officer

Lantok Electrical Engineering Zone

18th B Downtown, Central Avenue,

Parker Ville, USA

Dear Miss. Hampton:
Re: Application for Electrical engineer position

I am a fresh undergraduate in Electrical Engineering from Darthmouth College. I came across an advertisement for the post of Electrical Engineer in Herald on 30th June, 2015.

I am highly focused and aim to begin and promote my career in the field of Electrical designing and automation. Being a fresher to this field, I would like to commence my career with your well-established and accredited company. It would be an immense pleasure for me if I assist your company in its various fields like trouble shooting, analytical power conduction, etc.

Looking forward for a positive response which would give me an opportunity to enhance and expand my career goals. In addition, I assure you of my expertise and complete dedication which will be an asset to your company. Please contact me at the above mentioned contact details as per your convenience.

Yours sincerely,

(Signature)

Tom Bolton

Enclosures:

Resume

Educational Certificates

Supplementary Certificates

B. Job Application Letter Sample for an Experienced Electrical Engineer.

Grace Kingsley

Haddock Tower Society,

114, Little Avenue,

New York, USA

grace.kingsley@e-mail.com

Contact Number - (444) 555 6666

10/07/2015

Adam Baleen

Human Resources Officer

Silverstone Electrical Engineering Systems

Perth's Avenue, Lane - 467, Downtown,

New York, USA

Dear Mr. Baleen:

The advertisement in New York Times on 28th June 2015, prompted me to apply for the post of Electrical Engineer at Silverstone Electrical Engineering Systems. I have a keen interest in joining the analytical engineering program at your Engineering Systems. I would like to be a member of your organization, as it is one of the best leading Electrical engineering systems company in USA.

I have earned a post-graduate degree in Electrical Engineering. In my previous projects I have assisted on multiple troubleshooting processes, complex engineering projects, etc. In addition, I have a ten years' experience due to which I can handle installation schedules and AutoCAD projects perfectly.

I hope that my work experience have caught your attention. In addition, I would like to assure you that I am extremely committed to my profession and I believe that I am an appropriate candidate for this post. Hope to get a reply from you on the provided contact details.

Yours sincerely,

(Signature)

Grace Kingsley

Enclosures:

Resume

Educational Documents

Additional Certificates

Experience Letter

Recommendation Letter

C. How to Send an Email Application Letter

If you're sending your cover letter via email, list your name and the job title in the subject of the email message. Include your contact information in your email signature, but don't list the employer's contact information. Skip the date, and start your email message with the salutation.

D. Curriculum Vitae (CV). Sample and Writing Tips.

When applying for certain positions in the US, as well as jobs internationally, you may be required to submit a curriculum vitae rather than a resume. A curriculum vitae, or CV, include more information than your typical resume, including details of your education and academic achievements, research, publications, awards, and more.

What to Include in Curriculum Vitae

A curriculum vitae, commonly referred to as CV, is a longer, more detailed synopsis than a resume. Your CV should be clear, concise, complete, and up-to-date with current employment and educational information.

The following is a curriculum vitae example for a job seeker in the field of electrical engineering. This CV includes employment history, education, competencies, skills and personal interests.

Electrical Engineer CV Example

Edward White

4, Delson Road

London, GB

Phone: 54-876-34

edward77@ycmail.com

Objective

I am looking for a good position in this field where I can use my skills and capabilities to the best effect. I possess effective organizational skills and the ability to work together with other people and produce the final output in a perfect way.

Professional Qualifications

2002 – 2005: Electricity Board, Electrical Engineer

Designed effective circuits and control systems for electrical management.

Solved complex projects using specialized engineering techniques and tools.

Introduced new methods of developing electrical systems.

2005: ElectroCom Ltd., Electrical Engineer

Met officials and higher administration to evaluate the working progress.

Completed asigned projects of managing electrical board systems and evaluation of connection lines from one part to another.

Education

1997-2000

B. Tech / B. E (Electrical), Engineering School.

2000-2002

M. Tech/ M.E (Electrical), Engineering School

Hobbies

Reading

Sketching

Text-based assignments

Ex. 1. Прочитайте и переведите еще одно заявление о приеме на работу. Напишите по образцу свое собственное.

To whom it may concern:

I venture to write you to inquire whether your Department may allow me a post-graduate course this year.

I am a graduate of the University of Alabama at Birmingham where I specialized in electrical engineering.

I enclose my data sheet and two references, I should be glad if you could consider my application.

Yours faithfully,
David Morgan.

Ex. 2. Переведите следующие словосочетания и используйте их при составлении резюме.

to be reliable	to be professional	to be patient
to be well-organized	to be hardworking	to be sensitive
to be intelligent	to be honest	to be practical
to be adaptable	to be ambitious	to be independent
to be flexible	to be experienced	to be romantic
to be loyal	to be responsible	to be punctual
to be energetic	to be communicative	to be sociable
to be friendly	to be modest	to be helpful

Ex. 3. Скажите, к какому виду информации принадлежат приведенные ниже отрывки.

– CV;
– Contract;
– Letter of apology;
– Letter of complaint.

1) ……..

I am writing in connection with the above invoice for electrical equipment. We received the cables of two types yesterday.

Unfortunately, the coating of one of them is damaged.

We would be very grateful if you could change it as soon as possible.

…….

(From Company to Company by A. Littlejohn)

2)……

I have enclosed my resume, and I would like to schedule an interview. I'll call you next week.

I look forward to meeting you.

…….

(From Business Correspondence by L. Loughheeds)

Ex. 4. Расположите части делового письма в правильном порядке.

	Yours sincerely,
	Dear Mr Mortison,
	67, Upper Thames Lane, London, EC 4 V 3 AH
	Unfortunately, we have not yet received the cables OPTIMUM

	which were a part of our order. We would be grateful if you could deliver them as soon as possible or pay money back.
	D. Barker Manager
	May 17, 2013
	Mr G. Mortison P. Marlow& CO LTD 21, Bird Street London E1 6 TM

Ex. 5. Запомните правильное расположение и порядок заполнения конверта.

Марка

Имя и фамилия
отправителя
номер квартиры, дома,
название улицы,
город, штат, почтовый
индекс,
страна

Имя и фамилия ***получателя***
номер квартиры, дома, название
улицы,
город, штат, почтовый индекс,
страна

Ex. 6. Соотнесите информацию на конверте с ее объяснением ниже.

(1) Design Plus, Co
55 (2) Stevenson Road
(3) San Francisco, CA 94015

(4) Mr. P.T. Vitale
(5) Mutual Insurance Company
33 South Street
New York, (6) NY 3476

_____the street name in the return address
_____the town the letter comes from
_____the sender's name
_____the addressee
_____the addressee's company name
_____the ZIP Code in the mailing address

Ex. 7. Прочитайте и переведите текст собеседования о приеме на работу, по аналогии составьте свой собственный диалог.
Job Interview

Employer: Good morning! How are you?

Candidate: Fine, thank you very much.

Employer: We made this appointment to speak about your personality traits and your professional skills. Please, tell us about yourself.

Candidate: I`m a very friendly person. Love to people helps me at solving different problems. I am responsible and diligent. I`m really good at working with personal computers and I`m very interested in designing electrical systems. When I was a university undergraduate I was twice awarded the second prize in the machine tools design competition.

Employer: Can you explain us, why should our company hire you?

Candidate: I can work very well with other people, because I`m a real team player. My qualification and professional skills help me to get any job done.

Employer: You mean you have never had a confrontation with your colleagues at your last place of work?

Candidate: No I haven`t. I always resolved difficult problems without confrontation. I`m a very hard worker.

Employer: Tell us about your main negative and positive traits.

Candidate: I am outgoing optimist. I like people and I enjoy being around them. What about my negative traits… Well, I like to discuss the newest gadgets with my friend Paul very much, because they are a very important part of my life. Often we are fully unmindful of time and depress our relatives.

Employer: Maybe, this side of your character exercises significant influence on your private life but it cannot be bad for your professional abilities.

GRAMMAR REVISION

8. Герундий (Gerund)

Герундий – это неличная форма глагола, выражающая процесс действия и сочетающая в себе свойства глагола и существительного.

Герундий	Активный залог	Пассивный залог

Gerund Indefinite выражает действие, одновременное с действием сказуемого	**V-ing** using	**being V3** being used
Gerund Perfect выражает действие, предшествующее действию сказуемого	**having V3** having used	**having been V3** having been used
Употребление	Функции	
1. В позиции существительного (N): а) перед глаголом; б) после глагола без предлога; г) в позиции после глагола-связки. 2. В позиции прилагательного (Adj). 3. В позиции наречия (Adv).	a) *Reading* is my hobby, (подлежащее) b) I like *reading*, (прямое дополнение) c) I am fond of *reading*, (предложное дополнение) d) My hobby is *reading*, (именная часть сказуемого) e) There are different ways of *reading*, (определение) f) After *reading* the book he went to bed. (обстоятельство).	
Способы перевода	Примеры	
1. Существительное 2. Инфинитив 3. Деепричастие 4. Придаточное предложение	*Reading* is useful. *Чтение* – полезно. He finished *reading* the book. Он закончил *читать эту книгу.* *After reading this book* he gave it to me. *Прочитав эту книгу*, он дал ее мне. I thanked him for *giving me this book.* Я поблагодарил его за то, *что он дал мне эту книгу*	

9. Три *ing*-формы

Итак, читая английский текст, следует помнить, что существуют три части речи, имеющие окончание *-ing* (три *ing*-формы) – Participle I, Gerund и Noun:

Covering – Participle I – покрывающий (определение); покрывая (обстоятельство)

(by) covering – Gerund – путем покрытия (процесс)

(a) covering – Noun – покрышка, пленка, покрытие (предмет)

Герундий и отглагольное существительное требуют к себе особого внимания, так как часто они могут переводиться одинаково: существительным с окончанием *-ание, -ение.* Однако это не говорит об их

одинаковом значении. Поэтому при переводе следует, во-первых, отличить по формальным признакам герундий от существительного и, во-вторых, понять, почему автор использует в этом контексте, например, существительное, а не герундий:

а) если перед *ing*-формой есть предлог (но нет артикля) и после нее нет предлога *of,* то это герундий, и, значит, автора интересует процесс, действие в его длительности;

б) если перед *ing* -формой стоит артикль или после нее есть дополнение с предлогом *of,* то это отглагольное существительное и, значит, автора интересует сам факт, явление, предмет, а не процесс. Ср.:

There are different ways of solving a problem (solving – герундий, обозначающий процесс).

Существуют разные способы решения одной и той же проблемы.

The solving of the problem was approved (the solving – существительное, обозначающее факт).

Такой метод решения этой проблемы был одобрен.

EXERCISES

Ex. 1. Переведите предложения, определяя функции герундия в предложении.

1. Having access to the code was symbolic.
2. It may well be worthwhile considering the purpose of the investigation.
3. Search theory is potentially applicable to any searching process.
4. We have modified the network while retaining the SFS property.
5. Upon switching off the current the pressure dropped.
6. A committee has been established for the purpose of coordinating the nomenclature.
7. From here on, the theory starts evaluating the various alternatives of action in terms of the objectives.
8. It is worthwhile thinking over the effects I have just described.
9. Besides being useful in general interpolation technique, the procedure can be effectively used to approximate the first coefficients of F.
10. They were against postponing the meeting and for going on with the discussion of this problem.
11. We were all for starting the experiment at once.
12. It is no use speaking of it.
13. Operating conditions differed widely.
14. They could not help seeing the importance of the process.
15. The purpose of the method is determining system stability.
16. In one's search to understand what happens in this particular case, one cannot help being influenced by the history of quite another problem.
17. We succeeded in designing a flexible system.

Ex. 2. Переведите текст, обращая внимание на герундий.

Automation in the Research Process

Our goal should be automating the routine and thereby leave more time for the creative process.

With that word of caution, let's proceed by arbitrarily dividing research into three stages and examining each stage to find what functions of the research process might be automated without endangering creativity. Stage one includes the dreams, the ideas, the exploratory work, selecting the problem, setting the objective, testing technical feasibility, and searching the literature. Stage two involves planning the experiment, conducting the experiment, checking the alternates, data taking, and data evaluation. Stage three is the solution of the problem – drawing conclusions and making recommendations.

Although there is a great deal of creativity involved in stage one, there are also opportunities for automation. The burden of keeping up with the literature even in one's own restricted field is becoming heavier with each passing year. The mass of reading necessary to make a literature search has increased immensely. Advances in computer technology have made possible storing and quick retrieving essentially all the scientific literature.

Ex. 3. Переведите предложения, определяя, какой частью речи является ing-форма.

1. The theory also basically improves understanding of a queuing situation enabling better control.
2. Everything must have a beginning.
3. By this definition the following is meant.
4. We obtained these values in terms of the following formula.
5. This procedure is finding increasing use.
6. The problem, however, is in not dividing the structure finely enough.
7. The system architecture consists of several layers together with corresponding compiling modules.
8. The accumulated bulk of knowledge on how to run an automation process provides deep understanding of the mechanism of business.

Ex. 4. Переведите предложения, обращая внимание на значение глагольных форм.

1. Today, scientists are making diamonds in laboratories – diamonds that are needed in all kinds of industrial processes in making the machines that will remake nature into a better world for us to live in.
2. The Industrial Engineering Stream is intended for students whose interests lie mainly in the design and production side of mechanical engineering.

3. The Engineering Science Stream is meant for those who are analytically minded and who wish to study in depth the theoretical techniques used by engineers.
4. Each student design bureau is a self-contained organization which sometimes works on orders of various enterprises and institutions.
5. The engine is the source of power that makes the wheels go around and the car move.

Ex. 5. Переведите текст, обращая внимание на сказуемые в страдательном залоге.

Automation is often referred to as a new subject and its various aspects have not yet all been paid adequate attention to. Thus, for example, its commercial aspects have been only recently fully appreciated. Many problems arising from the impact of automation on national and world economy have not even been dealt with. It is, therefore, of paramount importance that general public should be informed both of its technological and social aspects.

There is hardly any aspect of human life that would not be affected by the changes that automation will bring about. Unfortunately, there is relatively little factual material available for analyzing the consequences of automation. Indeed, most economists are not yet fully aware of the problems that might arise in the process of automation. The effect of these developments on the trend of prices, capital investments and balance of payments has not yet been fully appreciated. These subjects should be adequately dealt with in foreseeable future.

10. Запятые в английском предложении

Правила постановки запятых в английском языке отличаются от этих правил в русском языке. Вот основные из них.

Запятая ставится:

1) для выделения вводных элементов предложения:

Big power stations, up to 4,800,000 kV, were being constructed.

2) для отделения независимого причастного оборота:

Measuring devices being widely used, their characteristics are constantly improved.

3) для выделения вводных придаточных предложений, если они сообщают дополнительные сведения или служат пояснением к главной мысли:

The insulation, that may be of air or a solid dielectric, separates the conductor from the axis.

4) после обстоятельственного причастного оборота в начале предложения:

When tested, the motor broke down.

5) перед словом *which,*если оно относится не к одному слову, а к предыдущей части предложения:

New plastic materials had been produced, which led to producing new types of isolators.

6) однородные члены предложения отделяются друг от друга запятой. Перед завершающим перечисление союзом *and* часто также ставится запятая:

Frequency is known to be the number of cycles, oscillations, and vibrations if a wave motion or oscillations in unit time, usually one second.

Common faults in a transformer are an open in the winding, a short between the primary and the secondary, and a short between turns.

7) если сложноподчиненное предложение начинается с придаточного:

Since she was a good specialist, they called her for some piece of advice.

Запятая не ставится:

1) если главное предложение стоит перед придаточным предложением:

Let me know if you are not sure about it.

2) перед союзами *but ,because, provided, as, since*…:

The engine cannot be restarted until its oil level is brought up to the correct level.

Поставьте запятые там, где необходимо.

1. Wattmeter is an instrument for the direct measurement of the power in watts of a circuit.
2. A few pounds of uranium can supply a medium- sized town with power it needs for a year.
3. Pierre Curie examined properties of crystals which led him to the discovery of piezoelectric properties.
4. The amount of heat depends on the current and the time it flows.
5. The device was connected to the cable under test which made it possible to detect the fault.
6. Since the energy sources of the world are decreasing it is necessary to turn to atomic energy.
7. Other factors being constant the current is known to be directly proportional to conductivity.
8. When being rubbed some substances produce electric charges.
9. A few pounds of uranium can supply a medium sized town with power it needs for a year.

10. This council sets standards for the design operation and maintenance of generating and transmission systems.
11. The instrument should be packed in a box which will prevent dust and dirt from getting inside its mechanisms.
12. When a wattmeter is used the readings on its scale show the value of power being used.
13. The deflection like that of an ammeter is proportional to the current flowing through the armature coil.
14. Direct current for battery charging for trams trolleybuses and electric locomotives is changed from alternating current by means of rectifiers.
15. Electricity is now used to operate lights pumps elevators power tools refrigerators air-conditioners radios TV sets industrial machinery and other kinds of equipment.

PART V. GENERAL GRAMMAR REVISION

Времена глагола

Ex. 1. Определите время и залог сказуемого и переведите предложения на русский язык.

1. The electron was discovered more than fifty years ago, but has never been seen.
2. In this type of receiver a crystal detector is followed by an audio amplifier.
3. Most electronic devices are enclosed in glass tubes from which the air has been pumped out.
4. Semiconductor devices which are being used to help electron valves reduce the size of instruments considerably.
5. The receiver has been developed to illustrate the principle of electronics.
6. A new steam boiler will be installed on a 131-foot tower and will have a heating surface of 1,300 square feet.
7. Pumps which are driven by sunshine energy have been developed in Italy.
8. One may be sure that by the end of our century some new discoveries in the field of X-ray and atomic energy application will have been made by scientists.
9. The lamp does not flash when the switch is being turned off.
10. The electric current reaches its maximum value when the magnetic lines are being cut most rapidly by the conductors.

Модальные глаголы

Ex. 2. Переведите следующие предложения на русский язык.

1. Ammeters are connected in series with the circuit in which the current is to be measured.

2. The valuable property of radiation possessed by the radioactive isotopes may be used for various purposes.
3. Only a half wave of the a-c power supply is able to pass through the tube.
4. The operator cannot have forgotten to switch the motor off, he is very careful.
5. Lead storage batteries must be kept fully charged if they are to stay in good condition.
6. Somehow the motor must “tell” the operator how fast it is turning, he may read its speed on a scale or may judge its speed by its noise.
7. The rating should depend not only upon the average coil heating but also upon the ability of the machine to transfer heat from the hot spots at the taps.
8. The image on the screen of a space TV set should be much better than the one we obtain from ordinary sets.
9. In the new model vacuum tubes must have been replaced by semiconductors.

Причастие. Независимый причастный оборот.

Ex. 3. Определите формы и функции причастий. Переведите предложения.

1. A vacuum tube is a device consisting of a number of electrodes contained within an evacuated bulb.
2. Increasing the voltage across a resistor, we increase the current which flows through the resistor.
3. The heat produced per second depends both upon the resistance of the conductor and upon the amount of current flowing through it.
4. The voltage being increased, the field becomes strong enough to cause the electrons to produce additional ions by collision.
5. Part of the energy being changed into heat, not all the chemical energy of the cell or battery is transformed into electric energy.
6. While experimenting in their laboratory Pierre and Marie Curie discovered a new ray-shooting element-radium.
7. Two or more cells connected together constitute a battery.
8. Being subjected to radiation, various substances undergo radical changes of their properties.
9. When heated or subjected to strong electric charges, the cathode emits large quantities of electrons.
10. Being a good insulator, rubber is often used in cables.
11. Having conducted many experiments scientists proved that electricity, like matter, had an atomic character.
12. Having already made remarkable progress, radio and television continue to develop and to find wider and wider application in science, industry and agriculture.
13. When focused, the beam from the gun produces a small spot on the screen.

Герундий

Ex. 4. Определите формы и функции герундия. Переведите предложения на русский язык.

1. The high-voltage X-rays serve industry by helping to photograph thick metal objects.
2. Overheating the tubes greatly reduces the emission capability.
3. On taking the conductor out of the field the electrons will redistribute themselves so that the charges disappear.
4. Withdrawing the core decreases the amount of effective iron.
5. The grid is usually operated at a slight negative potential so that the electrons will pass through the grid without hitting its wires.
6. The process of converting a modulated radio frequency, called detection or demodulation, is essentially that of rectification.
7. Any conducting material may be heated merely by being placed close to an arc current.

Инфинитив

Ex. 5. а) Определите функции инфинитива и переведите предложения на русский язык.

1. To launch rockets a new type of fuel was needed.
2. The purpose of tension test is to determine the mechanical characteristics of a material.
3. The substance to be tested must be wet or in a solution. 7. To master a foreign language is important for a Bachelor of Science.

4. To master a foreign language is important for a Bachelor of Science.

5 To understand many parts of electronics, we must know how electricity behaves at higher frequencies.
6 This method of voltage control was the first to be used in connection with synchronous converters.
7. To know the quantity of energy present in a body is very important.

б) Определите инфинитивные обороты и переведите предложения на русский язык.

1. The temperature in the centre of the sun is believed to be 15 mln degrees Centigrade.
2. We know the Earth to be turning on its axis, moving around the Sun in its orbit.
3. It is difficult for an astronaut to control a rocket flying at high speed.
4. Previously we watched a time delay relay operating from batteries.
5. The orbit of Mars turned out to be an ellipse.
6. Nearly a month is required for the Moon to circle the Earth.

7. The instrument is not likely to be damaged, if all rules are followed.
8. It is possible for vacuum tubes to convert part of their energy into visible light.

PART VI. CONVERSATIONAL PHRASES

Meeting People and Parting	
Hallo, Ann. How are you?	Привет, Энн. Как дела?
Meet my wife	Познакомьтесь – моя жена
This is Bob	Это Боб. Знакомьтесь
Let me introduce you to…	Позвольте познакомить вас с …
Let me introduce … to you	Позвольте представить вам… (Позвольте познакомить вас с…)
(I'm) pleased to meet you	Рад знакомству
(It's) nice to meet you	Приятно познакомиться
We've met before	Мы (уже) знакомы
Nice to see you (again)	Рад вас видеть (снова)
How are things (with you)?	Как (у вас) дела?
How are you getting on with your book (picture, etc.)?	Как у вас продвигаются дела с книгой (картиной и т.п.)?
How's everybody at home? How is she feeling? How is your wife? So, so. Middling. Very (pretty) much the same Getting better / worse	Как поживает ваша семья? Как она себя чувствует? Как (себя чувствует) ваша жена? Ничего Средне. (Так себе) Так же (без перемен) Лучше / хуже.
(I'm) fine / I'm doing fine	У меня дела идут прекрасно
Not bad.	Неплохо
Not too good.	Не очень хорошо
I'm glad for you.	Рад за вас
Look who's here! It's long time since we met last. I haven't seen you for ages. I don't see much of him (her, etc.).	Смотри, кто пришел. Кого я вижу! Мы давно не виделись Не видел тебя сто лет Я его (ее и т. п.) редко вижу
(Excuse me,) I must be going.	(Извините), я должен идти
See you later.	Еще увидимся. (Я не прощаюсь)
See you soon.	До скорого
Hope to see you soon.	Надеюсь, скоро увидимся
Hope we meet again.	Надеюсь встретиться
See you tomorrow/ on Monday, at John's, etc.	До завтра / Увидимся в понедельник у Джона и т. п.

Keep in touch.	Давайте о себе знать / не пропадайте / звоните, заходите
I've got things to do.	У меня дела
I've got an appointment.	У меня встреча
I won't take up any more of your time.	Не буду вас задерживать.
It's been nice seeing you/ meeting you.	Было приятно увидеть (встретить) вас
I'll be missing you.	Буду скучать без вас
Keep well.	Будьте здоровы, не болейте
Take care of yourself.	Берегите себя
My best regards to everybody at home.	Передайте привет всем дома
Thanks	
Thank you, you've been very helpful	Спасибо, вы мне очень помогли
Thank you, anyway	Тем не менее, спасибо
Thank you for the pleasure of your company	Спасибо за компанию
Thank you for a nice party (a wonderful evening). It's been a pleasure	Спасибо за чудесный вечер, Я получил большое удовольствие
Thank you for coming	Спасибо, что пришли
Invitations, arrangements, offers	
How (What) about going to …?	Как насчет того, чтобы пойти…?
What about you (us, etc.)? Why not to go to …?	А вы (мы и т. п.)? Почему бы не пойти …?
What are you doing on the third (in the evening, tomorrow night, Saturday morning, etc.)?	Что вы собираетесь делать третьего числа (вечером, завтра вечером, в субботу утром и т. п.)?
Have you got anything to do on the fifth?	У вас есть дела пятого числа?
Are you engaged?	Вы заняты?
Where do we meet?	Где мы встретимся?
When do we meet?	Когда мы встретимся?
What time shall we make it?	На какой час мы договоримся?
Does it suit you?	Вас это устраивает?
Will it be all right for you if …?	Вас устроит, если …?
Shall I pick you up (at your office, etc.)?	Заехать /зайти за вами (на работу и т. п.)?
Shall I call for you?	За вами зайти (заехать)?
May I see you home?	Можно проводить вас домой?
Are you going my way? I'll give you a	Вам со мной по пути? Я вас

lift.	подвезу (на машине)
What's the occasion?	По какому поводу? Какое событие?
Can I help you?	Вам помочь?
Need any help?	Вам нужна помощь?
What can I do for you?	Чем могу помочь?
Leave it to me.	Предоставьте это мне
Shall I give you a lift?	Вас подвезти?
Am I in your way?	Я вам мешаю?
Look (here)	Послушайте. (Привлекая внимание)
That's all right with me	Меня это устраивает
Fine!	Прекрасно!
That suits me perfectly	Мне это очень удобно
That's settled!	Решено!
(That's a) good idea! I'd love to / I'll be delighted	Прекрасная мысль! С удовольствием
I'll be looking forward to it	Я буду с нетерпением ожидать этого
It would be very kind of you	Это было бы очень мило с вашей стороны
I'll be very thankful to you	Буду вам очень благодарен
Let me see …	Дайте подумать …
I'll leave a message for you (at home, at the office, etc.)	Я оставлю вам записку (дома, на работе и т. п.).
As you say	Как хотите. (Пусть будет по-вашему)
You're always welcome	(Мы) вам всегда рады
Nothing special. Why?	Ничего особенного. А что?
Sorry, I am engaged	К сожалению, я занят
I'm afraid I can't. Previous engagement	К сожалению, я не могу. Я в это время буду занят. (Я уже договорился на это время)
Yes, please Please do / Do, please	Да, пожалуйста Да, пожалуйста (сделайте это)
No, thank you / Please don't	Нет, спасибо / Не нужно этого делать
Don't bother. I'll manage	Не беспокойтесь. Я справлюсь сам
Don't bother. It's quite all right	Не беспокойтесь, вы мне не мешаете
Come over (to my place)	Приезжайте ко мне

Look me up (at home, at the office)	Заходите ко мне (домой, на работу)
I don't mind	Не возражаю
Apologies	
Apologize to Martin (your brother, etc.) for me.	Извинитесь за меня перед Мартином (братом и т.п.)
I hope I didn't hurt you	Надеюсь, я не ушиб вас (не сделал вам больно)
I meant well	Я действовал из лучших побуждений
That's (quite) all right	Ничего. Все в (полном) порядке
Not at all	Нисколько. (Совсем нет)
Never mind	Ничего. (Пусть это вас не беспокоит)
Forget it	Забудьте об этом / Не вспоминайте об этом
You needn't apologize. It's my fault	Вам нет необходимости извиняться. Это моя вина
You are not to blame	Вы не виноваты
No trouble at all!	Никаких проблем!
Don't be (get) cross with me	Не сердитесь на меня
Forgive me, please	Простите меня, пожалуйста
No harm done	Ничего страшного / Ничего не случилось

PART VII. TEST YOURSELF

Variant I.

1. The_____is one of the way in which Oxford and Cambridge differ from all the other English universities.
tutorial system
higher education
comprehensive school system
under-graduate

2. We've got a meeting in 10 minutes. Do I have to_____? – Yes, you do.
attract
attend
attain
alone

3. The mass of a body is defined as the_____of matter it contains.

quality
quantity
condition
measurement
4. A volume of space that is essentially empty of matter is called ...
capacity
container
amount
vacuum

5. Donald is so_____ in the laboratory. I think he should be a true scientist.
creative
creation
creatively
creator

6. Mr and Mrs Cooper and a friend of_____are coming to see us.
them
theirs
ours
their

7. I am afraid the problem is _____ than it seems.
much more complicated
much complicated
the most complicated
more less complicating

8. If you run_____two hares, you will catch neither.
for
after
behind
from

9. I gave him the book_____he might study the subject at home.
because
after
so that
though

10. The Prime Minister's Election_____soon.

will held
held
will beheld
will hold
11. He is known_____much attention to his work.
to pay
paying
having paid
paid

12. At last the decided to_____smoking.
give away
give in
give off
give up

13. You_____do it today. You can do it tomorrow morning.
shouldn't
can't
needn't
mustn't

14. Выберите реплику, наиболее соответствующую ситуации общения
Student A: I am going to the party.
Student B: _____!
– I wish you every happiness!
– Have a good journey!
– All the best!
– Have fun!

15. Выберите реплику, наиболее соответствующую ситуации общения
Student: Shall I read the text again for the next time?
Teacher: _____.
– It is out of the question.
– Yes, of course.
– Noting of the kind.
– You seem to know better.

16. Выберите реплику, наиболее соответствующую ситуации общения
Clerk: _____.
Customer: I would like to book two round trip tickets to Boston.
– Have a nice trip!

– May I help you?
– What do you want?
– What is the problem?

17. The term of the_____has a maximum duration of five years.
Paliament of New Zealand
United States Congress
Paliament of Australia
British Paliament

18. Wall Street, the symbol of the US financial power, is located in ...
Chicago.
Los Angeles.
Washington.
New York.

19. The Canadian national currency is the ...
Canadian dollar.
Canadian pound.
American dollar.
Euro.

20. An English physicist, mathematician, astronomer, who formulated the theory of universal gravitation is ...
Lord Kelvin.
Alexander Fleming.
Isaac Newton.
Charles Darwin

21. Прочитайте текст и выполните задания.

Renewable Energy

1. Renewable energy is energy generated from natural resources. In its various forms, it derives directly from the sun, wild, rain, tides, and geothermal heat. Renewable energy is derived from natural processes that are replenished constantly. Each of these sources has unique characteristics which influence how and where they are used.

2. The majority of renewable energy technologies are powered by the sun. The Earth-Atmosphere system is in equilibrium so that heat radiation into space is equal to incoming solar radiation, the resulting level of energy with the Earth-Atmosphere system can roughly be described as the Earth's "climate."

3. The hydrosphere absorbs a major fraction of the booming radiation. Most radiation is absorbed at low latitudes around the equator, but this energy is dissipated around the globe in the form of winds and ocean currents. Wave motion may play a role in the process of transferring mechanical energy between the atmosphere and the ocean through wild stress. Solar energy is also responsible for the distribution of precipitation which is tapped by hydro electric projects, and for the growth of plants used to create biofuels.

4. While most renewable energy projects and production is large-scale, renewable technologies are also suited to small off-grid applications, sometimes to rural and remote areas, where energy is often crucial in human development. Some renewable energy technologies are criticized for being intermittent or unsightly, yet the renewable energy market continues to grow. Climate change concerns, coupled with high oil prices, peak oil, and increasing government support, are driving increasing renewable energy legislation, incentives and commercialization.

(Encyclopedia Wikipedia)

1) Определите, какое утверждение соответствует содержанию текста.
The Earth "climate" constitutes the resulting level of energy solar radiation.
All renewable energy is generated by the Sun.
Sources of renewable energy have much in common.
Some renewable energy technologies being criticized, the renewable energy market is increasing.

2) Определите, какое утверждение не соответствует содержанию текста.
Independently of location, renewable energy projects and production are practicable.
Natural processes are the sources of renewable energy.
Every source of renewable energy has its designation.
Renewable energy needs to be constantly replenished.

3) Ответьте на вопрос.
What power do most renewable energy technologies use?
Natural processes provide all renewable energy.
People put into practice most renewable energy projects and production.
The hydrosphere absorbs a major fraction of the incoming radiation.
The sun is power for the most renewable energy technologies.

4) Укажите, в какой части текста(1, 2, 3, 4) содержится ответ на вопрос
Why is renewable energy valuable?

5) Укажите, какой части текста (1, 2, 3, 4) соответствует следующая идея:

Renewable energy sources are interrelated.

6) Определите основную идею текста.
Renewable energy is vitally important for people.
The Earth climate is affected by the incoming solar radiation.
The renewable energy technologies promote people not to live everywhere they want.
Renewable energy is the kind of energy which is naturally replenished.

22. Расположите части делового письма в правильном порядке.
A) Mr R. Morrison
P. Marlow& CO. LTD
21 Bird Street
London E l 6 TM

B) 67, Upper Thames Street,
London, EC4 V 3AH

C) Unfortunately, we have not yet received the computers "OPTIMA 133" which were a part of this order. We would be grateful if you could deliver these as soon as possible or refund our money.

D) Dear Mr Morrison,

E) Yours sincerely,

F) 17 May 2009

G) D. Barker

Manager

1	2	3	4	5	6	7

23. Определите, к какому виду делового документа относится представленный ниже отрывок.

I wish to complaint in the strongest possible terms about the treatment I received from the member of your stuff. I was billed the wrong amount of money and when I pointed to the fact I was rudely interrupted.

Letter of complaint

Resume
Memo
Inquiry letter

24. Соотнесите информацию под определенным номером на конверте с тем, что она обозначает.

(1) Horizons Books Inc.
(2) Harrison Road
Cleaveland, Ohaio 368 79
(3) Canada

(4) Victor Sharp, Personal Manager
Ernest & Young
(5) 23 Rachelie Avenue
Dallas Texas (6)14336
USA

___the house number in the return address
___the addressee
___the ZIP Code
___the sender
___the addressee`s house number
___the country the letter comes from

26. Выберите слова или словосочетания для заполнения пропусков так, чтобы они отражали особенности оформления служебной записки:

To : (1) Katharine Chu
From : (2) _____, Sales
Subject : (3) _____
(4)_____: 24 November 2015

I am writing to inform you of my intention to resign from G & S Holdings.
I would like to leave, if possible, in a month`s time on Saturday, 26 December. This will allow me to complete my current workload. I hope that this suggested arrangement is acceptable to the company.

Thank you for your support.

Stephen Yu.

Regional Manager
Stephen Yu
Notification of my resignation

Date

Variant II.

1. Заполните пропуск
_____ methods include lectures, tutorial and seminars.
Teaching
Innovative
Conferencing
Technological

2.Would you like a single or a _____ antenna?
suitable
double
vehicle
nice

3. The output of a generator can be used as an input to electric, hydraulic, or air_____.
rotor
flow
motor
current

4._____is a device which converts electrical energy to mechanical energy.
A turbine
An electric motor
A wheel
A piston

5. KVN (Club of the smart and the merry is one of the oldest forms of student _____.
entertainment
entertain
entertainer
entertainable

6. I wrote a list so that I wouldn't forget_____.
anything
something
some
nothing

7. I wrote a list so that I wouldn't forget_____.

anything
something
some
nothing

8. What is the_____ mountain in Europe?
most high
high
highest
more high

9. _____the morning we went to the museum.
On
–
At
In

10. _____ I were you, I would stop smoking
However
Since
Because
If

11. Alice said that her parents_____ in a week.
comes
will come
would come
have come

12. The train is reported_____ on time.
to be arrived
having been arrived
being arrived
to have arrived

13. It_____us what flight to choose.
depended
depended on
depended from
depended at

14. I got lost and_____ask the policeman the way.
should

must
may
had to

15. Выберите реплику, наиболее соответствующую ситуации общения (2).

Student: _____
Professor: Sure, just a minute.
– Help anybody!
– Can you give me a hand with the course work, please?
– Can you do anything?
– Would you mind assisting me with the course work, if you've got a moment?

16. Выберите реплику, наиболее соответствующую ситуации общения.

Employee: I can't come to work today. I've got the flue.
Boss: _____.
– Oh, well.
– Oh, I hope you will feel better soon.
– OK, see you tomorrow.
– Congratulations!

17. Выберите реплику, наиболее соответствующую ситуации общения.

Professor: Has anyone got questions?
Student: _____.
– What should I do?
– Could you explain what these terms mean?
– Hey, mister! What do these terms mean?
– When does this lecture finish?

18. St. Paul's Cathedral, the greatest monument and Wren's masterpiece, is situated in_____.

Liverpool
London
Oxford
Manchester

19. There are_____ stars on the USA flag.
51
50
47
49

20. There is_____on the official flag of Canada.

a red star
a red maple leaf
a green birch leaf
a number of stars and stripes

21. The famous person who didn't live in the USA is_____.
Walt Disney
William Shakespeare
Mark Twain
Bill Gates

22. Расположите части делового письма в правильном порядке.
A) Dear Dr. Carson:
B) Dr. Ralph Carson, 55 Chapel Street, Newton, Massachusetts 02160
C) 316 Anderson Road, Coral Gables, Florida 33134 May 16, 2004
D) I am writing in connection with your advertisement for the post of lab assistant in yesterday's the Daily.

1	2	3	4

23. Соотнесите информацию под определенным номером на конверте с тем, что она обозначает.

(1) Damon Printers. Inc.
101 Gould Street

(2) Wakefield, MA 01880
(3) USA

(4) Reservation Manager
Ritz Hotel
20 (5) Peace Square
Paris (6) P3571
France

...____the street name in the mailing address
____the sender's name
____the country the letter comes from
____the town the letter comes from
____the addressee
____the ZIP Code in the mailing address

24. Определите, к какому виду делового документа относится представленный ниже отрывок.

I have enclosed my resume, and I would like to schedule an interview. I will call you early next week. I look forward to meeting you.

(From Business Correspondence by Lin Lougheeds)

CV
Letter of application
Memo

25. Прочитайте текст и выполните задания.

Engineering

1. Engineering is the professional art of applying science to the optimum conversion of the resources of nature to the uses of humankind. The word *engine* is derived from the Latin root *ingenerare,* which means *to create*. The engines of war were devices such as catapults, floating bridges, and assault towers; their designer was the engineer, or military engineer. The counterpart of the military engineer was the civil engineer, who applied essentially the same knowledge and skills to designing buildings, streets, water supplies, sewage systems, and other projects.

2. The function of the scientist is to know, create and develop, while that of the engineer is to do. The scientist adds to the store of verified, systematized knowledge of the physical world; the engineer brings this knowledge to bear on practical problems. Engineering is based principally on physics, chemistry, and mathematics and their extensions into materials science, solid and fluid mechanics, thermodynamics, transfer and rate processes, and systems analysis.

3. Unlike the scientist, the engineer is not free to select the problem that interests him; he must solve problems as they arise; his solution must satisfy conflicting requirements. Usually efficiency costs money; safety adds to complexity; improved performance increases weight. The engineering solution is the optimum solution, the end result that is most desirable. It may be the most reliable within a given weight limit, the simplest that will satisfy certain safety requirements, or the most efficient for a given cost. In many engineering problems the social costs are significant.

4. Engineers employ two types of natural resources - materials and energy. Materials are useful because of their properties: their strength, ease of fabrication, lightness, or durability; their ability to insulate or conduct; their chemical, electrical, or acoustical properties. Important sources of energy include fossil fuels, wind, sunlight, falling water, and nuclear fission. Since most resources are limited, the engineer must concern himself with the continual development of new resources as well as the efficient utilization of existing

ones.

(Encyclopedia Britannica)

1) Определите, является ли утверждение *Thermodynamics is one of the basic parts of engineering*

– истинным
– ложным
– в тексте нет информации

2) Определите, является ли утверждение *Engineers employ material resources because they are unlimited*

– истинным
– ложным
– в тексте нет информации

3) Определите, является ли утверждение
Many engineering solutions should take into account social costs

– истинным
– ложным
– в тексте нет информации

4) Определите, является ли утверждение *The quality of work of a mechanical engineer is continually rising*

– истинным
– ложным
– в тексте нет информации

5) Укажите, какой части текста (1, 2, 3, 4) соответствует следующая информация:

Differences in the functions of scientists and engineers

6) Укажите, какой части текста (1, 2, 3, 4) соответствует следующая информация:

The origin of the term "engineer" and its meaning

7) Укажите правильный ответ на вопрос.

What is meant by engineering solution?

The solution is considered to be engineering if only engineers take part in solving arising problems.

The solution is considered to be engineering if it suggests applying new technological methods of production.

The solution is considered to be engineering if it is reliable, no matter how heavy it is.

The solution is considered to be engineering if it satisfies the requirements of efficiency, reliability and simplicity in the cheapest way possible.

PART VIII. TEXTS FOR INDIVIDUAL READING

Работа со словарем

Слова в словаре даются в их исходной форме: для имени существительного – общий падеж; для прилагательного и наречия – положительная степень (сравнения); для глагола – инфинитив (неопределенная форма).

Исходную форму слова мы устанавливаем, отбрасывая его грамматическое окончание. Это могут быть словоизменительные суффиксы -(e)s, -(e)r, -(e) st, -(e)d, -ing.

Как и русское, английское слово многозначно. В словарях обычно приводятся несколько значений слова. Иногда их количество весьма велико (к примеру, такие многозначные слова, как take, set, get, put). Наша задача – выбрать из данных значений то, которое соответствует контексту. Однако среди значений, данных в словаре, такового может и не быть! В этом случае необходимо самому найти нужное русское слово, осмыслить его значение в контексте. Если в словаре отсутствует производное слово, надо выбрать его корневую основу, отбросив суффиксы и приставки. К примеру, слово uselessness сосоит из трех компонентов: корня use (польза), отрицательного суффикса прилагательного -less и суффикса существительного -ness, имеющего абстрактное значение. При переводе получаем существительное «бесполезность, ненужность». Заметим, что значение отрицания в русском слове часто передается приставкой без-.

Text 1. Power Station

A power station (also referred to as a generating station, power plant, or powerhouse) is an industrial facility for the generation of electric power.

At the center of nearly all power stations is a generator, a rotating machine that converts mechanical energy into electrical energy by creating relative motion between a magnetic field and a conductor. The energy source harnessed to turn the generator varies widely. It depends chiefly on which fuels are easily available and on the types of technology that the power company has access to.

The first power station was the Edison Electric Light Station, built at 57, Holborn Viaduct, which started operation in January 1882. This was an initiative of Thomas Edison that was organized and managed by his partner, Edward Johnson.

A Babcock and Wilcox boiler powered a 125 horsepower steam engine that drove a 27 ton generator called Jumbo, after the celebrated elephant. This

supplied electricity to premises in the area that could be reached through the culverts of the viaduct without digging up the road, which was the monopoly of the gas companies. The customers included the City Temple and the Old Bailey. Another important customer was the Telegraph Office of the General Post Office but this could not be reached though the culverts. Johnson arranged for the supply cable to be run overhead, via Holborn Tavern and Newgate.
(1156 printed characters)

Text 2. Thermal Power Stations http://en.wikipedia.org/wiki/File:Dampfturbine_Laeufer01.jpg

In thermal power stations, mechanical power is produced by a heat engine that transforms thermal energy, often from combustion of a fuel, into rotational energy. Most thermal power stations produce steam, and these are sometimes called steam power stations. Not all thermal energy can be transformed into mechanical power, according to the second law of thermodynamics. Therefore, there is always heat lost to the environment. If this loss is employed as useful heat, for industrial processes or district heating, the power plant is referred to as a cogeneration power plant or CHP (combined heat-and-power) plant. In countries where district heating is common, there are dedicated heat plants called heat-only boiler stations. An important class of power stations in the Middle East uses by-product heat for the desalination of water.

The efficiency of a steam turbine is limited by the maximum temperature of the steam produced and is not directly a function of the fuel used. For the same steam conditions, coal, nuclear and gas power plants all have the same theoretical efficiency. Overall, if a system is on constantly (base load) it will be more efficient than one that is used intermittently (peak load).

Besides use of reject heat for process or district heating, one way to improve overall efficiency of a power plant is to combine two different thermodynamic cycles.
(1177 ch.)

Text 3. Cooling Towers http://en.wikipedia.org/wiki/File:RatcliffePowerPlantBlackAndWhite.jpg

All thermal power plants produce waste heat energy as a byproduct of the useful electrical energy produced. The amount of waste heat energy equals or exceeds the amount of electrical energy produced. Gas-fired power plants can achieve 50% conversion efficiency while coal and oil plants achieve around 30-49%. The waste heat produces a temperature rise in the atmosphere which is small compared to that of greenhouse-gas emissions from the same power plant.

Natural draft wet cooling towers at many nuclear power plants and large fossil fuel fired power plants use large hyperbolic chimney-like structures (as seen in the image at the left) that release the waste heat to the ambient atmosphere by the evaporation of water.

However, the mechanical induced-draft or forced-draft wet cooling towers in many large thermal power plants, nuclear power plants, fossil fired power plants, petroleum refineries, petrochemical plants, geothermal, biomass and waste to energy plants use fans to provide air movement upward through downcoming water and are not hyperbolic chimney-like structures.

The induced or forced-draft cooling towers are typically rectangular, box-like structures filled with a material that enhances the contacting of the upflowing air and the downflowing water.
(1100 ch.)

Text 4. Other Sources of Energy

Other power stations use the energy from wave or tidal motion , wind, sunlight or the energy of falling water, hydroelectricity. These types of energy sources are called renewable energy.

http://en.wikipedia.org/wiki/File:Croton_Dam_Muskegon_River_Dscn1080_cropped.jpgDams built to produce hydroelectricity impound a reservoir of water and release it through one or more water turbines, connected to generators, and generate electricity, from the energy provided by difference in water level upstream and downstream.

A pumped-storage hydroelectric power plant is a net consumer of energy but decreases the price of electricity. Water is pumped to a high reservoir when the demand, and price, for electricity is low. During hours of peak demand, when the price of electricity is high, the stored water is released through turbines to produce electric power.

A solar photovoltaic power plant uses photovoltaic cells to convert sunlight into direct current electricity using the photoelectric effect. This type of plant does not use rotating machines for energy conversion.

Solar thermal power plants are another type of solar power plant. They use either parabolic troughs or heliostats to direct sunlight onto a pipe containing a heat transfer fluid, such as oil. The heated oil is then used to boil water into steam, which turns a turbine that drives an electrical generator.
(1111 ch.)

Text 5. Solar Thermal Electric Plant

The central tower type of solar thermal power plant uses hundreds or thousands of mirrors, depending on size, to direct sunlight onto a receiver on top of a tower. Again, the heat is used to produce steam to turn turbines that drive electrical generators.

There is yet another type of solar thermal electric plant. The sunlight strikes the bottom of a water pond, warming the lowest layer of water which is prevented from rising by a salt gradient. A Rankine cycle engine exploits the temperature difference in the water layers to produce electricity.

Not many solar thermal electric plants have been built. Most of them can be found in the Mojave Desert of the United States although Sandia National Laboratory (again in the United States), Israel and Spain have also built a few plants.

Wind turbines can be used to generate electricity in areas with strong, steady winds, sometimes offshore. Many different designs have been used in the past, but almost all modern turbines being produced today use a three-bladed, upwind design. Grid-connected wind turbines now being built are much larger than the units installed during the 1970s, and so produce power more cheaply and reliably than earlier models. With larger turbines, the blades move more slowly than older, smaller, units, which makes them less visually distracting and safer for airborne animals.
(1136 ch.)

Text 6. Biomass Fuelled Power Plants

Biomass, a renewable energy source, is biological material from living, or recently living organisms, such as wood, waste, (hydrogen) gas, and alcohol fuels. Biomass is commonly plant matter grown to generate electricity or produce heat. In this sense, living biomass can also be included, as plants can also generate electricity while still alive.

The most conventional way in which biomass is used however still relies on direct incineration. Forest residues for example (such as dead trees, branches and tree stumps), yard clippings, wood chips and garbage are often used for this. However, biomass also includes plant or animal matter used for production of fibers or chemicals. Biomass may also include biodegradable wastes that can be burnt as fuel. It excludes organic materials such as fossil fuels which have been transformed by geological processes into substances such as coal or petroleum.

Industrial biomass can be grown from numerous types of plants. The particular plant used is usually not important to the end products, but it does affect the processing of the raw material.

Although fossil fuels have their origin in ancient biomass, they are not considered biomass by the generally accepted definition because they contain carbon that has been "out" of the carbon cycle for a very long time. Their combustion therefore disturbs the carbon dioxide content in the atmosphere.
(1199 ch.)

Text 7. Cogeneration

Cogeneration (also combined heat and power, CHP) is the use of a heat engine or a power station to simultaneously generate both electricity and useful heat.

All power plants must emit a certain amount of heat during electricity generation. This can be into the natural environment through cooling towers, flue gas, or by other means. By contrast CHP captures some or all of the by-product heat for heating purposes, either very close to the plant, or – especially in Scandinavia and eastern Europe – as hot water for district heating with temperatures ranging from approximately 80 to 130 °C. This is also called Combined Heat and Power District Heating or CHPDH. Small CHP plants are an example of decentralized energy.http://en.wikipedia.org/wiki/Combined_heat_and_power_-_cite_note-0#cite_note-0

In the United States, Con Edison distributes 30 billion pounds of 350 °F/180 °C steam each year through its seven cogeneration plants to 100,000 buildings in Manhattan – the biggest steam district in the United States. The peak delivery is 10 million pounds per hour (corresponding to approx. 2.5 GW).

By-product heat at moderate temperatures (212-356°F/100-180°C) can also be used in absorption chillers for cooling. A plant producing electricity, heat and cold is sometimes called trigeneration or polygeneration plant.

Cogeneration is a thermodynamically efficient use of fuel.
(1107 ch.)

Text 8. Electricity Generation

Electricity generation is the process of creating electricity from other forms of energy.

The fundamental principles of electricity generation were discovered during the 1820s and early 1830s by the British scientist Michael Faraday. His basic method is still used today: electricity is generated by the movement of a loop of wire, or disc of copper between the poles of a magnet.http://en.wikipedia.org/wiki/Electricity_generation - cite_note-0#cite_note-0

For electric utilities, it is the first process in the delivery of electricity to consumers. The other processes, electricity transmission, distribution, and electrical power storage and recovery using pumped storage methods are normally carried out by the electrical power industry.

Electricity is most often generated at a power station by electromechanical generators, primarily driven by heat engines fueled by chemical combustion or nuclear fission but also by other means such as the kinetic energy of flowing water and wind. There are many other technologies that can be and are used to generate electricity such as solar photovoltaics and geothermal power.http://en.wikipedia.org/wiki/File:2008_US_electricity_generation_by_source_v2.png

Centralized power generation became possible when it was recognized that alternating current power lines can transport electricity at very low costs across great distances by taking advantage of the ability to raise and lower the voltage using power transformers.
(1131 ch.)

Text 9. Methods of Generating Electricity

There are seven fundamental methods of directly transforming other forms of energy into electrical energy:

- Static electricity, from the physical separation and transport of charge (examples: turboelectric effect and lightning)
- Electromagnetic induction, where an electrical generator, dynamo or alternator transforms kinetic energy (energy of motion) into electricity
- Electrochemistry, the direct transformation of chemical energy into electricity, as in a battery, fuel cell or nerve impulse
- Photoelectric effect, the transformation of light into electrical energy, as in solar cells
- Thermoelectric effect, direct conversion of temperature differences to electricity, as in thermocouples, thermopiles, and thermionic converters.
- Piezoelectric effect, from the mechanical strain of electrically anisotropic molecules or crystals
- Nuclear transformation, the creation and acceleration of charged particles (examples: betavoltaics or alpha particle emission)

Static electricity was the first form discovered and investigated, and the electrostatic generator is still used even in modern devices such as the Van de Graaff generator and MHD generators.

Almost all commercial electrical generation is done using electromagnetic induction, in which mechanical energy forces an electrical generator to rotate.
(1168 ch.)

Text 10. Electroscope

An electroscope is a sensitive instrument for detecting small electric charges. It consists of a glass-jar closed with a stopper of insulating material in which is fitted a varnished glass-tube. A rod passes through the tube. At the top of the rod there is a metal hall or disc and at the bottom of the rod two pieces of gold leaf are suspended. When a charge is brought near the electroscope, a charge of opposite sign is induced on the metal ball, and a charge of the same sign appears on the two of the gold leaves. Since, the two pieces of gold leaf now have charges of like sign they repel each other,

As an example a negatively charged glass rod is brought to the electroscope. A positive charge is induced on the ball and a negative charge appears on the two pieces of gold leaf.

The polarity of a charge may be determined by means of an electroscope. We charge the electroscope negatively by touching the ball with a rod of hard rubber which is rubbed with flannel or silk. If the unknown charge is brought to the electroscope it will induce on the ball a charge of opposite polarity and on the gold leaves a charge of the same polarity as that of the unknown charge. Therefore, if the unknown charge is negative, the gold leaves will repel each other; if it is positive, they will attract.
(1100 ch.)

Text 11. Uses

The light bulb, an early application of electricity, operates by Joule heating: the passage of current through resistance generating heat.

Electricity is an extremely flexible form of energy, and has been adapted to a huge, and growing, number of uses. The invention of a practical incandescent light bulb in the 1870s led to lighting becoming one of the first publicly available applications of electrical power. Although electrification brought with it its own dangers, replacing the naked flames of gas lighting greatly reduced fire hazards within homes and factories. Public utilities were set up in many cities targeting the burgeoning market for electrical lighting.

The Joule heating effect employed in the light bulb also sees more direct use in electric heating. While this is versatile and controllable, it can be seen as wasteful, since most electrical generation has already required the production of heat at a power station. A number of countries, such as Denmark, have issued legislation restricting or banning the use of electric heating in new buildings.

Electricity is however a highly practical energy source for refrigeration, with air conditioning representing a growing sector for electricity demand, the effects of which electricity utilities are increasingly obliged to accommodate.
(1110 ch.)

Text 12. Application of electricity

Electricity is used within telecommunications, and indeed the electrical telegraph, demonstrated commercially in 1837 by Cooke and Wheatstone, was one of its earliest applications. With the construction of first intercontinental, and then transatlantic, telegraph systems in the 1860s, electricity had enabled communications in minutes across the globe. Optical fiber and satellite communication technology have taken a share of the market for communications systems, but electricity can be expected to remain an essential part of the process.

The effects of electromagnetism are most visibly employed in the electric motor, which provides a clean and efficient means of motive power. A stationary motor such as a winch is easily provided with a supply of power, but a motor that moves with its application, such as an electric vehicle, is obliged to either carry along a power source such as a battery, or to collect current from a sliding contact such as a pantograph, placing restrictions on its range or performance.

Electronic devices make use of the transistor, perhaps one of the most important inventions of the twentieth century, and a fundamental building block of all modern circuitry. A modern integrated circuit may contain several billion miniaturized transistors in a region only a few centimeters square.
(1119 ch.)

Text 13. Electrical Phenomena in Nature

Electricity is not a human invention, and may be observed in several forms in nature, a prominent manifestation of which is lightning. Many interactions familiar at the macroscopic level, such as touch, friction or chemical bonding, are due to interactions between electric fields on the atomic scale.

The Earth's magnetic field is thought to arise from a natural dynamo of circulating currents in the planet's core. Certain crystals, such as quartz, or even sugar, generate a potential difference across their faces when subjected to external pressure. This phenomenon is known as piezoelectricity and was discovered in 1880 by Pierre and Jacques Curie. Some organisms, such as sharks, are able to detect and respond to changes in electric fields, an ability known as electroreception, while others, termed electrogenic, are able to generate voltages themselves to serve as a predatory or defensive weapon. The best known example is the electric eel that detect or stun their prey via high voltages generated from modified muscle cells called electrocytes. All animals transmit information along their cell membranes with voltage pulses called action potentials, whose functions include communication by the nervous system between neurons and muscles. An electric shock stimulates this system, and causes muscles to contract. Action potentials are also responsible for coordinating activities in certain plants and mammals.
(1200 ch.)

Text 14. Electric Currents and their Properties

Conduction is the name normally given to a movement or flow of charges. The charges are usually electrons, but may also be ions when the conduction takes place in gaseous or liquid conductors, in which the ions are mobile.How does the current flow through a wire? A metal is made up of tiny crystals which are visible under a microscope. A crystal is a regular and orderly arrangement of atoms. As it was explained, an atom is a complex particle in which tiny electrons

move around nucleus. When the atoms are tightly packed as they are in a metallic solid, some of the electrons move freely between the atoms. These are called free electrons. Ordinarily, the free electrons move at random through the metal. There must be some driving force to cause the electrons to move through the metal conductor. This driving force tending to produce the motion of electrons through a circuit is called an electromotive force or e.m.f. that moves electric charges from one point in the circuit to another.When an electromotive force is applied to the ends of a wire the free electrons move in one direction. It is the movement of the free electrons in a conductor that induces an electric current. The greater the number of participating electrons, the greater is the flow of current.
(1100 ch.)

Text 15. Conductors, Insulators, Semiconductors

Conductors are materials that have a large number of loosely bound valence-ring electrons; these electrons are easily knocked out of their orbit and are then referred to as free electrons. Insulators are materials in which the valence-ring electrons are tightly bound to the nucleus. In between the limits of these two major categories is a third general class of materials called semiconductors.Two bodies oppositely charged have a difference of potential between them. A difference of potential or voltage is measured by the work required to carry a unit of positive charge from one body to another against the force of attraction or repulsion. The magnitude of the difference of potential depends upon the concentration of the charge and not on the amount of the charge.

If a positively charged body and a negatively charged body are brought in contact, electrons from the body with negative charge will move over to the body having the positive charge until equilibrium of charge has taken place.

There is a very instructive analogy between the use of the word "potential" in electricity and "pressure" in hydrostatics just as water tends to flow from points of higher hydrostatic pressure to points of lower hydrostatic pressure, so electricity tends to flow from points of higher electrical pressure, on potential, to points of lower electrical pressure, or potential.
(1190 ch.)

Text 16. Energy Conversion

Energy transformation or energy conversion is the process of changing one form of energy to the other. In physics, the term energy describes the capacity to produce certain changes within any system, without regard to limitations in transformation imposed. Changes in total energy of systems can only be accomplished by adding or removing energy from them, as energy is a quantity which is conserved (unchanging), as stated by the first law of thermodynamics.

Mass-energy equivalence, which rose up from special relativity, states that changes in the energy of systems will also coincide with changes (often small in practice) in the system's mass, and the mass of a system is a measure of its energy content.

Energy in many of its forms may be used in natural processes, or to provide some service to society such as heating, refrigeration, light, or performing mechanical work to operate machines. For example, an internal combustion engine converts the potential chemical energy in gasoline and oxygen into thermal energy which, by causing pressure and performing work on the pistons, is transformed into the mechanical energy that accelerates the vehicle (increasing its kinetic energy).

A solar cell converts the radiant energy of sunlight into electrical energy that can then be used to light a bulb or power a computer.
(1139 ch.)

Text 17. Entropy and Limitations in Conversion of Thermal Energy

Conversions to thermal energy (thus raising the temperature) from other forms of energy, may occur with essentially 100% efficiency (many types of friction do this).

Conversion among non-thermal forms of energy may occur with fairly high efficiency, though there is always some energy dissipated thermally due to friction and similar processes. Sometimes the efficiency is close to 100%, such as when potential energy is converted to kinetic energy as an object falls in vacuum, or when an object orbits nearer or farther from another object, in space.

On the other hand, conversion of thermal energy to other forms, thus reducing the temperature of a system, has strict limitations, often keeping its efficiency much less than 100% (even when energy is not allowed to escape from the system). This is because thermal energy has already been partly spread out among many available states of a collection of microscopic particles constituting the system, which can have enormous numbers of possible combinations of momentum and position (these combinations are said to form a phase space).

In such circumstances, a measure called entropy, or evening-out of energy distributions, dictates that future states of an isolated system must be of at least equal evenness in energy distribution. In other words, there is no way to concentrate energy without spreading out energy somewhere else.
(1216 ch.)

Text 18. A lamp

A lamp is a replaceable component that produces light from electricity. Compact lamps are commonly called light bulbs; for example, the incandescent light bulb. Lamps usually have a base made of ceramic, metal, glass or plastic, which secures the lamp in the socket of a light fixture. The electrical connection to the socket may be made with a screw-thread base, two metal pins, two metal caps or a bayonet cap.

There are several types of lamps:

Incandescent lamp, a heated filament inside a glass envelope

Halogen lamps use a fused quartz envelope, filled with halogen gas

LED lamp, a solid-state lamp that uses light-emitting diodes (LEDs) as the source of light

Arc lamp

Xenon arc lamp

Mercury-xenon arc lamp

Ultra-high-performance lamp, an ultra-high-pressure mercury-vapor arc lamp for use in projectors

Metal-halide lamp

Gas-discharge lamp, a light source that generates light by sending an electrical discharge through an ionized gas

Fluorescent lamp

Compact fluorescent lamp, a fluorescent lamp designed to replace an incandescent lamp

Neon lamp

Sodium-vapor lamp

Sulfur lamp

Electrodeless lamp, a gas discharge lamp in which the power is transferred from outside the bulb to inside via electromagnetic fields

Lamps can be used as heat sources, for example in incubators and toys such as the Easy-Bake Oven.

(1131 ch.)

Text 19.Wind power

Air flow through wind turbines or sails can produce mechanical power which can be converted into electrical power. Windmills are used for their mechanical power, windpumps for water pumping, and sails to propel ships. Wind power as an alternative to fossil fuels, is plentiful, renewable, widely distributed, clean, produces no greenhouse gas emissions during operation, and uses little land. The net effects on the environment are far less problematic than those of nonrenewable power sources.

Wind farms consist of many individual wind turbines which are connected to the electric power transmission network. Onshore wind is an inexpensive source of electricity, competitive with or in many places cheaper than coal or gas plants. Offshore wind is steadier and stronger than on land, and offshore farms have less visual impact, but construction and maintenance costs are considerably higher. Small onshore wind farms can feed some energy into the grid or provide electricity to isolated off-grid locations.

Wind power is very consistent from year to year but has significant variation over shorter time scales. It is therefore used in conjunction with other electric power sources to give a reliable supply. As the proportion of wind power in a region increases, a need to upgrade the grid, and a lowered ability to supplant conventional production can occur.
(1158 ch.)

Text 20. A Fuel Cell

A fuel cell is a device that converts the chemical energy from a fuel into electricity through a chemical reaction of positively charged hydrogen ions with oxygen or another oxidizing agent. Fuel cells are different from batteries in that they require a continuous source of fuel and oxygen or air to sustain the chemical reaction, whereas in a battery the chemicals present in the battery react with each other to generate an electromotive force (emf). Fuel cells can produce electricity continuously for as long as these inputs are supplied.

The first fuel cells were invented in 1838. The first commercial use of fuel cells came more than a century later in NASA space programs to generate power for satellites and space capsules.

Since then, fuel cells have been used in many other applications. Fuel cells are used for primary and backup power for commercial, industrial and residential buildings and in remote or inaccessible areas. They are also used to power fuel cell vehicles, including forklifts, automobiles, buses, boats, motorcycles and submarines. In addition to electricity, fuel cells produce water, heat and,

depending on the fuel source, very small amounts of nitrogen dioxide and other emissions.

The energy efficiency of a fuel cell is generally between 40–60%, or up to 85% efficient in cogeneration if waste heat is captured for use.
(1146 ch.)

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