

Министерство сельского хозяйства Российской Федерации
ФГОУ ВПО «Красноярский государственный аграрный университет»

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АНГЛИЙСКИЙ ЯЗЫК

Рекомендовано научно-методическим советом Федерального государственного образовательного учреждения высшего профессионального образования «Красноярский государственный аграрный университет» для использования в качестве учебно-методического пособия для студентов, обучающихся по всем направлениям подготовки

Красноярск 2011

ББК 81.2 Англ
С89

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С89 **Сугоняко, Т.А.**

Английский язык: учеб. пособие / Т.А. Сугоняко, Е.В. Чантурия; Краснояр. гос. аграр. ун-т. – Красноярск, 2011. – 126 с.

Представлен практический материал по совершенствованию навыков и умений в различных видах чтения, обучению грамматике и устным формам общения по научной тематике.

Предназначено для студентов 2 курса бакалавриата (направление 110300.62 «Агроинженерия») Института энергетики и управления энергетическими ресурсами АПК очной, заочной и сокращённой форм обучения

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ВВЕДЕНИЕ

Учебное пособие предназначено для студентов 2 курса бакалавриата (направление 110300.62 «Агроинженерия») Института энергетики и управления энергетическими ресурсами АПК очной, заочной и сокращённой форм обучения и составлено в соответствии с требованиями программы по английскому языку для второго этапа обучения студентов неязыковых вузов. Цель данного учебного пособия – подготовить студентов к практической деятельности, умению работать с литературой по специальности. В учебном пособии также предусмотрено обучение устным формам общения по научной тематике на материале предложенных текстов и упражнений.

Пособие включает 11 уроков для аудиторных занятий, тексты для самостоятельной работы и 11 тестовых заданий. В учебном пособии представлены тексты для изучающего и ознакомительного чтения, слова и выражения для активного владения, система упражнений на словообразование, на снятие семантических и лексических трудностей. Тестовые задания предназначены для контроля усвоения лексико-грамматического материала, для проверки и оценки понимания содержания текста.

Представленные в пособии тексты для самостоятельной работы студентов информативны, тематически связаны с основными текстами. К текстам для самостоятельной работы разработаны задания.

Тексты учебного пособия составлены на основе статей из зарубежных научных журналов с последующей адаптацией и сокращением их в учебных целях.

Представленный грамматический материал позволит студентам правильно читать, говорить по-английски, а также окажет значительную помощь при составлении аннотаций и реферировании текстов. Учебное пособие снабжено словарем по специальности.

РАБОЧАЯ ПРОГРАММА

Программа дисциплины “Иностранный язык” по направлению 110300.62 “Агроинженерия” разработана на кафедре иностранных языков КрасГАУ.

Составители: Сугоняко Т.А. и Чантурия Е.В.

Программа предназначена для студентов бакалавриата по направлению 110300.62 “Агроинженерия”, обучающихся по модульно-рейтинговой системе.

Цели изучения дисциплины

1. Обучение иностранному языку как обязательному компоненту профессиональной подготовки современного специалиста любого профиля.
2. Системный подход к обучению иностранным языкам.
3. Коммуникативно-ориентированный и профессионально-направленный характер обучения.
4. Создание целостной системы обучения иностранным языкам на разных этапах обучения на основе индивидуального подхода.
5. Достижение образовательной и воспитательной целей обучения на основе гуманитаризации, гуманизации и экологизации обучения.

Задачи изучения дисциплины

1. Формирование фонетических, лексических навыков.
2. Формирование умений иноязычного общения, чтения, аудирования, письма.
3. Осуществление контроля сформированности умений и навыков на всех этапах обучения.
4. Развитие самостоятельности студента, его творческой активности и личной ответственности за результаты обучения.

Дисциплина изучается в 1, 2, 3, 4 календарных модулях. Общий объем часов 340, в том числе 175 часов аудиторных занятий, 165 часов самостоятельной работы студентов. Формы оценки знаний в I, II и III календарных модулях – зачет, в IV календарном модуле – экзамен.

Рекомендуется при прохождении уроков из основного блока текстов выполнять тесты и прорабатывать тексты самостоятельной работы.

Программа составлена на основании Государственного образовательного стандарта высшего профессионального образования. Календарные модули 3 и 4, общий объем часов – 169, в том числе 84 часа аудиторных занятий, 75 часов самостоятельной работы студентов.

Календарный модуль 3

Дисциплинарный модуль 3.1

Unit 1. Importance of Agricultural Electrification

Unit 2. New Developments

Unit 3. Transformers

Дисциплинарный модуль 3.2

Unit 4. Electrical Structure of Matter

Unit 5. Electrical Effects

Unit 6. Electrical Instruments

Календарный модуль 4

Дисциплинарный модуль 4.1

Unit 7. Electric Motors

Unit 8. Asynchronous Machines

Unit 9. Selection of Electric Motors

Дисциплинарный модуль 4.2

Unit 10. The Power System

Unit 11. Light and Radiation

Самостоятельная работа: тексты для самостоятельной работы

Контрольные задания для экзамена

ТРЕБОВАНИЯ К ЗНАНИЯМ СТУДЕНТОВ

Конечные требования к владению иностранным языком на втором этапе обучения: наличие коммуникативной компетенции, необходимой для иноязычной деятельности по изучению и творческому осмыслению зарубежного опыта в профилирующей и смежных областях науки и техники, а также для делового профессионального общения. По окончании обучения студент должен:

- владеть идиоматически ограниченной речью, а также освоить стиль нейтрального научного изложения;
- владеть навыками разговорно-бытовой речи (нормативным произношением и ритмом речи), применять их для повседневного общения;
- понимать устную (монологическую и диалогическую) речь на бытовые и специальные темы;

- активно владеть наиболее употребительной (базовой) грамматикой и основными грамматическими явлениями, характерными для профессиональной речи;
- знать базовую лексику общего языка, лексику, представляющую нейтральный научный стиль, а также основную терминологию своей широкой и узкой специальности;
- читать и понимать со словарем специальную литературу по широкому и узкому профилю специальности;
- владеть основами публичной речи, делать сообщения и доклады (с предварительной подготовкой);
- участвовать в обсуждении тем, связанных со специальностью (задавать вопросы и отвечать на вопросы);
- владеть основными навыками письма, необходимыми для подготовки публикаций, тезисов и ведения переписки;
- иметь представление об основных принципах аннотирования, реферирования и перевода литературы по специальности.

Итоговый контроль (экзамен)

А. Письменная зачетная работа, предшествующая экзамену: составление аннотации текста объемом 5000–7500 печатных знаков; время написания 90 минут.

В. Содержание экзамена.

1. Сделать письменный перевод со словарем с иностранного языка на русский язык текста по специальности объемом 1800 печатных знаков. Время на подготовку 60 минут.

2. Сделать устное сообщение по изученной теме.

LESSON 1

Importance of Agricultural Electrification

Грамматика: Модальные глаголы. Эквиваленты модальных глаголов.
Причастие прошедшего времени [participle 2] как определение. Группа простых времён в пассиве.
Повторение.

Прочтите текст, расскажите о сферах применения электричества в сельском хозяйстве.

1. The use of energy on a farm is essential to the increase of agricultural production. Electricity is a clean, versatile and an inexpensive energy. In many cases this energy is ideally suited for a large number of power requirements. Agricultural electrification can much improve the standards of living of village people. In agricultural production and processing electricity has resulted in higher farm incomes, better working conditions. In future electrification will be able to improve the economic well-being of all people. It must bring comfort and entertainment into every home.

2. It is a key factor in our modern system of agriculture. A farmer has various electrical machines on the farm which are used to milk cows, store meat, process fruits and cook food. Electrically operated brooders, lamps, water warmers and many others provide the farmer with tools which save him labour.

Electricity lights farm-houses at night, unloads the silo, pumps water, runs electric motors and does many other things.

3. In research work electrical instrumentation measures, detects and controls variables. Electrical instruments offer many advantages over other types of instruments such as mechanical instruments. Higher accuracies and speeds of measurements can be achieved by electrical instrumentation.

4. Electrical science has many problems which are to be solved by engineers. Fundamental principles of electricity and magnetism are essential to the understanding of the theory of operations of electrical and electronic circuits.

Словарный минимум

essential	a	существенный
increase	v	увеличивать
power		энергия
result in	v	приводить к чему-либо, иметь результатом
income		доход
suit	v	годиться, подходить
measure	v	измерять
detect	v	обнаруживать
offer	v	предлагать
advantage		преимущество
accurate		точный
speed	n	скорость
achieve	v	достигать
circuit		электрическая цепь
solve	v	решать
process	v	обрабатывать
provide	v	снабжать, обеспечивать
use	v	употреблять, пользоваться
	n	применение, польза
versatile	a	многосторонний, универсальный
variable	n	переменная (величина)
require		требовать
operate	v	действовать, работать, управлять
instrumentation		контрольно-измерительные приборы, оборудование
design	v	конструировать
run	v	управлять
tool	n	станок, рабочий (ручной) инструмент

Упражнения

1. Назовите глаголы, от которых образованы следующие существительные:

measurement, electricity, achievement, production, processing, requirement, improvement, warmer, application, solution, operation, understanding, designer.

2. Установите по словообразовательным элементам принадлежность следующих слов к определённым частям речи:

operator, economic, disadvantage, scientist, suitable, essential, lighting, electrify, unload, mechanical, entertainment, higher, useful, user, used, usage, inexpensive.

3. Образуйте от глаголов, стоящих в скобках, причастие прошедшего времени и употребите его в качестве определения к существительным.

Образец: (to mention) method-mentioned method - упомянутый метод.

(to know) advantages, (to achieve) progress, (to increase) production, (to save) power, (to improve) working conditions, (to require) quality, (to find) decision, (to receive) machine-tools.

4. Переведите словосочетания. Обратите внимание на функцию причастия 2:

1. Technology offered ten years ago;
2. Accuracy and speed required by the user;
3. Advanced automated production;
4. Using the components made by partners;
5. 9,5 billion roubles saved thanks to this development;
6. Principle used in processing milk.

5. Скажите, что указанное действие может или должно произойти:

1. Mini-computers are used in each field of the national economy.
2. Scientists and engineers at our sectoral research institutes took part in the technical re-equipment of the branch.
3. Speaking about new projects developed at the Ministry of the Machine Tool and Instrument Making Industry he mentioned primarily about automated lines.
4. A computer's capacity is increased by designing specialized processors.

6. Назовите в словарном минимуме слова, близкие по значению данным:

1. need. 2. energy. 3. to supply. 4. to decide. 5. many-sided.
6. to utilize. 7. to demand. 8. to operate.

7. Выпишите из текста и переведите письменно предложения, содержащие:

- 1) эквиваленты модальных глаголов;
- 2) глаголы в Indefinite Passive.

8. Укажите предложения, при переводе которых следует употребить слова ВОЗМОЖНО, СЛЕДОВАЛО БЫ:

1. The machine-tool can be stopped at any moment.
2. This line should have been put into operation long ago.
3. Our engineers had to solve many complicated problems to reduce wear (износ) in machinery.
4. Nuclear energy may be used to light and heat our homes.
5. He may have got the condenser he needed.

9. Скажите, что указанное действие произойдёт в будущем:

1. Atomic energy finds such wide application that our age might be called the age of atom.
2. The computers should be uniform in design and should have standardized components.
3. This arrangement must be perfectly reliable in operation.
4. The use of electricity for various purposes was to be followed by a wider application of electrical devices.
5. Compressed air or electricity must be used in both cases.
6. Rapid tram lines have to be built in the remote areas of the city.

10. Перепишите предложения, используя модальные глаголы (или их эквиваленты) с инфинитивом в пассиве.

1. The scientist referred these measurements at the conference.
2. Next year they will put into operation the new atomic power station.
3. We widely use electricity and electronic devices for various purposes.
4. They offered the scientists new themes for research.
5. First of all we decided the problem of using such variables.
6. You ought to pay more attention to the problem of power consumption.

11. Расскажите:

- а) о преимуществе электричества над другими видами энергии;
- в) где и как используется электричество в сельском хозяйстве.

12. Прочтите текст и скажите, есть ли смысловая связь данного текста с основным. Дайте обоснование своему ответу.

Use of Electricity for Farming Processes

1. Farming conditions have been changed during the past decade or two. They may be characterized by a definite trend toward the greater

utilization of electricity. This trend is natural result of our country's rapid development.

2. Most workers in rural electrification find themselves fully occupied with one operation as farm service, adviser, inventor, agricultural engineer, distribution engineer, administrator etc. Specialists should know electrical applications. They must understand and design simple electrical and electronic systems for agricultural industry. Agricultural electrification is the science and art. It comprises a distribution of electricity in rural areas, the service in keeping electric lines, the use of electricity by farmers, designing electrical equipment for agricultural production and processing operations. Everywhere we turn we can see application of electricity.

3. When farm electrification is mentioned, most people have in mind only lighting and electric motors for pumping of water. In fact, new uses and methods of application are constantly found for electricity on farms. The most general way of electricity is for light of farm houses, heating, control, power and communication. This in turn reduces labour requirements. On most of our farmsteads it is used for pumping water for livestock, for running electric motors, for providing comfort for our rural homes.

4. New uses for the application of electricity are found every day. Engineers were long ago able to heat buildings for chick and young animals, glass-houses and other structures used for plant production. In addition to these examples, there are further application of electricity for soldering and welding, as well as the known process of brazing by means of carbon tips connected to the welding apparatus.

13. Укажите в тексте предложения, которые могут служить ответом на следующие вопросы:

1. What is the main tendency of utilizing electricity in this country?
2. What should electrical engineer know and be able to do?
3. What are his principal duties?
4. How is electricity used in animal husbandry and plant production?

14. Приведите из текста факты, подтверждающие следующее утверждение:

Utilization of electricity reduces labour requirements.

15. Придумайте заголовки к каждому абзацу текста.

16. Перечислите все виды работ в хозяйстве, выполняемых с помощью электричества.

TEST 1

Choose the right variant.

1. Electricity is energy:
 - a) dirty;
 - b) clean;
 - c) valuable.
2. Electricity must bring into every home:
 - a) comfort;
 - b) happiness;
 - c) luck.
3. A farmer has various on the farm:
 - a) food;
 - b) clothes;
 - c) electrical machines.
4. Electricity farm-houses at night, unloads the silo, pumps water:
 - a) brings;
 - b) lights;
 - c) comes.
5. Higher accuracies and speeds of measurements can be achieved by.....:
 - a) electrical instrumentation;
 - b) mechanical instruments;
 - c) reading literature.
6. Electrical science has many problems which are solved by.....:
 - a) readers;
 - b) engineers;
 - c) workers.
7. Fundamental principles of electricity and magnetism are.....to the understanding of the theory of operations of electrical and electronic circuits:
 - a) good;
 - b) excellent;
 - c) essential.

8. Can agricultural electrification much improve the standards of living of village people?

- a) Yes, it do;
- b) No, it can not;
- c) Yes, it can.

9. In agricultural production and processing electricity has resulted in higher farm incomes better...:

- a) music;
- b) food;
- c) working conditions.

10. Electricity operated brooders, lamps, water warmers and many others provide the farmer with tools which save him...:

- a) life;
- b) house;
- c) labour.

11. This kind of energy...on farms:

- a) is used;
- b) were used;
- c) uses.

12. Electrical instruments...many advantages over mechanical instruments:

- a) has;
- b) have;
- c) is having.

13. ... electrification a key factor in our modern system of agriculture?

- a) does;
- b) do;
- c) is.

14. Agricultural electrification improves the standards of living of village people, ...?

- a) doesn't it;
- b) didn't it;
- c) isn't it.

15. What lecture ... last Friday?

- a) they attend;
- b) did they attend;
- c) will they attend.

LESSON 2

New Developments

Грамматика: Существительное в функции определения.

Perfect Tenses Active and Passive.

Прочтите текст и назовите системы управления, о которых идёт речь.

1. Many types of electric and electronic control systems are used in agriculture. A great potential exists for agricultural controls and processing operations. Components for the agricultural controls must be chosen most carefully.

2. Extreme variations in temperature, humidity, chemicals and air pollution can affect the work of the equipment. The systems must be constructed for economy combined with high reliability. We shall have to study many specific and detailed applications of advanced control systems.

3. Sterner developed a light activated silicon controlled rectifier in measuring circuit. The second development is a ventilation control system for grouped two-speed fans. The parallel connections permit to use higher currents during motor operations.

This device controls both ventilation and heating equipment of livestock buildings.

4. Air contaminants have to be removed in a ventilation or air-conditioning system. Electronic air cleaners use electrostatic precipitation to collect solid matter. They usually have fixed or moving collector plates.

5. Many automatic control systems are used for automatic thinning and harvesting of crops, for the sorting of potatoes from stones and soil clods by infrared reflectance etc.

6. There is a control system developed for automatic silo unloading. A current meter relay is installed to monitor the current to the impeller motor. The system uses thyatrons. They conduct current to energize the control relay to raise or lower the unloader. Safety devices have also been included in the design.

Пояснения к тексту

impeller motor – роторный двигатель

a light activated silicon controlled rectifier – кремниевый

фотоуправляемый вентиль

current meter relay – токовое реле

safety device – предохранительное устройство

Словарный минимум

exist	v	существовать
choose		
(chose, chosen)	v	выбирать
variation		колебание, изменение
equipment	n	оборудование
affect	v	воздействовать
reliable	a	надёжный
device	n	приспособление, устройство
rectifier		детектор, выпрямитель, вентиль
permit	v	позволять
double	v	удваивать
connect	v	соединять, связывать
voltage	n	напряжение
current		ток
remove	v	удалять, устранять
develop	v	усовершенствовать, развивать, разрабатывать
fix	v	укреплять, закреплять
plate	n	пластина
unload	v	разгружать
meter	n	измеритель, счётчик
install	v	устанавливать
conduct	v	проводить, вести
energize	v	(по) ставить под напряжение
include	v	включать (в)
raise	v	поднимать, увеличивать, повышать
lower	v	понижать
monitor	v	контролировать, проверять

Упражнения

1. По сходству с какими словами в русском языке можно догадаться о значении следующих слов:

type, control, specific, temperature, system, potential, construction, economy, relay, detail, optical, sort (v), ventilation, group, parallel, automatic, collector.

2. Укажите в словарном минимуме слова, близкие по значению следующим:

To check, to influence, to allow, to lead, to part, to reduce.

Слова, противоположные по значению:

To remove, to raise, to separate, unreliable, to load.

3. Подберите словарные определения к следующим словам:

develop v, connect v, rectifier, meter, energize v, monitor v.

1. an apparatus for measuring electricity; 2. to join two things together; 3. to become better; 4. to give energy to, to activate; 5. to check or regulate the performance of a machine; 6. a device for changing alternating current into direct current.

4. Укажите слова, которые не сочетаются со словом **electric**:

1. engineering, 2. lighting, 3. current, 4. meter, 5. equipment, 6. speed, 7. fan, 8. installation, 9. monitor, 10. circuit, 11. device.

5. Укажите, в каких предложениях причастие 2 употреблено в функции определения:

1. The energy utilized per second is proportional to the frequency.
2. These units supplied with infrared reflectance are used for sorting of potatoes.
3. From their very nature, charged particles are influenced by electric fields.
4. Ultraviolet installations with bactericide lamps help to clean contaminated air in livestock buildings.
5. Carbon was the first material used for such a conductor.
6. The method described above is the most accurate and should be followed.
7. All processes are mechanized or automatized.

6. Найдите в пункте “b” русские эквиваленты словосочетаний из пункта “a”. Обратите внимание на перевод цепочки существительных:

a) direct current system; data processing equipment; a current meter relay; heat and solar energy; ventilation control system; high tension lines; electro-station construction project;

b) токовое реле, система управления вентиляцией, тепловая и солнечная энергия, система постоянного тока, высоковольтные сети, оборудование для обработки данных, проект строительства электростанции.

7. Закончите предложение, подобрав соответствующее продолжение:

1. The design of a silo unloader includes...

...a silicon controlled rectifier;

...a current meter relay;

...infrared reflectors.

2. The principle of electrostatic precipitation is used in ...

...grouped two-speed fans;

...electronic air cleaners;

...safety devices.

8. Назовите по-английски устройства и автоматические контролирующие системы, о которых говорится в тексте.

9. Скажите, что указанное действие уже выполнено.

1. We are to take into consideration all advantages and disadvantages to decide what system is the best for the future work.

2. Electro-welding is to bring basic changes to the heavy machine-building industry.

3. Built-in devices double the reliability of the computers.

4. Science is to play a decisive role in the transition over to new equipment and technologies.

5. The relay will be given its initial position.

6. Russian scientists tried to find practical application for the phenomenon discovered.

10. Найдите в тексте ответ на вопрос:

What affects the work of the equipment?

11. Прочтите ещё раз абзац №6 и расскажите о системе управления, предназначенной для автоматической разгрузки силоса.

12. Прочтите текст. Придумайте к нему заголовок.

Text

1. The farmer also uses electricity for the following: plant and animal production; insect control, application in ultra-violet form for

bacteriological and biological purposes; heating and drying by means of infra-red light; colour sorting.

2. It is generally known that flowers can be forced to flower at a certain time by the changed duration of daylight or by means of regulated quantity of electric lighting. But did you know these facts? The days extended in winter will be able to induce higher egg production in the case of hens and turkeys.

3. Scientists have also found that young chicks grow much more rapidly if the lighting is controlled artificially to provide certain periods of light and darkness.

4. If used, infra-red light can improve the generation of certain seeds. Some insects can be killed by the application of these rays. Infra-red light produced artificially nowadays, is widely used as a source of heat in brood chambers for chicks and to a less extent in breeding pens for pigs, lambs and calves. Infra-red light thaws water-pipes or prevents such pipes from freezing during severe cold. These rays can be used to dry vegetables and fruit artificially after washing.

5. Artificial light is now often used for the sorting of fruit and other products. Certain colour can be used to make green fruit or bad and dark spots more visible to the naked eye. Often the light is even combined with the necessary electronic circuits. Such a circuit makes it possible for the fruit to be sorted automatically for size, colour and bad spots.

Пояснение к тексту

by means (of)	посредством
in the case (of)	в случае
to a less extent	в меньшей степени

13. Укажите в тексте и переведите предложения, содержащие:

- а) модальные глаголы или эквиваленты;
- б) глаголы в Indefinite Passive.

14. Ответьте на вопрос:

How can farmers affect plant growing and egg production using electric lighting?

15. Расскажите по-английски о способах применения инфракрасного света в сельском хозяйстве.

TEST 2

Choose the right variant.

1. Many types of electric and electronic control systems are used in:
 - a) agriculture;
 - b) chemical industry;
 - c) culture.

2. We shall have to study many...:
 - a) grammar rules;
 - b) specific and detailed applications;
 - c) control system.

3. The parallel connections permit to use...:
 - a) plates;
 - b) higher currents;
 - c) extreme variations.

4. Electronic air cleaners use electrostatic precipitation to collect...:
 - a) money;
 - b) solid matter;
 - c) equipment.

5. Many automatic control systems are used for ...:
 - a) automatic thinning;
 - b) sorting potatoes;
 - c) affect.

6. Air contaminants have to be removed in a...:
 - a) ventilation;
 - b) air-conditioning system;
 - c) reliable condition.

7. ... exists for agricultural controls and processing operations:
 - a) Much water;
 - b) A great potential;
 - c) A good equipment.

8. ... for the agricultural controls must be chosen more carefully:
- a) Cross-section;
 - b) Components;
 - c) Winding.
9. Extreme variations in temperature, humidity, chemicals and air pollution can affect the work of the...:
- a) variation;
 - b) equipment;
 - c) current.
10. Sterner developed a light activated silicon controlled rectifier in...:
- a) agriculture;
 - b) in the design;
 - c) measuring circuit.
11. What problems ... next year?
- a) will this group of engineers solve;
 - b) this group of engineer will solve;
 - c) did this group of engineers solve.
12. What problem did you ... at the conference yesterday?
- a) discussed;
 - b) discuss;
 - c) discussing.
13. This problem ... by our engineers many years ago:
- a) is solved;
 - b) solved;
 - c) was solved.
14. This device ... the ventilation system in livestock buildings:
- a) control;
 - b) controls;
 - c) is controlled.
15. Components for the agricultural controls ... properly:
- a) was chosen;
 - b) were chosen;
 - c) is chosen.

LESSON 3

Transformers

Грамматика: Степени сравнения прилагательных и наречий.

Повторение.

Прочитайте текст и назовите типы трансформаторов.

1. One of the basic problems of electrical technology is the transmission of energy from the place where it occurs cheaply to the places where the consumers are situated. The higher the voltage in the transmission line, the smaller is the current required for a transmitted power and the less is the cross-section of the wires. Thus, the highest voltage energy provides a cheap transmission of electricity over long distances.

2. A power station generates low-voltage high-intensity electric currents. This electric energy must be transformed into high-voltage low-intensity currents. This is economically solved only for alternating current (a.c.) by means of transformers.

3. The transformer was developed by P. N. Yablochkov (1876). He made practical use of it for his lighting installations. A transformer operates as a static electromagnetic apparatus on the basis of mutual induction.

4. In a transformer alternating current of one voltage is transformed into alternating current of the same frequency but of different voltage. A transformer has several windings electrically insulated from each other. The winding connected to the energy source is called the primary. The other windings are called secondaries. The most frequently used transformer is the double-wound transformer.

5. The voltage across the primary winding can be less than the secondary voltage. This transformer is of the step-up type. In the reverse case the transformer is called a step-down transformer. Corresponding to these voltages one must differentiate the high-voltage (or high-tension) windings and low-voltage (low-tension) windings.

6. The windings have a common closed core made up of steel. This provides higher magnetic interaction between them. The largest loss occurs at current frequencies higher than 20 kcps. For this reason, at the higher frequencies, air-cored transformers are used.

7. The current induces an alternating magnetic flux in the transformer core. The ratio of the emf's induced in the windings is equal to the ratio of the number of turns of these windings:

$$E : E = W : W$$

This ratio is called, the transformation ratio.

Пояснения к тексту

low-voltage high-intensity current – ток низкого напряжения большой силы

step-up (down) – повышать (понижать)

double-wound – с двойной обмоткой

kc/s – kilocycles per second – килогерц

emf – electromotive force – электродвижущая сила

Словарный минимум

transmit	v	передавать
occur	v	иметь место, случаться
cross-section		поперечное сечение
wire		провод, проволока
alter	v	изменять(ся)
alternating		переменный (ток)
mutual		взаимный
frequency	n	частота
wind (wound)	v	наматывать
winding		обмотка
insulation	n	изоляция
source		источник
primary		первичная
secondary		вторичная
current intensity		сила тока
across		через, сквозь, поперёк
reverse	a	обратный
tension		напряжение
core		сердечник
interaction		взаимодействие
loss		потеря
induce	v	индуктировать, наводить
flux		поток

ratio		отношение, пропорция
equal		равный
turn		оборот
step	v	трансформировать
generate	v	вырабатывать, производить

Упражнения

1. Назовите глаголы, от которых образованы эти существительные:
transmission, winding, insulation, induction, operator, consumer, connection, solution, transformer, requirement, development.
2. Назовите исходную форму следующих прилагательных и наречий:
higher, more, smaller, less, largest, simpler, most, cheaper, later, better, longer, lower, further, worse.
3. Переведите предложения, обращая внимание на конструкции: «the more .., the less...».
 1. The more experiments we carry out, the better results we obtain.
 2. The longer I use this method, the less I like it.
 3. The better ferromagnetic material is in the core, the more intensive the magnetic flux.
4. Выпишите из текста и переведите предложения, содержащие эту конструкцию.
5. Переведите предложения, обращая внимание на союзы:
 - either – также;
 - either ... or – или ... , или;
 - neither ... nor – ни ... , ни;
 - since – с – так как;
 - both ... and – как ... , так и.
 1. A transformer can step alternating voltages either up or down.
 2. The amount of energy did not change either.
 3. One hundred years ago there were neither electric lamps nor electric motors.
 4. Since the primary is connected to an a. c. line, the current of this winding is continually changing.
 5. There are important differences between the two materials, both in their technology and in their physical properties.
 6. Since the early seventies of the last century electricity just began to find practical application.

6. Из пункта «b» выберите близкие по значению слова и словосочетания глаголам из п. «a».

a) to occur, to alter, to generate, to transmit, to interact.

b) to bring into being, produce; to act on each other; to change, become different; to take place, happen; to send or cause go from one place to another.

7. Укажите в тексте эквиваленты следующих русских словосочетаний:

поперечное сечение провода; ток высокого напряжения малой силы; посредством трансформатора; на основе взаимной индукции; той же частоты, но другого напряжения; трансформатор с двойной обмоткой; переменный магнитный поток; отношение электромагнитной силы, индуцируемой в обмотках.

8. Употребите глаголы, данные в скобках в Perfect Active or Passive:

1. The computers ... entirely new technical possibilities in automatic control of industrial processes (to create).

2. By the end of the 19th century rubber ... already ... by people for making different useful things (to use).

3. This laboratory ... a large research centre (to become).

4. The farmers got much good fruit after their methods of work (to change).

5. They... already this installation in their laboratory when we came (to test).

6. Instruments based on this principle ... in his works (to describe).

7. He said that the power station ... on our farm (to construct).

9. Переведите предложения, обращая внимание на функцию Participle 1:

1. He took great interest in the problem, devoting the rest of his life to it.

2. Electrons forming an atom are in motion.

3. While working at this invention, he used an induction coil of special design.

4. The substance affecting a magnetic field was metallic.

5. Our institute is one of the leading organizations developing mini-computers.

6. When working at the design of a flying machine, he had to think of a source of light that would be suitable for it.

10. Скажите, что действие продолжается.

Образец: They have already tested this machine.

They are testing this machine now.

1. We have designed this instrument according to the new requirements.
2. Scientific information did not grow so rapidly in the last century.
3. Our electric circuits can work on sunlight.
4. Atomic physics has made tremendous progress.
5. Not so many students took part in research last year.
6. I have never worked with the electric equipment before.

11. Найдите в тексте ответы на следующие вопросы:

1. What current does a power station generate?
2. How does a transformer step alternating current?
3. How are the windings differentiated?
4. What does a steel closed core provide?

12. Укажите, какие утверждения соответствуют содержанию текста:

1. Since the primary winding is connected to the energy source it always has higher voltage than the secondary one.
2. The higher the voltage of current in the transmission line, the cheaper is its transmission.
3. Air-cored transformers are used most frequently.

13. Прокомментируйте понятие “the transformation ratio”.

14. Скажите, какой ответ неправильный:

1. A transformer alters....
 - a) the electric current intensity;
 - b) tension;
 - c) frequency of current.
2. In a step-down transformer voltage is....
 - a) higher across the primary winding;
 - b) less in the secondary winding;
 - c) equal in both windings.
3. A transformer operates....
 - a) as a static electromagnetic apparatus;
 - b) on the basis of mutual induction;
 - c) in the winding.

15. Подготовьте краткое сообщение о назначении трансформатора и его устройстве, используя следующие опорные слова:

P. N. Yablochkov, an instrument, to step down, alternating current, transmission, on the basis, windings, to connect, to insulate, types, a core.

16. Скажите, что нового вы узнали из текста.

TEST 3

Choose the right variant.

1. One of the basic problems of electrical technology is the...:
 - a) transmission of energy;
 - b) frequency of current;
 - c) the electric current intensity.

2. Thus the highest voltage energy provides a cheap transmission of electricity over...:
 - a) long way;
 - b) long road;
 - c) long distances.

3. A power station generates low-voltage high-intensity...:
 - a) electric currents;
 - b) current intensity;
 - c) tension.

4. This is economically solved only for alternating current (a.c.) by means of...:
 - a) wire;
 - b) transformers;
 - c) core.

5. The transformer was developed by...:
 - a) P.N. Yablochkov;
 - b) Isaak Newton;
 - c) Michael Faraday.

6. Yablochkov made practical use of the transformer for his...:
 - a) require;
 - b) lighting installations;
 - c) instrumentation.

7. A transformer has...:
- a) current intensity;
 - b) several windings;
 - c) flux.
8. This electric energy must be transformed into...:
- a) core;
 - b) alternating current;
 - c) high-voltage low-intensity currents.
9. A transformer operates as a static electromagnetic apparatus on the...:
- a) frequency;
 - b) basis of mutual induction;
 - c) wire.
10. What winding is called primary?
- a) the winding connected to the energy source;
 - b) the winding connected to the transformer;
 - c) the winding connected to the low-voltage.
11. We ... do this work in time yesterday:
- a) could;
 - b) can;
 - c) must.
12. I ... to make these experiments:
- a) could;
 - b) must;
 - c) had to.
13. The student ... electrical parameters is my friend:
- a) measured;
 - b) measuring;
 - c) measure.
14. The ... results were discussed at the conference:
- a) obtained;
 - b) obtaining;
 - c) obtain.

15. The windings have a common core ... of steel:

- a) make;
- b) made;
- c) making.

LESSON 4

Electrical Structure of Matter

Грамматика: Continuous Passive. Сложные формы Participle 1.

Прочтите текст и скажите, от чего зависит проводимость материалов.

1. Matter is composed of atoms. Atoms possess electrical charges. Each atom contains a central core called a nucleus. Each nucleus contains a certain number of neutrons and protons. The number of protons in the nucleus has determined the total positive charge that the nucleus is possessing. This number has been called the atomic number. A normal atom possesses as many electrons in shells about the nucleus as there are protons in the nucleus.

2. The charge on an electron is equal in magnitude but opposite in sign to that on the proton. A normal atom is electrically neutral.

3. Many materials have such a tight bound on electrons that it is difficult for them to migrate. These materials have been called insulators. Other materials called conductors have an outermost electron tied to the parent atom by a very small force. This electron has been called a free electron. They are free to wander from atom to atom because of the thermal agitation of the atom.

4. When an electric field is applied to such a conductor the electrons drift in the direction opposite to the field. Thus there is a flow of electrical charges and an electric current flows in the conductor. In general, metals such as copper, aluminium, silver and gold are good electrical conductors.

5. In a perfect insulator, all electrons are tightly bound to the parent atoms and molecules. No free electrons drift in an electric field. Materials that are good insulators are quartz, rubber and other specially formed dielectric materials.

6. Some materials called semiconductors are neither good conductors nor good insulators. They will conduct some current. Elements with such properties are silicon, germanium, oxides, sulphides and others. Engineers have used them extensively in electronic devices. With the discovery of the electron, it became clear that electrons do the moving when there is electric conduction in metal. The well-established rule for the positive charged movement is still used.

Словарный минимум

matter		вещество
possess	v	владеть, обладать
charge	v, n	заряжать, заряд
contain	v	содержать
certain	a	определенный
determine	v	определять, устанавливать
shell		оболочка
magnitude		величина
sign		знак
tie	v	связывать, привязывать
agitation		возбуждение
apply	v	применять, употреблять
drift	n	движение (электронов)
flow	u	течь
	n	поток
bind (bound)	v	связывать
property		свойство
semiconductor		полупроводник
extensively		широко
move	v	двигаться
total		весь, суммарный
thermal		термический, тепловой
parent		основной, исходный
form	v	создавать, образовывать
nucleus		ядро (атома)
tight		прочный, крепкий

Упражнения

1. Запомните произношение следующих слов. Переведите их на русский язык:

neutral, neutron, sign, to wander, quartz, oxides, sulphides, sulphur, germanium, proton, aluminium, silicon.

2. Образуйте существительные от следующих глаголов:

a) при помощи суффикса -or (-er):

to insulate, to conduct, to operate, to produce, to contain, to drive, to transform, to generate, to clean.

b) при помощи суффикса -tion:

to induce, to interact, to install, to move, to direct, to rotate, to apply, to combine, to connect.

3. Выберите из слов, выделенных курсивом, близкие по значению следующим словам:

voltage, power, to consist (of), to occur, to affect, key, to tie, to connect, up-to-date.

To influence, modern, tension, energy, to take place, to compose, to bind, main, to link.

4. Найдите в пункте “b” соответствующие эквиваленты словосочетаний пункта “a”.

a) 1. thermal agitation; 2. tightly bound; 3. atomic number; 4. to apply a tension; 5. electric conduction; 6. parent atom; 7. outermost electron; 8. to drift in the direction;

b) 1. включать под напряжением; 2. атомное число; 3. электрон, наиболее удалённый от центра (ядра); 4. тепловое возбуждение; 5. прочно привязанный; 6. двигаться в направлении; 7. исходный атом.

5. Замените данные словосочетания одним словом из приведённых ниже:

1. the whole amount or number; 2. what a thing is made of; 3. to move from one place to another; 4. to tie together; 5. a thing that conducts electricity, heat; 6. a material that does not conduct electricity.

1. – dielectric; 2. – total; 3. – a conductor; 4. – a matter; 5. – to bind; 6. – to migrate.

6. Употребите глаголы, данные в скобках в Continuous Passive.

Образец: Another iron and steel centre (to create) in Siberia.

Another iron and steel centre is being created in Siberia.

1. All we have spoken about has been and (to develop) by the institutes of higher learning.

2. Siberia (to transform) into a leading national centre of heavy industry.

3. Much attention (to give) at present to the development of international scientific contacts.

4. New superconducting magnets currently (to build) and they will find application in research and industry.

5. Everything that (to do) along the line of developing new and progressive technology is the result of our scientists' and engineers' joint efforts.
6. The idea of conducting researches on an international scale widely (to discuss) at scientific meetings.
7. Сравните переводы причастия 1 в страдательном залоге и перфектной формы причастия 1 (Active).
 - a) причастие 1 в страдательном залоге:
 1. The new generation of plants and equipment, being developed by us today, will raise labour productivity by 50 to 100 per cent.
 2. Being cooled in air the metal becomes hardened.
 3. The temperature of the matter now being raised shows that movement of its molecules is speeded up.
 4. Atomic ice-breaker is able to sail in any weather, being equipped with up-to-date radiolocation devices.
 - b) перфектная форма причастия 1:
 1. Having replaced the fuses (предохранители) I switched on the current.
 2. Having discovered the property of the electron scientists placed it at the service of mankind.
 3. Having discussed all the advantages and disadvantages of the design we started work.
 4. Having done their job the builders have gone and their place has been taken by operators.
8. Объясните предложениями из текста, почему одни материалы являются изоляторами, другие проводниками. Назовите эти материалы.
9. Найдите в тексте ответ на вопрос: What materials are called semiconductors?
10. Вставьте в следующие предложения подходящий предлог из данных под чертой:
 1. The conductivity ... metals is very little influenced ... temperature.
 2. The conductivity of semiconductors sharply increases ... heating and drops ... cooling.
 3. Yablochkov solved a problem ... which many inventors had been working ... years.

4. Radio electronics was extensively used ... radio-telemetric data transmission and ... radio communication ... the earth.
5. Machine-tool builders propose the use ... machines that would make it possible to cut expenditure of metal ... almost 25 per cent.

For, at, by, of, with.

11. Определите формы и функции причастий и переведите предложения:

1. Being a good insulator rubber is often used in cables.
2. A number of Western companies are showing increasing interest in our computer technology.
3. Much is being done today to widen foreign trade as quickly as possible.
4. Having obtained the necessary materials we could finish the experiment.
5. The substance being investigated contained some admixtures (примеси).
6. The amount of heat generated depends on the quality of fuel used.
7. Using the energy of the atom we produce electric energy.
8. We have designed this instrument according to the new requirements.

12. Прочтите 1 и 2 абзацы текста и ответьте на вопросы:

1. What determines the positive charge in the nucleus?
2. What do we call the atomic number?
3. Is the charge on an electron and on the proton equal in sign?
4. What electrical charge has a normal atom?

13. Расскажите по-английски о строении атома, используя следующие слова:

to compose, an atom, to possess, to contain, a nucleus, to determine, charge, number, as many... as, magnitude, sign, neutral.

TEST 4

Choose the right variant.

1. Matter is composed of ...:

- a) shells;
- b) atoms;
- c) signs.

2. Each nucleus contains a certain number of...:
 - a) matter;
 - b) charge;
 - c) neutrons and protons.
3. A normal atom is electrically...:
 - a) neutral;
 - b) accurate;
 - c) versatile.
4. Many materials have been called...:
 - a) magnitude;
 - b) insulators;
 - c) circuit.
5. In general metals such as copper, aluminium, silver, and gold are good...:
 - a) agitation;
 - b) semiconductors;
 - c) electrical conductors.
6. Some materials will conduct...:
 - a) some current;
 - b) speed;
 - c) tools.
7. With the discovery of the electron, it became clear that electrons do the moving when there is electric conduction in...:
 - a) power;
 - b) metal;
 - c) turn.
8. Many materials have such a ... on electrons that is it difficult for them to migrate:
 - a) matter;
 - b) tight bound;
 - c) free electron.

9. Where do free electrons drift?
- a) shell;
 - b) in an electric field;
 - c) in an electric charge.
10. Some materials called semiconductors are...:
- a) tight nucleus;
 - b) neither good conductors nor good insulators;
 - c) certain magnitudes.
11. We ... a voltmeter to measure voltage:
- a) are used;
 - b) use;
 - c) will be used.
12. Farmers ... various electrical machines on farms:
- a) have;
 - b) has;
 - c) am having.
13. ... electricity run electric motors?
- a) does;
 - b) do;
 - c) has.
14. What machines ... for milking cows?
- a) a farmer used;
 - b) does a farmer use;
 - c) farmers used.
15. An ammeter ... to measure current:
- a) uses;
 - b) are used;
 - c) is used.

LESSON 5

Electrical Effects

Грамматика: Сложные формы причастий. Причастные обороты.

Прочтите текст и скажите, какой учёный открыл химический эффект электрического тока.

1. An electric current by itself has absolutely no value. Developing some useful electrical effects engineers were capable of constructing numerous practical applications. There are only a few electrical effects, but, having taken single or together in combinations, they were responsible for the proper functioning of all electrical apparatus.

2. The heating effect of an electric current is the first practical application. Heat is always developed in a conductor when a current of electricity passes through it at high voltage. Several factors are responsible for the heating process, the most important are the following ones: (1) the value of the current, (2) the resistance of the conductor, (3) the time of flowing the current, (4) the physical size of heat-absorbing device, (5) an air temperature surrounding the conductor etc.

3. In many of the heating units found in the home, such as radiant heaters, electric stoves etc. the heating is an useful effect, being under perfect control. However, excessive heating may result in severe damage of electrical equipment. An electric motor always uses low-melting metal, called fuses or circuit breakers, preventing the damage of the motor.

4. Michael Faraday having discovered the chemical effect of an electric current, showed the connection between electricity and chemical action. This fact has resulted in such modern processes as electroplating, electrofining, the production of oxygen, hydrogen and the manufacture of metallic sodium etc.

5. In this connection it is important to underline that electrochemical reactions are absolutely exact being governed by exact laws. The international ampere is the unit of electric current accepted by an act of Congress in 1894.

6. The basis for all electrochemical actions is the elementary electrolyte. It includes two metallic plates called electrodes immersed in a solution having any salt and acid, called electrolyte. A current of electricity having been passed through a cell from a source of electric power, chemical changes take place. The metal from one plate is carried over the other plate. In other case, gases having been formed as a new chemical product, are collected at the electrodes.

7. In the lead-acid battery the electrodes are charged, i.e. by sending current into the battery, then being used as a source of electricity until the plates have been reduced.

Пояснения к тексту

heating unit – нагревательный элемент

radiant heater – лучистый радиатор

electroplating – гальванопокрытие

Словарный минимум

effect		эффект, действие
value		ценность, величина
capable		способный
proper	a	правильный, надлежащий
responsible	a	ответственный, важный
resistance		сопротивление
heat	v	нагревать
size	n	размер
absorb	v	поглощать
surround		окружать
excessive		чрезмерный
damage	v	повреждать
melt	v	плавить
fuse		плавкий предохранитель
unit		единица (измерения)
breaker		автоматический выключатель
prevent	v	предотвращать
action		действие
manufacture		изготовление, производство
exact	a	точный
govern	v	управлять, руководить
law		закон
ampere		ампер
accept	v	принимать
cell		батарея, элемент
pass	v	проходить
change	v	изменять
take place	v	происходить

carry over	v	переносить
solution		раствор
acid		кислота
electrolyte		электролит

Упражнения

1. Запомните произношение следующих слов, переведите.

Oxygen, hydrogen, sodium, apparatus, radiant, electrolytic.

2. Образуйте от следующих слов прилагательные с суффиксом -ive или -ic. Назовите их значение:

a) prevent v, construct v, effect, conduct v, protection, produce v, collect v, action, induction, intensity.

b) atom, period, economy, character, metal, magnet, science, climate, mechanics, electrolyte.

3. Назовите пары слов, близких по значению.

- | | |
|----------------|-----------------|
| 1. manufacture | 1. accurate |
| 2. adopt v | 2. use v |
| 3. occur v | 3. production |
| 4. apply v | 4. accept v |
| 5. exact | 5. take place v |
| 6. apparatus | 6. run v |
| 7. govern v | 7. device |

4. Объясните, по какому принципу сгруппированы слова. Назовите их значение.

a) connect v – disconnect

advantage – disadvantage

cover – discover

continue v – discontinue

b) accurate – inaccurate

effective – ineffective

capable – incapable

adequate – inadequate

c) possible – impossible

proper – improper

acceptable – unacceptable

known – unknown

5. Найдите в пункте “a” соответствующие русские эквиваленты словосочетаний пункта “b”.

a) 1. circuit breaker, 2. the value of the current, 3. heat-absorbing device, 4. melting metal, 5. metallic sodium, 6. immersed in a solution, 7. proper functioning, 8. heating value, 9. accepted by an act;

b) плавкий металл, теплопоглощающее устройство, металлический натрий, автоматический выключатель, величина тока, узаконенная, теплотворная способность (тепловой эффект), погруженный в раствор, надлежащая (правильная) работа.

6. Найдите в тексте предложения, в которых говорится о:

1) факторах, влияющих на процесс нагревания;

2) нагревательных элементах.

7. Определите формы и функции причастия 2 и переведите предложения на русский язык.

1. The condenser is, on the whole, two conductors separated by a dielectric or an insulating material.

2. If heated, the wire melts.

3. When treated properly this material will be a good insulator.

4. There was a great increase of the quantity of parts produced.

5. Some day atomic energy might have been used to control the weather of the world.

6. Both apparatus are equipped with a rubber-insulated conductor.

7. When properly insulated the wire may be used in conditions of excessive moisture.

8. Замените данные словосочетания одним словом.

1. the standard unit for measuring the strength of an electric current;

2. to take from one place to another; 3. to stop or keep from doing something; 4. any fixed measure used as standard; 5. an apparatus using fuel or electricity for heating.

1 – to prevent; 2 – stove; 3 – ampere; 4 – to carry; 5 – unit.

9. Закончите предложения согласно содержанию текста.

1. Being governed by exact laws

2. The acids when they are dissolved in water form

3. The chemical effect of an electric current has found practical application in

4. The unit accepted for measuring

5. Electrolytic cell includes two metallic

10. Переведите предложения, определив форму причастий. Обратите внимание на перевод независимого причастного оборота.

1. The circuit having been broken up, the flow of current stopped.
2. The problem having been solved, they started their tests.
3. Each atom consists of a central part called the nucleus around which move electrons, the numbers of electrons depending on the kind of atom.
4. Having been measured with unreliable instruments the emf was found inaccurate.
5. Acids react with oxides of all the metals, a salt and water being formed.
6. While separating radium, M. Curie found other radioactive elements.
7. The transformer is oil cooled, the hot oil being passed back through the radiators by means of a pump.
8. Radioactivity discovered, we made great progress in atomic physics.

11. Найдите в тексте ответы на следующие вопросы.

1. What are the effects of an electric current?
2. What did M. Faraday's discovery result in?
3. What is the basis for electrochemical action?

12. Прочтите абзац №6 ещё раз и скажите, как используют электричество для получения химического эффекта.

13. Составьте список ключевых слов, несущих основную смысловую нагрузку.

14. Расскажите, что нового вы узнали из текста.

TEST 5

Choose the right variant.

1. Developing some useful electrical effects engineers were capable of constructing numerous...:

- a) effect;
- b) practical applications;
- c) cells.

2. Where is heat always developed?

- a) in an acid;
- b) in a conductor;
- c) in a heating unit.

3. What must be under perfect control?
 - a) the heating;
 - b) heat-absorbing device;
 - c) the value of the current.
4. Who discovered the chemical effect of an electric current?
 - a) Joseph Lister;
 - b) Ernest Rutherford;
 - c) Michael Faraday.
5. Who showed the connection between electricity and chemical action?
 - a) Charles Darwin;
 - b) Michael Faraday;
 - c) James Clerk Maxwell.
6. What is international ampere?
 - a) the unit of electric current;
 - b) a breaker;
 - c) an electrolyte.
7. The metal from one plate is carried over...:
 - a) the river;
 - b) the radiant heater;
 - c) the other plate.
8. A ... having been passed through a cell from a source of electric power, chemical changes take place:
 - a) radio electronics;
 - b) conductivity of metals;
 - c) a current of electricity.
9. An electric motor always use...:
 - a) damage of motor;
 - b) fuses;
 - c) several factors.
10. The problem having been solved, they started the experiments:
 - a) они решили проблему и начали эксперименты;

b) после того, как проблема была решена, они начали эксперименты;

c) они продолжили эксперименты после решения данной проблемы.

11. ... electricity an expensive energy?

a) does;

b) are;

c) is.

12. Are they ... an examination now?

a) take;

b) taken;

c) taking.

13. ... the installion being repaired now:

a) are;

b) is;

c) does.

14. At 8 o'clock yesterday I ... the electric store:

a) was repairing;

b) repair;

c) were repairing.

15. Safety devices ... in this design:

a) has been included;

b) was included;

c) have been included.

LESSON 6

Electrical instruments

Грамматика: Инфинитив в функции подлежащего, обстоятельства цели, определения.

Прочтите текст и скажите, какие приборы используются для измерения электрических параметров.

1. Agricultural engineers use a great number of electrical instruments to make electrical measurements. The basic AC measuring devices are

believed to be the most important instruments the engineer is primarily concerned about. He will require them to measure and evaluate electrical parameters in majority of cases.

2. Most AC voltmeters and ammeters are of the electrodynamic type. For measurements of high current and voltage, current and potential transformers are required as auxiliary equipment.

3. The voltmeter is an instrument for the measurement of voltage. You should know the voltmeter to be placed across the leads where the voltage is being determined. You are certain to increase the range of a voltmeter by adding resistors, known as multipliers, in series. The added resistors equalled to the resistance of the voltmeter, double the range of the voltmeter.

4. An ammeter is a low resistance instrument, to be placed in series with the line where the current is to be determined. Alternating current ammeters may be single-range or multiple range instruments. A single ammeter may be made to operate over many ranges. To measure a large current a current transformer is used. An ammeter should under no circumstances be placed across any voltage source.

5. The wattmeter, you are likely to have tested in the circuit, is used for measuring power. Direct current power is equal to the product of the current through the load and the voltage across the load. To determine the power it is necessary to measure only the current and voltage. When properly adjusted the wattmeter reads the product of the effective voltage, effective current and power factor. In a wattmeter the movable coil is the potential coil and the stationary coils are the current coils.

Словарный минимум

device	прибор
concern	касаться, иметь отношение
require	требовать
majority	большинство
evaluate	оценивать
auxiliary	вспомогательный
lead	проводник
determine	определять
multiplier	увеличитель диапазона измерений
double	увеличивать в два раза
alternating current	переменный ток

single-range	однодиапазонный
product	результат, произведение
load	нагрузка, заряд, заряжать
factor	коэффициент
power factor	коэффициент мощности
add	добавлять, присоединять
resistor	резистор, реостат

Упражнения

1. По сходству с каким словом в русском языке можно догадаться о значении следующих слов:

instrument, engineer, electricity, basic, voltmeter, wattmeter, stationary, phase, theory, transformer, electrodynometer, proportional.

2. Сгруппируйте слова по частям речи:

а) существительные; б) прилагательные; в) числительные; г) наречия; д) глаголы.

measurement, effective, negative, equipment, practically, determine, operate, measure, transform, transformer, add, addition, require, evaluate, electrical, important, forty, agricultural, eighteen, power, fully, operate, operation, expression, factor, direct, directly, pointer.

3. Выберите из пункта “b” русские эквиваленты к словам и словосочетаниям из пункта “a”.

a) circuit transformer, voltage source, to determine power, potential coil, potential transformer, alternating current ammeter, movable coil, single-range ammeter.

b) катушка напряжения, амперметр переменного тока, токовый трансформатор, источник напряжения, однодиапазонный амперметр, определять мощность, трансформатор напряжения, подвижная катушка.

4. Определите функции инфинитива, учитывая его место в предложениях, и переведите их:

1. The results of the test to be considered are given in table two.

2. Special symbols are used to show electric systems.

3. In 1756 the great Russian scientist M.V. Lomonosov was the first to make theoretical analysis of electrical phenomena.

4. Who was the first to invent an electric motor?

5. To solve this problem is of great importance.

6. Electrical measurements are used, firstly, to measure electrical quantities (current, voltage, power, resistance) and, secondly, to measure heat, light, mechanical and other non-electrical quantities by electric methods.

5. Расположите пункты плана согласно содержания текста:

1. The use of basic AC measuring devices.
2. The measurement of direct current power.
3. The use of an ammeter.
4. The use of a voltmeter.

6. Укажите предложения, которые противоречат содержанию текста:

1. To measure a small current a circuit transformer is used.
2. The range of a voltmeter can be increased by adding resistors.
3. An ammeter should not be placed across any voltage source.
4. A single ammeter cannot be made to operate over many ranges.
5. In a wattmeter the movable coil is a current coil.

7. Укажите предложение в тексте, которое может служить ответом на следующий русский вопрос:

Для измерения каких электрических параметров используются токовые трансформаторы и трансформаторы напряжения в качестве вспомогательного оборудования?

8. Какие предложения в тексте могут служить ответами на следующие вопросы:

1. How can direct current power be determined?
2. What device doubles the range of the voltmeter?
3. What transformer is used to measure a large current?
4. What device is used for measuring power?
5. How is a voltmeter connected?

9. Подготовьте несколько вопросов по содержанию текста, используя новую лексику занятия.

10. Расскажите по-английски о приборах для измерения и оценки электрических параметров, используя следующие слова и словосочетания.

Electrical instruments, to measure and evaluate electrical parameters, to use a voltmeter, to determine the voltage, to place across the leads, to add resistors, low resistance instrument, to be placed in series with the line, a single-range ammeter, a circuit transformer, to use a wattmeter.

TEST 6

Choose the right variant.

1. An ammeter is a resistance instrument:
 - a) high;
 - b) low;
 - c) large.

2. An ammeter is placed with the line where the current is being determined:
 - a) in series;
 - b) in parallel;
 - c) across.

3. To measure a large current a transformer is used:
 - a) current;
 - b) potential;
 - c) distribution .

4. The wattmeter is used for power:
 - a) adjusting;
 - b) measuring;
 - c) transforming.

5. The voltmeter is an instrument for the measurement of:
 - a) current;
 - b) voltage;
 - c) resistance.

6. The range of a voltmeter is increased by resistors in series:
 - a) adding;
 - b) determining;
 - c) moving.

7. The added resistors the range of the voltmeter:
 - a) double;
 - b) reduce;
 - c) evaluate.

8. What do agricultural engineers use to make electrical measurements?
- a) alternating current;
 - b) a great number of electrical instruments;
 - c) multiplier.
9. A single ammeter may be made to operate over...:
- a) good device;
 - b) power factor;
 - c) many ranges.
10. What is direct current equal?
- a) to power factor;
 - b) to the product of the current through the load and the voltage across the load;
 - c) to increase the range of a voltmeter.
11. The ... resistors double the range of the voltmeter:
- a) added;
 - b) adding;
 - c) add.
12. Electrons ... an atom are in motion:
- a) forming;
 - b) formed;
 - c) form.
13. Having read the newspaper I put it on the table:
- a) читая газету;
 - b) прочитанная газета;
 - c) прочитав газету.
14. Having constructed the power station they started to build a new school:
- a) строя электростанцию;
 - b) построив электростанцию;
 - c) построенная электростанция.

15. A new power station having been built, some energy problems were solved:

- a) Когда новая электростанция была построена, некоторые энергетические проблемы были решены;
- b) Некоторые энергетические проблемы будут решены, после того как новая электростанция будет построена;
- c) Они построили новую электростанцию и решили некоторые энергетические проблемы.

LESSON 7

Electric Motors

Грамматика: Инфинитивные конструкции.

Прочитайте текст и скажите, какой тип двигателей широко используется в сельском хозяйстве.

1. Electric motors are the most convenient means of obtaining mechanical power. They may be classified as either DC or AC machines. All electric motors, used in agricultural operations are of the AC type. The practical use of the AC electric motors requires that they should be constructed of single-phase and polyphase types. The two main types of motors classified as to principle of operation are synchronous and induction motors.

2. Electric motors can operate in a wide range of temperatures (the lower temperature, the better the operation). The induction motors are simple and reliable. It is natural that they should be almost exclusively used in agricultural operations. An induction motor depends on induced currents for its operations.

3. A.C. motors are quiet, safe, and efficient in operation, and very convenient to control, and are therefore an ideal type of power device. An operator can start or stop a unit of several thousand h. p. by merely pressing a button of an automatic remote controller such as is used with many large A.C. motors.

Electric motors when properly selected and installed serve many years and require only periodic care.

There are many different sizes of electric motors. Why are these different sizes needed or, in other words, what is the difference about the various loads that causes one to select one size of motor for this application and another for a different application? The answer is obtained by examining the characteristics of the various loads.

4. Engineers found that the synchronous speed of an induction motor would depend on the frequency of the applied voltage and the number of poles. $N=(t*120)/P$ where N-speed (rpm); t- frequency (cycles per second); p-number of poles.

5. The actual speed of an induction motor is from one to ten percent below synchronous speed. This difference of speeds is known as slip. If you take a motor with a synchronous speed of 1800 rpm and a 4 % slip, it would have an actual speed of 1728 rpm. Slip increases as a motor becomes more heavily loaded.

Словарный минимум

regard	рассматривать, считать
induction	индукция
induction motor	асинхронный двигатель
reliable	надежный
depend	зависеть
induced current	индуцированный ток
rotate	вращаться
flux	поток
pole	полюс
slip	скольжение
rpm	оборотов в секунду
(revolution per second)	
rotation	вращение
frequency	частота, повторяемость
cut	отключать, отсоединять
uniform	равномерный, единообразный

Упражнения

1. Выберите из пункта “b” русские эквиваленты к словам и сочетаниям пункта “a”.

a) polyphase motor, induction motor, the number of poles, difference of speeds, a turning moment, motor slip, to depend on induced current, require, to apply voltage.

b) число полюсов, разница скоростей, многофазовый двигатель, асинхронный двигатель, скольжение двигателя, подавать напряжение, вращающий момент, требовать, зависеть от индуцированного тока.

2. Определите по суффиксам, к какой части речи относятся следующие слова и переведите их:

classification, movement, lowest, classify, movable, central, induction, reliable, operation, widely, practical, requirement, magnetic, rotation, exclusively, actually, revolution, practical, natural, measurement.

3. Укажите в тексте предложения, в которых употреблены эквиваленты следующих русских слов и словосочетаний:

по принципу действия, средство получения, чем ниже температура, магнитное поле, вращающий момент, число полюсов, фактическая скорость.

4. Переведите следующие предложения на русский язык, обращая внимание на инфинитивные конструкции “сложное подлежащее” и “сложное дополнение”.

1. The most important characteristic of an electric measuring instrument is known to be its accuracy.

2. We know faulty insulation to be dangerous.

3. The year of 1895 is considered to be the date of the invention of the radio.

4. He is said to work under very hard conditions.

5. They expect this new electric equipment to be used in their laboratory.

6. Do you find aluminium to be a good conductor?

7. A large number of substances are known to be neither good conductors of electricity nor good insulators.

8. We know the synchronous speed of an induction motor to depend on the frequency of the applied voltage and the number of poles.

9. This young man is sure to be interested in electronics.

5. Закончите предложения, соединив соответствующие части:

1. Copper is known.....:

a).... that it is a good conductor;

b).... to be a good conductor.

2. Electricity is considered.....:

a).... to be a cheap form of energy;

b).... that it is a cheap form of energy.

3. The scientific conference is reported.....:

a).... that it will be held in April;

b).... to be held in April.

4. This problem is thought....:
- a).... to be solved next decade;
 - b).... that it will be solved next decade.

6. Переведите:

1. Сообщают, что группа специалистов приедет на следующей неделе.
2. Известно, что эти металлы являются хорошими проводниками.
3. Он, говорят, учится на нашем факультете.
4. Этот завод, как было известно, производит электронную аппаратуру.

7. Дополните предложения в соответствии с содержанием текста:

1. The electric motor should be regarded as.....
2. The practical use of the AC electric motors requires that.....
3. An induction motor depends on.....
4. The synchronous speed of an induction motor depends on.....
5. The actual speed of an induction motor is.....
6. Slip increases as.....

8. Выразите согласие или не согласие со следующими утверждениями, исходя из содержания текста.

Образец: This text is about electric motors.

– Yes, it is right. This text is about electric motors.

Electric motor cannot operate in a wide range of temperatures.

– No, it is wrong. Electric motors can operate in a wide range of temperatures.

1. All electric motors used in agricultural operations are of the DC type.
2. An induction motor depends on induced current.
3. Induction motors are very complex.
4. Induction motors are not reliable.
5. The synchronous speed of an induction motor depends on the frequency of the applied voltage and number of poles.

9. Ответьте на вопросы:

1. Can an electric motor be regarded as the most important means of obtaining mechanical power?
2. How are electric motors classified?
3. What type of electric motors is widely used in agricultural operations?

4. What is a slip?

10. Прочтите абзац 2 и ответьте на следующие вопросы:

1. Do electric motors operate better at low or high temperatures?

2. Why are induction motors widely used in agricultural operations?

11. Найдите в тексте предложения, которые могли бы служить ответом на вопрос:

What does the synchronous speed of an induction motor depend on?

12. Перескажите текст, используя новую лексику урока:

means of obtaining mechanical power, DC and AC machines, synchronous and induction motors, to operate in a wide range of temperature, simple and reliable, to depend on induced current, frequency of the applied voltage and the number of poles, actual speed, synchronous speed, slip.

TEST 7

Choose the right variant.

1. This text deals with.... types of alternating current motors: synchronous and asynchronous:

- a) one;
- b) two;
- c) three.

2. Electric motors are very efficient in.... electric energy into mechanical energy:

- a) converting;
- b) requiring;
- c) constructing.

3. All electric motors used in agricultural operations are of the.... type:

- a) AC;
- b) DC;
- c) h. p.

4. Electric motors can.... in a wide range of temperatures:

- a) develop;
- b) depend;
- c) operate.

5. Induction motors are...:

- a) simple;
- b) complex;
- c) scientific.

6. Induction motors are widely...:

- a) used;
- b) operate;
- c) take place.

7. Can electric motors.... many years?

- a) service;
- b) serving;
- c) serve.

8. Do electric motors.... periodic care?

- a) need;
- b) control;
- c) rotate.

9. The synchronous speed of an induction motor.... on the frequency of applied voltage and the number of poles:

- a) affect;
- b) operates;
- c) depends.

10. The actual speed of an induction motor is from one to ten percent.... synchronous speed:

- a) below;
- b) above;
- c) between.

11. They had to used this induction motor:

- a) уже использовали;
- b) должны использовать;
- c) должны были использовать.

12. We could repair the electric device:
- a) отремонтировали;
 - b) смогли отремонтировать;
 - c) можем отремонтировать.
13. The group of specialists are reported to come next week.
- a) Группа специалистов приедет на следующей неделе;
 - b) Сообщают, что группа специалистов приедет на следующей неделе;
 - c) Известно, что группа специалистов приедет на следующей неделе.
14. The synchronous speed of an induction motor is known ... on the frequency of applied voltage and number of poles:
- a) depend;
 - b) to depend;
 - c) depends.
15. Copper and aluminum are known to be good conductors of electricity.
- a) Известно, что медь и алюминий являются хорошими проводниками электричества;
 - b) Медь и алюминий – хорошие проводники электричества;
 - c) Мы считаем, что медь и алюминий являются хорошими проводниками электричества.

LESSON 8

Asynchronous Machines

Грамматика: Выражение модальности. Повторение.

Прочтите текст и скажите, на каком принципе основана асинхронная машина.

1. Electric machines, used to convert mechanical energy into electricity, are generators. Motors are used to convert electricity into mechanical energy. The simplest in construction and the most widely used is the asynchronous machine invented by M. O. Dobrovolsky in 1888.

2. The machine is known to have been based on the principle of the action of a rotating magnetic field on a short-circuited winding. The magnetic system of the electric machine consists of two cores. The outer

stationary core is called the stator. The rotating element is the rotor. A three-phase winding is placed into the slots of the stator.

3. The currents of this winding produce a rotating magnetic field. The currents in the winding of the rotor are induced by a rotating magnetic field. The stator core forms the outer part of the machine with the rotor core being placed inside on a shaft.

4. Like all electric machines, the asynchronous machine is reversible. This means, that they can operate as a motor or as a generator. The mode of operation of the machine is determined by the speed of its rotating field in relation to the rotor.

5. When the machine operates as a motor, the stator winding is the primary, receiving electric energy. The rotating magnetic field, produced by currents in the stator winding, induces currents in the winding of the rotor. The reaction of the latter with the magnetic field produces a turning moment (torque) which forces the rotor to follow the field performing mechanical work.

6. The decrease in current reduces the torque acting on the rotor. The rotor begins rotating slower than the field, i.e. asynchronously. This will take place when the rotor speed is about equal to the rotation speed of the field. The emf's induced by the field in the rotor will become less and, hence, also the rotor current. With a greater mechanical load on a motor the braking torque and the slip increase. This increases the emf's and currents in the rotor. The torque is increased too and the dynamic equilibrium is restored.

Словарный минимум

generator	генератор, источник энергии
winding	обмотка
short circuit	короткое замыкание в сети
core	сердечник
slot	паз, щель
shaft	вал
outer	внешний, наружный
reversible	реверсивный, обратимый
mode	способ, режим
relation	отношение
induce	индуцировать, наводить
force	сила, заставлять

decrease	уменьшение, уменьшать
reduce	уменьшать
restore	восстанавливать
brake torque	тормозной момент

Упражнения

1. Выберите из пункта “b” русские эквиваленты к словам и словосочетаниям пункта “a”.

a) rotating magnetic field, brake torque, great load, to determine speed, to increase slip, mode of operation, induced current, to reduce torque, winding of the rotor, to restore equilibrium;

b) тормозной момент, восстанавливать равновесие, определять скорость, увеличивать скольжение, режим работы, обмотка ротора, вращающееся магнитное поле, большая нагрузка, индуцированный ток, уменьшить вращающий момент.

2. Дайте русские эквиваленты следующих слов на основе их сходства с однокоренными словами в русском языке.

machine, mechanical, energy, system, process, stator, rotor, element, motor, generator, reaction, equilibrium, construction, principle, chemical, experiment.

3. Найдите предложения, в которых глаголы *to be*, *to have* имеют модальное значение, переведите их.

1. An ammeter has to be connected in series and a voltmeter in parallel.

2. Many problems have been solved by these research institutes.

3. Many problems were to be solved in connection with the construction of new transmission lines.

4. They will have to repair the electric equipment in a month.

5. Chemical potential energy has been changed into electrical energy.

6. These capacitors have to be connected in series.

7. They have conducted several experiments with batteries.

8. In practice the resistance is measured with an ohmmeter.

4. Заполните пропуски, выбрав нужную грамматическую форму:

1. The first asynchronous machine ... in 1888.

a) had invented; b) has invented; c) was invented.

2. The outer stationary core ... to be called the stator:

- a) are known; b) is known; c) were known.
3. A three-phase winding is known ... into the slots of the stator:
a) to place; b) to be placed; c) is placed.
4. Michael Faraday ... his discovery in 1831:
a) had been made; b) made; c) has made.
5. The experiment will take ... than two hours.
a) least; b) most; c) less.
5. Найдите в каждом ряду слово, перевод которого дан в начале ряда:
- | | |
|------------|-----------------------------------------------------------------------------------------------|
| уменьшать | a) to produce; b) to reduce; c) to rotate; d) to determine. |
| называть | a) to call; b) to operate; c) to use; d) to restore. |
| означать | a) to place; b) to base; c) to mean; d) to contain. |
| изобретать | a) to induce; b) to move; c) to invent; d) to increase. |
| заставлять | a) to act; b) to force; c) to generate; d) to require. |
6. Дополните предложение в соответствии с содержанием текста.
1. A three-phase winding is placed into...
 2. The asynchronous machine was invented by...
 3. The magnetic system of the electric machine consists of...
 4. The outer stationary core is called...
 5. The rotor core is placed...
 6. The mode of operation of the machine is determined by...
7. Ответьте на вопросы:
1. How are electric machines used to convert mechanical energy into electricity called?
 2. Who was the inventor of the asynchronous machine?
 3. How many cores does an electric machine consist of?
 4. What core is called the stator?
 5. What is a rotating element in the electric machine?
 6. Where is a three-phase winding placed?
 7. What core forms the outer part of the machine?
 8. Where is the rotor core placed?
8. Найдите ответ на следующий вопрос в тексте:
Как определяется режим работы асинхронной машины?
9. Найдите в тексте предложения, которые могли бы служить ответами на следующие вопросы:
1. When does the rotor begin rotating slower than the field?
 2. When do the brake torque and the slip increase?
 3. What enables to increase the emf's and currents in the rotor?
10. Выполните следующие задания:

1. Prove that the asynchronous machine is reversible.
2. Describe the construction of the asynchronous machine.
11. Составьте список ключевых слов, передайте основное содержание текста, используя их.

TEST 8

Choose the right variant.

1. Electric machines, used to convert mechanical energy into electricity, are...:
 - a) poles;
 - b) polyphase motors;
 - c) generators.
2. Whom was the asynchronous machine invented by?
 - a) Dolivo-Dobrovolsky;
 - b) H. Davy;
 - c) Newton.
3. How do we call the outer stationary core?
 - a) winding;
 - b) stator;
 - c) slot.
4. Like all electric machines, the asynchronous machine is...:
 - a) difficult;
 - b) reversible;
 - c) strong.
5. What is the mode of operation of the asynchronous machine determined by?
 - a) the speed of its rotating field;
 - b) the brake torque;
 - c) the short circuit.
6. When the machine operates as a motor, the stator winding is the...:
 - a) secondary;
 - b) primary;
 - c) outer.
7. What does the winding of the rotor produce?

- a) torque;
- b) induced current;
- c) rotating magnetic field.

8. The magnetic system of the electric machine consists of...:

- a) windings;
- b) two cores;
- c) brake torque.

9. What does a three-phase winding produce?

- a) a rotating magnetic field;
- b) short circuit;
- c) mechanical energy.

10. The torque is increased too and the dynamic equilibrium is...:

- a) reduce;
- b) detect;
- c) restored.

11. These materials ... to have been called insulators:

- a) are known;
- b) is known;
- c) to know.

12. He is said to have been worked at our substation.

- a) Говорят, что он работает на нашей подстанции;
- b) Говорят, что он работал на нашей подстанции;
- c) Известно, что он работал на нашей подстанции.

13. This installation is expected ... next month:

- a) is repaired;
- b) be repaired;
- c) to be repaired.

14. The engineer reported the new equipment to have been installed.

- a) Инженер сообщил, что устанавливается новое оборудование;
- b) Инженер сообщил, что новое оборудование установлено;
- c) Инженер сообщил нам об установке нового оборудования.

15. A group of scientists succeeded in developing a new kind of a ventilation system.

- a) Группе ученых удалось разработать новый тип вентиляционной системы;
- b) Группа ученых разработала новый тип вентиляционной системы;
- c) Группа ученых разрабатывает новый тип вентиляционной системы.

LESSON 9

Selection of Electric Motors

Грамматика: Герундий.

Прочтите текст и скажите, какие двигатели самые дешевые.

1. Motors are classified as general purpose, definite purpose or special purpose according to their application. The selection of a motor for a particular job should be considered from many points of view. In some cases more than one type of motor may be required to do the work. The nameplate of an electrical motor contains much information that can assist a farmer in identifying and describing the motor characteristics.

2. General purpose motors are built with standard ratings, operating characteristics and mechanical construction for a wide range of applications. They are expected to have the lowest cost. Definite purpose motors are usually designed with standard ratings, operating characteristics and mechanical construction for use in a special application or a particular industry. Special purpose motors are designed to meet specifically a set of requirements (such as for torque, bearings etc.) excluded from general purpose or definite purpose motors.

3. The specific voltage (dc, single-phase or polyphase, ac), maximum voltage and frequency must be known before a motor will be selected. Line voltage drop may have to be considered. Dual voltage motors (120/240 or 240/480 v) designed to operate on either of two voltages are widely used on farms. For low voltage operation the field windings are connected in parallel and for high voltage operation the windings are connected in series. This construction is similar for three-phase motors.

4. The maximum temperature rise of motor windings is fixed by the limiting operating temperature of the insulation. For many years the insulation material was cotton and paper (class A insulation) giving a 20-year life. The maximum upper limit of operation for these temperatures

was 105 °C. New classes of insulating materials have been developed from class A-105 °C maximum operating temperature to class H-180 °C maximum.

5. General torque characteristics of the load should be known such as whether the load requires high or low starting torque. Full motor load may be required continuously or for only a short time. Power and speed requirements should be known too. Speed may be changed by gear reduction. Everything should be taken into consideration: method of cooling, mounting, bearing construction, shaft size and gear reduction.

6. The nameplate of an electric motor can help you to select a motor for a particular application. The following information is usually provided: manufacturer, type of current (ac or dc), model number, type, phase (one, two or three), horsepower rating (h. p., or watts), frequency in cycles per second (c/s, Hertz, Hz), r. p. m. (revolutions per minute), volts, amperes, temperature rise.

Словарный минимум

nameplate	фирменная дощечка, марка изготовителя
rating	мощность
bearing	подшипник
exclude	исключать
field winding, exciting winding	обмотка возбуждения
similar	похожий, подобный
fix	укреплять, устанавливать
insulating	изоляционный
insulation	изоляция, изоляционный материал
cotton	хлопок
gear	шестерня
reduction	уменьшение
mounting	монтаж

Упражнения

1. Укажите исходные формы следующих слов:

describing, identifying, required, assists, lost, applications, operating, lowest, requirements, designed, contains, points, known.

2. Укажите, к какой части речи относятся следующие слова:

mechanical, application, usually, greatly, operate, special, develop, development, revolution, continuously, reduction.

3. Переведите следующие сложные слова и группы слов:

nameplate, maximum operating temperature, horsepower rating, revolutions per minute, shaft size, cycles per second, cooling system, bearing construction.

4. Выделите герундий и герундиальные обороты в следующих предложениях и переведите их:

1. The conductivity of semi-conductors sharply increases with heating and drops with cooling.

2. The dependence has opened great prospects for employing semi-conductors in measuring techniques.

3. I know of copper having been used as a conductor owing to its suitable characteristics.

4. The problem of turning heat directly into electricity has always attracted the attention of scientists.

5. Using automatic control makes it possible to increase productivity.

6. The engineer insisted on these experiments being made at our laboratory.

7. Besides reacting to light, semi-conductors react to all kinds of radiations and therefore are employed in designing electronic counters.

8. Semi-conducting materials are also an excellent means of maintaining a constant temperature irrespective of the surrounding temperature changes.

9. Photocells are capable of transforming ten per cent of sun-ray energy into electrical power.

10. Russian engineers and physicists turned their attention to semi-conductors more than thirty years ago, seeing in them the way of solving complicated engineering problems.

5. Дополните предложения в соответствии с содержанием текста:

1. For many years the insulation material was.....

2. Before selecting the motor we must know the specific voltage ...

3. Dual voltage motors are designed to operate.....

4. For low voltage operation the field windings are connected in.....

5. For high voltage operation the windings are connected in.....

6. Speed can be changed by.....

6. Выразите согласие или несогласие со следующими утверждениями, исходя из содержания текста. Дайте обоснование своего ответа.

Образец: 1. While selecting a motor many factors are taken into consideration.

Yes, it is right. While selecting a motor many factors are taken into consideration.

2. General purpose motors have the highest cost.

No, it is wrong. General purpose motors have the lowest cost.

1. The nameplate of an electric motor contains little information about the motor characteristics.

2. Dual voltage motors are not used in agriculture.

3. New classes of insulating materials have been developed.

4. The maximum operating temperature of an electric motor is 90°C.

5. For low voltage operation the windings are connected in series.

7. Ответьте на вопросы:

1. How are motors classified?

2. Does a nameplate of an electric motor help us in selecting a motor?

3. What motor characteristics must we take into consideration while selecting a motor?

4. How are field windings connected for low voltage operation?

5. What insulating materials are usually used?

8. Какие предложения в тексте могли бы служить ответами на следующие английские вопросы:

1. How can speed be changed?

2. How are field windings connected for low and high voltage operation?

3. Should power and speed requirements be taken into consideration?

9. Найдите в тексте предложение, в котором говорится о разработке новых видов изоляционных материалов.

10. Расшифруйте следующие сокращения:

c/s, r. p. m. , h. p., dc, ac, v., etc.

11. Выполните следующие задания:

1. Give the information which we can find in the nameplate of an electric motor.

2. Point out mechanical characteristics which should be taken into consideration while selecting a motor.

12. Составьте на английском языке резюме текста.

TEST 9

Choose the right variant.

1. How are motors classified according to their....?

- a) mounting;
- b) insulation;
- c) application.

2. What does the nameplate contain?

- a) information;
- b) capacitor;
- c) lead.

3. Definite purpose motors are usually designed for...:

- a) a special application or a particular industry;
- b) device;
- c) voltage.

4. The maximum temperature rise of the motor winding is fixed by the...:

- a) induced current;
- b) limiting operating temperature of the insulator;
- c) induction motor.

5. Must we take into consideration line voltage drop?

- a) Yes, we must;
- b) Yes , he must;
- c) No, we must not.

6. What was insulation material?

- a) cotton and paper;
- b) air;
- c) carbon.

7. Can the nameplate of an electric motor help you to select a motor?

- a) Yes, it can;

- b) Yes, it does;
- c) No, it doesn't.

8. How are general purpose motors built with?

- a) short circuit;
- b) induced current;
- c) standard ratings.

9. General purpose motors are expected to have the...:

- a) mounting;
- b) the following information;
- c) lowest cost.

10. Using automatic control makes it possible to increase labour productivity:

- a) использование;
- b) используя;
- c) использовать.

11. Did this engineer ... at the problem of agricultural electrification?

- a) works;
- b) work;
- c) worked.

12. This group of students ... an experiments yesterday at 2 o'clock:

- a) make;
- b) were making;
- c) was making.

13. Air contaminants ... in the ventilation system:

- a) have been removed;
- b) was removed;
- c) have removed.

14. High temperature and humidity ... the work of the equipment:

- a) has effected;
- b) have effected;
- c) have been effected.

15. Are they ... an examination now?

- a) take;
- b) taken;
- c) taking.

LESSON 10

The Power System

Грамматика: Герундий. Повторение.

Прочтите текст и скажите, наблюдается ли тенденция к увеличению атомных станций в мире.

1. An electrical system must include four main lines. They are generating plants, transmission lines, substations and distribution lines. The size may be from an extremely small system serving one community to a system covering the territory of the whole country.

2. Electric energy for the system is supplied by the generating plants. These plants include thermoelectric power stations, hydroelectric power stations. Nuclear plants are of special interest and are expected to increase in number all over the world.

3. Generating capacity normally depends upon the size of the system. The usual range is from 100 to 1.000.000 kW with the individual plant capacities being affected by the water supply, the location of the load centre and the types of loads to be served. Generated voltages are usually within the range of 2300–13800 volts. There is however some tendency to go to higher voltages.

4. Transmission lines are used to transmit electric energy to a location of the load centre. Transmission voltages from 13200 to about 500000 are used with the tendency toward the higher voltages. A transmission system usually consists of a network connected with two or more separate generating equipment. This can operate at a variety of load conditions.

5. Nearly all modern transmission systems in the USA operate on 60 cycles and the three-phase transmission is standard throughout the country. Two-phase transmission is used in many countries of Europe.

6. It is necessary that electric power substations should modify electric energy. Distribution transformers are not substations. A substation in comparison to a transformer is much more complex. Substations may perform the following: 1. transform, 2. switch, 3. interconnect, 4. regulate, 5. convert. Most substations performing many other functions transform electric energy of one potential to electric energy of another potential.

7. Distribution lines run from the distribution substations throughout the area to be served. Electricity is used without any voltage transformation. But most farms are served through a step-down transformer for reducing the distribution voltage. Such a transformer is expected to reduce the voltage from 4300 volts to 115, 230 and 440 volts. Rural industries may require higher voltages and might use 2300 volts from a 2300-volt distribution line.

8. Distribution lines may be either single-phase or three-phase. Many rural distribution lines are single-phase. But a large number of the single-phase lines is being converted to three-phase. Three-phase lines are commonly used in all feeder distribution networks. Underground service is becoming popular. Secondary transformers are usually located at the ground level.

9. Electric service requires that some voltage regulation should be provided in the distribution network on farms. Regulation is usually given on a percentage basis as indicated in the following equation. Percent regulation $(E_1 - E_2)/E_2$ where E_1 is the sending end voltage E_2 is the receiving end voltage.

Словарный минимум

plant	завод, станция, (силовая) установка
generate	производить, генерировать
generating plant	генераторная станция
distribution	распределение
capacity	выработка, мощность
affect	изменять, влиять, оказывать влияние
modify	изменять
step-down transformer	понижающий трансформатор
step-up transformer	повышающий трансформатор
network	сеть, энергосистема
regulation	регулирование
percentage	процент, процентное отношение
send	посылать
receive	получать
interconnection	взаимосвязь, объединение
secondary	вторичная обмотка
ground	земля, заземлять

Упражнения

1. Укажите исходные формы следующих слов:
serving, generating, expected, higher, reducing, more, performing, requires, capacities, being, called, industries.
2. Укажите, к каким частям речи относятся следующие слова:
modify, modification, regulation, convert, equation, reduce, reduction, conversion, special, extremely, transmission, capable, operator.
3. Проверьте себя, помните ли вы следующие глаголы:
to require, to design, to consider, to construct, to produce, to increase, to induce, to perform, to receive, to form, to place, to rotate, to convert, to invent.
4. Подберите правильные словарные определения к следующим словам:
condenser, transformer, voltage, generator, voltmeter.
 1. An apparatus for transforming the voltage of an electric current.
 2. A machine for changing mechanical energy into electric energy.
 3. An instrument for measuring an electromotive force, or a difference in electrical potential, by volts.
 4. Electromotive force, expressed in volts.
 5. A device for receiving and storing an electric charge.
5. Выделите герундий и герундиальные обороты в следующих предложениях и переведите их:
 1. Converting heat into electricity without using boilers or other machines was one of complicated engineering problems.
 2. The problem of using atomic energy for production of electricity is of great interest and scientists in different countries give much attention to it.
 3. We know of light increasing the conductivity of semi-conduction materials.
 4. We heard of their having conducted the experiments in time.
 5. They spoke of various methods of cooling transformers.
 6. He heard of the group of young specialists being sent to the Far East.
 7. I know of his having worked at our substation.
6. Выразите согласие или несогласие со следующими утверждениями, исходя из содержания текста. Дайте обоснование своего ответа.

- Образец:*
1. The power system is described in this text. – Yes, it is right. The power system is described in this text.
 2. A substation in comparison to a transformer is less complex. – No, it is wrong. A substation in comparison to a transformer is more complex.
1. Two-phase transmission is standard throughout the USA.
 2. Generating capacity usually depends on the size of the system.
 3. Plant capacity is affected by water supply, the location of the load centre and the types of loads.
 4. Underground service is becoming less popular.
 5. The substation transforms electrical energy of one potential to electric energy of another potential.
7. Ответьте на вопросы:
1. What parts does the electric system include?
 2. What types of stations are generating plants represented by?
 3. What is the function of transmission lines?
 4. May rural industries use voltage of 4300 volts?
 5. What purpose is a step-down transformer used for?
 6. Can a step-down transformer reduce the voltage from 4300 volts to 115 volts?
8. Укажите предложения в тексте, которые могут служить ответами на следующие вопросы:
1. Where are secondary transformers usually located?
 2. What are the functions of substations?
 3. What cycles do modern transmission systems in the USA operate on?
9. Какое предложение в тексте может служить ответом на следующий русский вопрос:
- Какие размеры могут иметь энергосистемы?
10. Что нового вы узнали из текста?
11. Составьте список ключевых слов и перескажите текст, используя их.

TEST 10

Choose the right variant.

1. How many lines must an electrical system include?
 - a) two;
 - b) five;
 - c) four.

2. Electric energy for the system is supplied by....:
 - a) a step-down transformer;
 - b) a step-up transformer;
 - c) generating plants.
3. What does generating capacity depend upon?
 - a) the size of the system;
 - b) the individual plant;
 - c) the distribution lines.
4. What are transmission lines used for?
 - a) to transmit electric energy;
 - b) to find practical application;
 - c) to double current.
5. Where is two-phase transmission used?
 - a) in the USA;
 - b) in Asia;
 - c) in many countries of Europe.
6. What is much more complex in comparison to a transformer?
 - a) a substation;
 - b) an electrical system;
 - c) a three-phase winding.
7. Where are three-phase lines commonly used?
 - a) in generating plant;
 - b) in all feeder distribution networks;
 - c) in bearings.
8. ... he invent a transformer in 1876?
 - a) did;
 - b) has;
 - c) had.
9. We ... to finish our experiment yesterday:
 - a) can;
 - b) had;
 - c) could.

10. We know faulty insulation ... dangerous:
a) to be;
b) be;
c) are.
11. We must read the motor nameplate...necessary information:
a) containing;
b) contained;
c) contain.
12. The methods...research work (улучшающие):
a) improves;
b) improving;
c) improved.
13. Farmers...by modern machines:
a) provided;
b) providing;
c) to provide.
14. The engineer ... new achievements (применяющие):
a) used;
b) using;
c) uses.
15. The ventilation system ... change of air (обеспечивающая):
a) provided;
b) provides;
c) providing.

LESSON 11

Light and radiation

Грамматика: Повторение. Инфинитивные обороты.

Страдательный залог.

Прочтите текст и назовите самые важные источники искусственного света.

1. The nature and properties of light have been the subject of discussion and study of many researches. It is a form of radiant energy which is capable of making the things visible. Visible light occupies only a very limited portion of the electromagnetic spectrum from 380 to 780 nm (nanometers).

2. In practice ultraviolet (UV) and infrared (IR) light are also referred to as light. The human eye, however, does not react to them. The nature of all electromagnetic radiation is the same, the difference being referred to the frequency and wavelength. The velocity of electromagnetic radiation in a vacuum is about 186000 miles per. sec., the speed of light.

3. Electromagnetic waves are not heat as such, but they are capable of converting the energy of the waves into heat energy. The visible portion of electromagnetic spectrum is important for illumination. Most lamps give radiation in all parts of this range. The luminous intensity within the range may vary greatly depending upon the type of lamp and its design. The human eye is likely to react maximally to radiations of about 550 nm. It has also been shown that some insects have maximum eye sensitivity within this spectrum too.

4. Light of good quality should be well diffused. From practical point of view, light is a production instrument. Scientists have demonstrated that light affects plants in many ways. Light has been used for many years by poultrymen. Lighting levels in some poultry operations are from 0,5 to 1,0 fc (footcandle).

5. Many illumination levels may be measured with using a lightmeter to read in footcandles. The sensitive element produces a current which is proportional to the illumination falling on it. A microammeter calibrated in fc is connected to the photocell. The range is usually of 0,2 to 2 or 3 fcs which are common in some poultry operations. For research work one may use bolometers.

6. The most important sources of artificial light for agricultural operations are incandescent lamps, fluorescent and high-intensity discharge lamps. The incandescent lamp is easily replaced. However, they radiate much heat. Fluorescent lamps operate much cooler and give more diffused illumination. High-intensity discharge lamps are used for outdoor lighting and for special application.

7. The main use of infrared radiation in agriculture is as a specialized source of heat. It can be localized and regulated. The universal source of IR is the incandescent type of infrared heat lamps.

8. The ultraviolet (UV) range includes the spectrum from 315 to 380 nm. This is a black light region. Radiation at 254 nm is known to cause a lethal effect on bacteria. It is capable of stopping mould growth in meat processing operations, reducing air-born bacteria in poultry production, pasteurization of numerous products.

Пояснения к тексту

time	– эд. умножить на
footcandle	– футосвеча (единица освещенности)
a discharge lamp	– (газо-)разрядная лампа
luminous intensity	– сила света
point of view	– точка зрения

Словарный минимум

radiate		излучать
radiant		лучистый, излучающий
visible		видимый
portion		часть, доля
cover	v	охватывать
refer (to)		относиться к
wavelength		длина волны
velocity		скорость
convert		превращать
range		спектр
luminous		световой
diffuse		рассеивать
level		уровень
vary		менять, изменять(-ся)
depend (on)	v	зависеть (от)
within		внутри
read	v	показывать (о приборе)
calibrate	v	градуировать
photocell		фотоэлемент
common		обычный, широко распространенный
poultry		домашняя птица, птицеводство
artificial		искусственный
incandescence		накал, накаливание
replace	v	заменять
cause	v	вызывать, быть причиной

Упражнения

1. Запомните произношение следующих слов, переведите их на русский язык:

vacuum, eye, human, view, fluorescent, specialized, ultraviolet, pasteurization, wavelength, source.

2. Выпишите из текста и переведите предложения, содержащие:

1. Инфинитивный оборот “сложное подлежащее”.

2. Perfect Passive.

3. Найдите в тексте английские эквиваленты следующим словосочетаниям:

очень ограниченная доля спектра, разница заключается в частоте и длине волны, сила света внутри спектра, с практической точки зрения, измеритель света в футосвечах, газоразрядные лампы высокого напряжения, для наружного освещения, прекращать рост плесени.

4. Закончите предложения согласно содержанию текста:

1. The difference between all electromagnetic radiation is in.....

2. 186000 miles per second is.....

3. Some insects react to radiation of.....

4. The energy of electromagnetic wave may be converted.....

5. radiate much heat.

6. The portion of the spectrum from 380 to 780 nm is.....

5. Выберите слова со сходными значениями:

to change, to reduce, to convert, to affect, velocity, illumination, to vary, to influence, to lower, lighting, speed, to transform, to use, to connect, to research, to link, to investigate, to apply.

6. Из правой колонки подберите слова, сочетающиеся по смыслу со словами из левой колонки:

1. visible

1. source

2. to convert

2. level

3. lighting

3. portion

4. specialized

4. affects

5. diffused

5. into heat

6. lethal

6. illumination

7. light

7. effect

7. Найдите в тексте ответы на вопросы:

1. What is the lighting level in some poultry operations?

2. How can one measure the lighting level?

3. What is the principle of a light meter operation?

8. Определите функцию инфинитива и переведите следующие предложения:

1. Only a limited number of reactions are known to be influenced by light.
2. In this case the atom may be expected to radiate energy.
3. Visible light was the first electromagnetic radiation to be studied.
4. For a material to be a semiconductor it must conduct electricity much worse than a metal and much better than an insulator.
5. The atom was supposed to be a complicated structure.
6. The intensity of light was the only physical condition to be estimated in the experiment.
7. This substance is found to possess the property of radioactivity.
8. The scientist expected this substance to fluoresce.

9. Переведите следующие предложения. Замените страдательный инфинитив в составе сказуемого страдательным залогом соответствующего числа и времени:

1. The substances can be used in agriculture.
2. The phenomenon of radioactivity has to be widely used in industry and medicine.
3. A large number of experiments had to be made on electrons of the given speed.
4. This problem is to be solved in the near future.
5. Electric energy can be easily converted into work.
6. He supposed that this effect can be caused by some unknown phenomenon.
7. A great number of experiments had to be made to obtain the required data.
8. The properties of this element must be described in detail.

10. Используйте инфинитив в скобках в Perfect или Indefinite соответствующей формы времени и залога. Обоснуйте свой выбор.

1. This experiment (to complete) by the very end of the working day.
2. This technological process greatly (to improve).
3. Fertilizers containing phosphates (to use) widely in agriculture.
4. These data (to obtain) before the experiment began.
5. The Russia Academy of Sciences (to open) in 1725.
6. Lighting level (to measure) with using a light meter.
7. Artificial light (to use) for many years in plant-growing.

11. Переведите на английский язык:

1. Этот эффект был вызван каким-то неизвестным веществом.

2. Для того чтобы детально изучить это явление, им пришлось провести очень много экспериментов.
3. Разрядные лампы высокого напряжения используются для наружного освещения.
4. Ему показали оборудование, которое будет использоваться в эксперименте.

TEST 11

Choose the right variant.

1. What is the nature and properties of light?
 - a) it is a form of radiant energy;
 - b) it is a wavelength;
 - c) it is a luminous range.
2. What does visible light occupy?
 - a) a very limited portion of the electromagnetic spectrum;
 - b) an operating temperature;
 - c) a standard rating.
3. Ultraviolet and infrared light are also referred to...:
 - a) as current;
 - b) as light;
 - c) as rating.
4. What is the velocity of electromagnetic radiation in a vacuum?
 - a) 200000 miles per sec;
 - b) 186000 miles per sec;
 - c) 389000 miles per sec.
5. The most important sources of artificial light for agricultural operations are:
 - a) incandescent lamps;
 - b) fluorescent and high-intensity discharge lamps;
 - c) artificial light.
6. Light of good quality should be well....:
 - a) radiate;
 - b) visible;
 - c) diffused.

7. What is the visible portion of the electromagnetic spectrum important for...:

- a) luminous intensity;
- b) velocity;
- c) illumination.

8. Such a transformer is known ... a step-down transformer:

- a) to be called;
- b) is called;
- c) calls.

9. They want the new substation to have been built by the end of the year:

- a) Они хотят своевременно построить новую подстанцию;
- b) Они хотят, чтобы новая подстанция была построена к концу года;
- c) Они построили новую подстанцию к концу года.

10. Their having made many experiments helped them solve this complex problem.

- a) Они провели много экспериментов для решения этой трудной проблемы;
- b) Они провели много экспериментов и решили эту сложную проблему;
- c) То, что они провели много экспериментов, помогло им решить эту сложную проблему.

11. They knew of these experiments having been made lately.

- a) Они недавно узнали о проведенных экспериментах;
- b) Они знали, что эти эксперименты были проведены недавно;
- c) Они знают, что эти эксперименты были проведены недавно.

12. Они не могут создать этот прибор, не используя полупроводники.

- a) They cannot construct this device not having been used semiconductors;
- b) They cannot construct this device without used semiconductors;
- c) They cannot construct this device without using semiconductors.

13. We know of his having worked at our substation.

- a) Мы знаем о том, что он работает на нашей подстанции;
- b) Мы знаем о том, что он работал на нашей подстанции;
- c) Говорят, что он работал на нашей подстанции.

14. He heard of the group of young specialists being sent to Moscow.

- a) Он слышал о том, что группу молодых специалистов посылают в Москву;
- b) Он слышал о том, что группу молодых специалистов послали в Москву;
- c) Он знает о том, что группу молодых специалистов посылают в Москву.

15. They spoke of using atomic energy in agriculture.

- a) Они говорили об использовании атомной энергии в сельском хозяйстве;
- b) Они говорили о том, как можно использовать атомную энергию в сельском хозяйстве;
- c) Они говорили об использовании атомной энергии в сельском хозяйстве и промышленности.

ТЕКСТЫ ДЛЯ САМОСТОЯТЕЛЬНОЙ РАБОТЫ

Read and translate the texts.

THE CONCEPT OF ELECTRICAL CURRENT

In the beginning of the 17th century Sir William Gilbert discovered that many substances could be electrified by friction. Gilbert named this effect “electric” after the word “electron”- the Greek name for amber. In 1756 the great Russian scientist M. V. Lomonosov was the first to make theoretical analysis of electrical phenomena.

At present the nature of electrification is explained by the electron theory. According to the modern theory all matter is composed of atoms or tiny particles. There are many kinds of atoms. Each atom consists of a nucleus, a small positively charged mass and a number of lighter negatively charged particles called electrons, which revolve around the nucleus. Normally each atom of a substance is electrically neutral, or it has

equal amounts of negative and positive charges, i.e. produces no electrical effects. If the number of negative charges is not equal to the number of positive charges, the matter will produce electrical effects.

When an electric charge is at rest it is spoken of as static electricity, but when it is in motion it is referred to as an electric current. In most cases, an electric current is described as a flow of electric charges along a conductor.

Not all substances are good conductors of electricity, as a general rule metals are good conductors of electricity, whereas nonmetals are poor conductors. The poorest of conductors are commonly called insulators or nonconductors. There are a large number of substances that are neither good conductors of electricity nor good insulators. These substances are called semi-conductors.

An electric current which flows in the same direction through a conductor or a current which does not change its polarity is called a direct current or a continuous current. Its abbreviation is D. C. An alternating current (A. C.) flows first in one direction and then in the other.

An electric circuit is a path through which an electric current flows. This is a complete path along which electrons can transmit their charges. An electric circuit includes a battery, generator, or magnetic means for producing current flow. Some portion of the circuit is made to do useful work.

The circuit is said to be open when no charges can move due to a break in the path. The circuit is said to be closed when no break exists – when switches are closed and all connections are properly made.

Answer the following questions:

1. What did William Gilbert discover in the beginning of the 17th century?
2. Who was the first to make theoretical analysis of electrical phenomena?
3. What theory is used to explain the nature of electrification?
4. What is matter composed of?
5. Are atoms tiny particles?
6. Are there many kinds of atoms?
7. What does each atom consist of?
8. Are electrons positively or negatively charged particles?
9. When will matter produce electrical effects?
10. What is static electricity?

11. What is an electric current?
12. Are metals good conductors of electricity?
13. What are semi-conductors?
14. What does the abbreviation D. C. mean?

BATTERIES

Batteries as sources of electrical energy are the result of a long series of experiments which started with the discoveries of Alessandro Volta, an Italian scientist, more than one hundred years ago. Today battery cells are manufactured in two common forms: (1) dry cells, used in flashlights, portable radios, etc., and (2) wet cells, used in automobiles, airplanes, boats, etc. The voltaic cell, as shown in fig. 9, is composed of three parts, a pair of dissimilar metal plates called *electrodes*, a dilute acid solution called the *electrolyte*, and a nonconducting container called the *cell*.

In a glass container filled with sulphuric acid there are two plates: one copper and the other zinc. If the two plates are connected by a copper wire, electricity will flow through it from the copper plate to the zinc plate. This may be shown by the wire becoming hot. If an ammeter is connected between the plates or electrodes, as they are now called, it will indicate that an electric current is flowing.

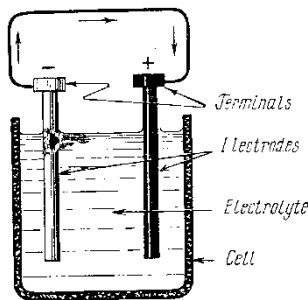


Fig. 9. The diagram of voltaic cell

The electrode from which electricity flows is termed the *positive* electrode and the receiving electrode is termed the *negative* electrode. Thus for the voltaic cell the copper plate is the positive electrode and the zinc plate the negative electrode. A copper wire will convey electricity and is called an electrical conductor. Copper, aluminium and silver are outstandingly good conductors.

Conductors must be surrounded by protective material which does not conduct electricity and prevent it to leak away. Materials which do not conduct electricity are called electrical *insulators*; there are many common examples-glass, wood, rubber, some plastics, “insulation” tape.

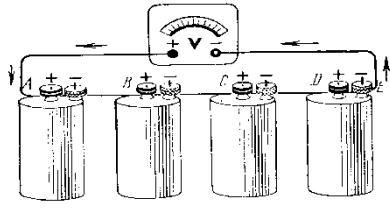


Fig. 10. The diagram of a battery

Remember that faulty insulation is dangerous and leads to unwanted electrical flow and probably to local overheating.

One common form of cell is shown in Fig. 9. If two or more cells are connected together, they form what is called a battery (Fig. 10).

In this diagram the battery is composed of four dry cells connected in series. By series connection it is meant that the (+) terminal of one cell is connected to the (-) terminal of the next. The purpose in connecting two or more cells in series is to obtain a higher *emf* than that available with one cell alone.

Each cell produces an *emf* of 1.5 volts, so that if the voltmeter is connected to the points, it will indicate 1.5 volts between A and B, 3.0 volts between A and C, 4.5 volts between A and D and 6 volts between A and E.

The common flashlight contains several dry cells connected in series.

Answer the questions:

1. Are batteries a source of electric energy?
2. Who is the inventor of batteries?
3. In what two forms are battery cells manufactured?
4. Where are dry cells used?
5. Where are wet cells used?
6. What parts is the cell composed of?
7. What electrode is called the positive electrode?
8. What electrode is termed the negative electrode?
9. Are copper and aluminium good electrical conductors?
10. What electrical insulators are mentioned in this text?
11. What can faulty insulation cause?

Read the text and make up the list of James Watt's works.

JAMES WATT

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 working in 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 design for a pressure gauge in 1790. The engine pressure indicator is also attributed to him.

In the development of the steam engine James Watt represents the perfecting of a sequence of stages beginning with the Newcomen 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.

Watt was interested in the strength of materials and designed a screw press for chemically copying written material. A leading brand of reprographic equipment today is remarkably similar. Watt received many honors in the Royal Society of London and Edinburgh, and was a number of the Academy of Sciences in France.

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

Пояснения к тексту

expertise
milestone
to repair

мастерство
веха
ремонтировать

governor	регулятор
pressure gauge	манометр (прибор для измерения давления)
sequence	последовательность
parallel motion and sun/planet gearing	параллелограммный механизм и планетарная передача
the latter	последний (из двух названных)
to coin the term	ввести термин
ft lb/min	футто-фунтов в минуту
strength of materials	сопротивление материалов
screw press	винтовой пресс

Read the text in 3 minutes without a dictionary, render it in Russian, title it and answer the questions.

WHAT CONTRIBUTION DID VOLTA AND EDISON MAKE TO THE DEVELOPMENT OF ELECTRICITY?

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.

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 ever corner of the world. Actual, other people were working simultaneously on the same problems, 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.

Answer the questions:

1. When did Volta make his experimental cell?

2. How did the development of practical applications of electrical energy advance during the nineteenth century?
3. What was Thomas Edison's invention?
4. Were other people simultaneously working on the same problem?

Read the text.

TYPES OF TRANSFORMERS

Transformers used to lower or rise the primary voltage are usually referred to as step-down or step-up transformer. Examples of the step-down type are distribution transformers. Power transformers raising voltage from perhaps 13800 volts to 230000 volts are of the step-up variety. Testing transformers used in high-voltage laboratories in connection with the testing insulators, circuit breakers and other high-voltage equipment are also of the step-up type.

Transforming the voltage within small ranges, we apply autotransformers. They are usually employed for starting a.-c. motors and in other cases. In the autotransformer the two windings, primary and secondary, being electrically and magnetically interconnected, have a good regulation, i.e. the voltage does not drop so much with load, and they have better efficiency.

Measuring high currents of high voltages, it is desirable to use low-range instruments in conjunction with specially constructed accurate-ratio transformers. The latter are called instrument current transformers and potential transformers.

Answer the questions:

1. How are transformers used to lower or raise the primary voltage called?
2. What are examples of the step-down type?
3. What are examples of the step-up type?
4. For what purpose are autotransformers employed?
5. Why have the autotransformers good regulation?
6. What is it desirable to use for measuring high currents or high voltages?

Read the text.

ALTERNATING-CURRENT MACHINES

There are types of alternating current machines: synchronous and asynchronous. The latter are usually referred to as induction machines.

A synchronous machine is one in which a strictly constant relation exists between the speed and the supply frequency. The synchronous machine is excited by direct current led to the exciting winding from a d. c. power circuit or from a special d. c. machine called the excited. Since low-power synchronous machines may also be constructed with permanent magnets, they have no special exciting (field) winding.

An induction machine is one in which the speed for a given frequency depends on the load. In an induction machine the magnetic field is created by an alternating current supplied from some a. c. power source.

As both synchronous and induction machines possess reversibility they may operated either as generators or as motors. Synchronous machines are mainly used as alternators for the production of a. c. power at electric power stations; they are also widely employed as synchronous motors and as synchronous condensers. When operated as condensers they improve the power factor.

In contrast to synchronous machines and asynchronous machines are mostly widely used as motor. Induction motors are the most common a. c. motors used in industry, transport, farms and even houses.

Answer the questions:

1. What types of a. c. machines are there?
2. What current is the synchronous machine excited by?
3. What does the speed of an induction machine depend on?
4. What is the magnetic field in an induction machine created by?
5. Why can a. c. machine operated as generators or as motors?
6. What machines are mostly used as alternators?
7. Are synchronous machines also used as motors?

Read the text.

THE DIRECT-CURRENT MACHINE

Electrical machines are divided into alternating current (a. c.) and direct-current (d. c.) machines. The basic parts of a d. c. machine are

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 in brush holders 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 and brushes: the machine operates as a generator. If the armature and 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.

Ex.1. Describe the work and the construction of direct current machines using the information from the text.

Read the text.

ALTERNATING CURRENT MOTORS

A. C. motors are made in sizes from 1/1000 h. p. and less, up to 60.000 h. p. and over, and they can be built even larger if any need for more powerful motors arises.

A. C. motors made to meet almost every conceivable need and condition

in the driving of machinery and equipment of all kinds. Some of the latest type A. C. motors are designed to produce excellent starting torque and give a wide range of speed control, and many other desirable characteristic with it which it was formerly thought possible to obtain only with D. C. motors.

Alternating current motors have the advantage of practically constant speed.

A. C. motors are quiet, safe, and efficient in operation, and very convenient to control, and are therefore an ideal type of power device. An operator can start or stop a unit of several thousand h. p. by merely pressing a button of an automatic remote controller such as is used with many large A. C. motors.

A. C. electric motors are rapidly replacing steam and gas engines and other forms of power in older factories; and practically all new factories, mills, and industrial plants are completely operated by electric motors.

Millions of A. C. motors are in machine shops, wood working shops, saw mills, automobile factories, and industrial plants of all kinds.

Alternating current motors are made in number of styles or types, depending upon the class of service and type of power supply they are intended for. The most common of these are the repulsion, induction, and synchronous types.

Repulsion motors are used on single-phase circuit only, but induction and synchronous motors are made in single-phase, two-phase, and three-phase types.

Single-phase motors are most commonly made in size from $\frac{1}{2}$ to 10 h.p., although in a few cases larger ones are used. They are usually wound for circuits of 100, 200 or 440 volts.

Two-phase motors are still in use to some extent in a few older plants and factories, but the great majority of A. C. motors are three-phase. Three-phase motors are commonly made in sizes from $\frac{1}{2}$ h. p. each, and can be made as large as any present requirement demand.

Voltage Ratings and Speed. The majority of three-phase motors are operated at 220, 440 and 550 volts, but many of the larger ones of several hundred h. p. and up, are designed for voltages of 1100, 2300, and 12.000 volts.

Medium-sizes A. C. motors are commonly made to operate at speeds ranging from 900 to 600 R. P. M.

Ex.1. Find the answers to the following questions from the text.

1. What size can A. C. motors be made?
2. For what purpose are A. C. motors used?
3. What are advantages of A. C. motors?
4. What are the most common type of A. C. motors?
5. At what voltage are the majority of three-phase motors operated?
6. Are repulsion motors used on single-phase or two-phase circuits?
7. At what speed are medium-sized A. C. motors made to operate?
8. At what speed do very large motors operate?

Ex.2 Give a short summary of the text in English.

Read the text.

HYDROGEN – A SOURCE OF POWER

Scientists consider hydrogen a very promising energy source. The reserves of hydrogen are practically unlimited. Per unit of weight it

contains almost three times more thermal energy than benzene. Besides, hydrogen can be used as fuel in transport, industry and home.

Hydrogen is easy to transport and store. It can be transported over large distances using conventional pipelines. It can be accumulated and kept for a long time either in conventional or natural reservoirs.

Scientists have found many ways of producing hydrogen – basically from ordinary water. And large volumes of this fuel can be obtained from coal, whose global reserves are tremendous. There is also an idea of using nuclear power plants to generate hydrogen. Scientists hope to use the energy of the sun, wind and tides to obtain hydrogen.

In several countries car engines fed by hydrogen have been tested successfully. Tests have also shown that adding five to ten per cent hydrogen to benzene increases engine efficiency by 40-45 per cent.

What is still holding back the use of hydrogen as fuel, and what has to be done in order to apply it extensively in the economy? The main reason is that now it is more expensive than mineral fuels, but in the near future hydrogen can be made cheaper to obtain. This new kind of energy opens up new prospects in aviation, metallurgy and some other industries.

Ex. 1. Complete the sentence in accordance with the contents of the text.

1. The reserves of hydrogen are...:
 - a) limited;
 - b) unlimited;
 - c) very small.

2. Hydrogen is easy...:
 - a) to start;
 - b) to flow;
 - c) to transport.

3. Hydrogen can be produced from...:
 - a) the energy of the sun;
 - b) from the energy of the wind;
 - c) ordinary water.

4. When we add 10 per cent of hydrogen to benzene...:
 - a) engine efficiency doesn't increase at all;
 - b) engine efficiency increases by 45 per cent;
 - c) engine efficiency increases only by 10 per cent.

Ex. 2. Answer the questions:

1. Why do scientists consider that hydrogen is a very important energy source?
2. Does hydron contain three times more thermal energy than benzene?
3. Can we use hydrogen as fuel in transport, industry and at home?
4. Is hydrogen easy or difficult to transport and store?
5. How can hydrogen be transported over long distances?
6. In what reservoirs can hydrogen be kept for a long time?
7. Have scientist found many ways of producing hydrogen?
8. Can we produce hydrogen from ordinary water?
9. Can this fuel be obtained from coal?
10. Are coal reserves great in the world?
11. Can nuclear power plants be used to generate hydrogen?
12. Can scientists use the energy of the sun, wind and tides to obtain hydrogen?
13. Hydrogen is a good fuel for cars, isn't it?
14. How much per cent must we add to benzene to increase engine efficiency by 40–45 per cent?
15. What holds back the use of hydrogen as a fuel?

Ex. 3. Give a short summary of the text in English.

Read the text.

LASERS TODAY AND TOMORROW

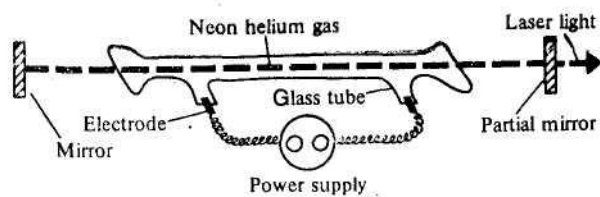
The laser has become a multipurpose tool. It has caused a real revolution in technology.

Atoms emit rays of different length which prevents the forming of an intense beam of light. The laser forces its atoms to emit rays having the same length and travelling in the same direction. The result is a narrow, extremely intense beam of light that spreads out very little and is therefore able to travel very great distances.

The most common laser is the helium-neon laser in the laser tube, there being 10 per cent helium gas and 90 per cent neon gas. At the end of the tube there is a mirror, and at the other end there is a partial mirror. The electrons get energy from a power supply and become "excited", giving off energy as light. This light is reflected by the mirror at one end of the tube. It can only escape through the partial mirror at the other end of the tube.

The first laser having been built in 1960, scientists developed several types of lasers which make use of luminescent crystals, luminescent glass, a mixture of various gases and finally semiconductors.

Having been developed at the Lebedev Institute of Physics in 1962, semiconductor quantum generators occupy a special place among the optical generators. While the size of a ruby crystal laser comes to tens of centimetres and that of a gas generator is about a metre long, a semiconductor laser is a few tens of a millimetre long, the density of its radiation being hundreds of thousands of times greater than that, of the best ruby lasers.



But the most interesting thing about semiconductor lasers is that they are able to transform electric energy directly into light wave energy. They perform it with an efficiency approaching 100 per cent as compared with a maximum of about 1 per cent of other lasers, this property of semiconductor lasers opening up new possibilities of producing extremely economical sources of light.

But it is in the field of communication that the laser will find its most extensive application in future. Scientists foresee the day when a single laser beam will be employed to carry simultaneously millions of telephone conversations or a thousand of television programmes. It will serve for fast communications across continents, under the sea, between the Earth and spaceships and between men travelling in space.

The potential importance of these applications continues to stimulate new development in the laser field.

Notes on the Text

laser – слово «лазер» состоит из начальных букв фразы, описывающей функцию прибора: Light Amplification by Stimulated Emission of Radiation – усиление света в результате вынужденного излучения

partial mirror – полупрозрачное стекло

power supply – источник питания

Ex. 1. Answer the questions:

1. A laser has caused a real revolution in technology, hasn't it?
2. What principle does a laser operate on?
3. How much per cent of helium gas and neon gas does the helium–neon laser contain?
4. When was the first laser built?
5. What types of lasers did scientists develop?
6. When and where was the first semiconductor quantum generator developed?
7. What can you say about the density of radiation in a semiconductor laser?
8. What is the size of a ruby crystal laser, a gas generator and a semiconductor laser?
9. What is the most interesting thing about semiconductor lasers?
10. Are lasers widely used in the field of communication?

Ex. 2. Give a short summary of the text in English.

Read the text.

ATOMIC FARMING

Theoretical and experimental research in atomic and nuclear physics has during recent years led us to the study of new peaceful uses of atomic energy.

Due to the use of radioactive isotopes, biologists and agriculturists are able to carry out research impossible by any other method. Scientists can now follow tagged atoms in fertilizers from the soil into plants. Thus the best time and the best method of applying the fertilizers can be determined.

Some interesting work has been done with radioactivity in the field of producing better varieties of plants. By shooting neutrons at oats, a variety of oats has been created that would be resistant to the disease known as rust.

Disease resistance is not the only aim of mutations by radiation. A variety of peanuts has been produced which yields about 30 per cent more crop per acre. Another one has been developed which has a size and shape fitted to harvesting machines.

How cows use food elements in producing milk is of great importance to farmers. Complicated processes can be followed in a cow's

body because tagged atoms act somewhat like a motion-picture camera in tracing the paths of certain food materials.

Radioactive sulphur is used in studies of feather formation in chickens and wool formation in sheep.

Radioactive isotopes are also being used successfully for food conservation.

Soon atomic power may supply cheap electricity throughout the world. Power-stations which generate electricity from the heat of splitting atoms may bring power to areas where fuel is scarce.

One way in which atomic energy may help farmers is through the use of atomic heat for orchards to protect oranges, lemons and other fruits from night frosts.

Atomic energy may help farmers in many other ways in the future.

Пояснения к тексту

atomic farming – применение атомной энергии в сельском хозяйстве

tagged atom – меченый атом

shoot – стрелять, бомбардировать

fit – подходить, соответствовать

sulphur – сера

Ex. 1. Answer the questions:

1. The author of this text describes the use of atomic energy in agriculture, doesn't he?

2. What helps biologists to carry out their researches?

3. Can scientists follow tagged atoms in fertilizers from the soil into plants?

4. What substance is used in studies of feather formation in chickens?

5. Do scientists use radioactive sulphur in studies of wool formation in sheep?

6. What atoms are used to trace food elements in a cow's body?

7. Can scientists develop new varieties of plants by means of radiation?

8. Will atomic heat protect fruit from night frosts?

Ex. 2. Complete the following sentences in accordance with the contents of the text.

1. Due to the use of radioactive isotopes scientists can find the best time and the best method of...:

- a) applying the fertilizers;
- b) watering the plants;
- c) artificial selection.

2. Radioactivity is used for...:

- a) irrigating fields;
- b) improving varieties of plant;
- c) producing milk.

3. The aim of mutations by radiation is...:

- a) the reduction of the vitamin content of vegetables;
- b) the increase of the vitamin content of vegetables;
- c) the increase of disease resistance of plants.

4. Radioactive isotopes are used successfully for...:

- a) food conservation;
- b) artificial lighting;
- c) studying various phenomena.

5. A variety of peanuts has been produced which yields...:

- a) about 20 per cent more crop per acre;
- b) about 10 per cent more crop per acre;
- c) about 30 per cent more crop per acre.

Ex. 3. Give a short summary of the text.

ГРАММАТИЧЕСКИЙ СПРАВОЧНИК

Tenses. Времена английского глагола

Время	<i>Indefinite</i>	<i>Continuous</i>	<i>Perfect</i>	<i>Perfect Continuous</i>
Present	work works (3 лицо, ед. число)	am is working are	have has worked	have has been working
Past	worked	working	had worked	had been worked
Future	shall will work	shall will be working	shall will have worked	shall will have been worked

Future-in-the Past (active)

<i>Future Indefinite in the Past Tense</i>	<i>Future Continuous in the Past Tense</i>	<i>Future Perfect in the Past Tense</i>	<i>Future Perfect Continuous in the Past Tense</i>
should work would	should be would working	should have would worked	should have been would working

Future-in-the Past (passive)

<i>Indefinite</i>	<i>Continious</i>	<i>Perfect</i>	<i>Perfect Continuous</i>
I should be invited. We should be invited. He (she, it, you, they) would be invited	—	I should have been invited. We should have been invited. He (she, it, you, they) would have been invited	

Indefinite Tenses. Active Voice (неопределённые времена)

<i>Present</i>	<i>Past</i>	<i>Future</i>
write writes Означает обычное, повторяющееся действие	wrote Выражает обычное действие в прошлом	shall will writes Выражает обычное действие в будущем

I live in a new house. The earth rotates round the sun. Spring comes after winter	I lived in this town last year. He finished school two years ago. I saw him in the morning	He will finish school next year. I will see the film this week. They will come by 7 o'clock
-----------------------------------------------------------------------------------------------	-----------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------

Continuous Tenses. Active Voice. (продолженные времена)

Present

Past

Future

am is writing are Выражает действие в процессе, в развитии, совершающееся в данный момент	was were writing Указывает на длительность действия в определённый момент в прошлом	shall will be writing Передает действие в развитии в определённый момент в будущем
I am sitting at the table and writing a letter. What are you doing now? I am not reading. I am writing	I was not reading when you came in. One evening, I was returning home along a narrow path	We shall be waiting for you at six o'clock. From 7 till 9 o'clock I shall be writing letters

***Perfect Tenses. Active Voice (совершенные времена, выражают
предшествование данному моменту)***

Present

Past

Future

have has written Выражает действие, законченное к настоящему моменту с определённым результатом	had written Выражает действие, завершенное к определённому моменту в прошлом	shall will have written Передает действие, закончившееся к определённому моменту в будущем
I have finished my work. He has seen this film. I have read [red] this book.	I had finished my work by 12 o'clock yesterday. (Я закончил работу вчера к 12 часам)	I shall have finished my work by the time our lessons begin. (Я закончу работу к началу занятий)

(Я закончил работу)
 (Он видел этот фильм)
 (Я читал (прочёл) эту книгу)

***Passive Voice* (страдательный залог)**

Пассивная форма всех времен глагола в английском языке образуется при помощи соответствующих личных форм вспомогательного глагола “to be” и “причастия 2” (Participle 2) основного глагола.

Вид	<i>Present</i>		<i>Past</i>		<i>Future</i>	
<i>Indefinite</i>	am		was		shall	
	is	asked	were	asked	will	be asked
	are					
<i>Continuous</i>	am	being	was	being		
	is	asked	were	asked		
	are					
<i>Perfect</i>	have	been			shall	have been
	has	asked	had been asked		will	asked

Пояснения

Страдательный залог образуют переходные глаголы. Глаголы в страдательном залоге означают действия, направленные на какой-либо объект.

Страдательный залог глаголов переводится:

1. Глаголами в страдательном залоге.

This house was built two years ago. – Этот дом был построен два года тому назад.

2. Глаголами в действительном залоге, если указано лицо, совершающее действие, то есть, если субъект действия выражен предложным дополнением с предлогами “by” (одушевлённый) или “with” (неодушевлённый).

The radio was invented by Popov in 1895. – Радио было изобретено Поповым в 1895 г. **The sky was covered with clouds.** – Небо было закрыто облаками.

3. Возвратными глаголами, оканчивающимися на -ся: **This house was being built for two years.** – Дом строился в течение двух лет.

4. Неопределённо-личной формой глаголов (наиболее распространённый способ перевода пассивных конструкций на русский язык.)

English is spoken everywhere in the world. – На английском языке говорят во всем мире.

Football is played all over the world. – В футбол играют во всем мире.

This device is being given special consideration. – Этому приспособлению уделяют особое внимание.

5. Если сказуемое стоит в пассиве и у него есть предлог, то перевод надо начинать с этого предлога, так как этот предлог относится к подлежащему и управляет им.

This film is much spoken about. – Об этом фильме много говорят.

He was laughed at by everybody. – Над ним все смеялись.

Причастие (Participle)

Вид	Действительный залог (<i>Active voice</i>)	Страдательный залог (<i>Passive voice</i>)
<i>Present</i>	preparing, doing	being prepared, being done
<i>Past</i>		prepared, done
<i>Perfect</i>	having prepared, having done	having been prepared, having been done

Причастие может выполнять в предложении следующие функции:

1) определения:

а) как определительный причастный оборот

The student reading a book is my friend. (Студент, читающий книгу – мой друг.)

The results obtained in our laboratory are published in a monthly magazine. (Результаты, полученные в нашей лаборатории, публикуются в ежемесячном журнале.)

б) как одиночное определение

The boiling water is evaporating.

The results obtained are published in a monthly magazine.

2) части простого глагольного сказуемого:

(примеры даны выше: published, evaporating)

Причастие употребляется только со вспомогательными глаголами во временах: Continuous, Perfect Continuous и в Passive Voice.

Is the door locked?

A page is missing from the book.

I have missed the train, it's a pity.

3) обстоятельство:

We spent the whole Sunday swimming and bathing in the river.

When completed, the project must meet the specifications. (По окончании проект должен удовлетворять техническим требованиям.)

4) как часть сложного дополнения:

I saw you passing our house.

He had the photo taken.

5) как часть независимого причастного оборота:

(Absolute Participial Construction)

Time permitting, I'll come next week. (Если время позволит)

The morning being cold, Nick put on his overcoat. (Так как утро было холодное....)

***Ing-forms:* герундий, причастие, отглагольное существительное**

Герундий – это неличная форма глагола, сочетающая свойства глагола и существительного. Подобной неличной формы в русском языке нет. Все формы герундия совпадают с формами причастия. Вот они:

Active	Passive
Indefinite Gerund и Present Participle <u>asking</u>	Indefinite Gerund и Present Participle <u>being asked</u>
Perfect Gerund и Perfect Participle <u>having asked</u>	Perfect Gerund и Perfect Participle <u>having been asked</u>

Причастие также является неличной формой глагола, но оно сочетает свойства глагола, прилагательного и наречия. Таким образом, герундий и причастие являются разными формами глагола и отличаются друг от друга как по значению, так и по синтаксическим функциям.

Герундий (Gerund)

Вид	Действительный залог (<i>Active voice</i>)	Страдательный залог (<i>Passive voice</i>)
<i>Indefinite</i>	preparing, doing	being prepared, being done
<i>Perfect</i>	having prepared, having done	having been prepared, having been done

Герундий является неличной формой глагола, имеет грамматические особенности как глагола, так и существительного и выражает процесс действия. В русском языке нет формы, соответствующей герундию.

Герундий переводится на русский язык:

- 1) инфинитивом; 2) существительным; 3) деепричастием; 4) придаточным предложением.

Герундий может выполнять в предложении следующие функции:

1. Подлежащего:

Doing homework took me a lot of time. (Приготовление уроков отняло у меня много времени.)

2. Дополнения (прямого, косвенного, предложного):

I like doing homework in the mornings. (Я люблю готовить уроки по утрам.) **I am fond of reading.** (Я люблю читать.)

3. Обстоятельства:

Before reading the text you must learn this rule. (Прежде чем прочитать текст, вы должны выучить это правило.)

4. Определения:

The new method of treating ties was tested in our laboratory. (Новый метод обработки шпал испытывался в нашей лаборатории.)

Примечание: герундию в функции определения предшествует, как правило, предлог of.

The steamer went to her port of loading. (Судно направилось к порту приписки.)

5. Именной части составного именного сказуемого.

My favorite occupation is reading. (Моё любимое занятие – чтение.)

6. Частью составного глагольного сказуемого:

He finished reading the book. (Он закончил читать книгу (чтение книги).)

Сложные формы герундия образуются: Когда перед ing-формой стоят: или местоимения в притяжательном падеже, или существительное в притяжательном падеже или в общем падеже. Такие сложные *герундиальные комплексы* (обороты) переводятся на русский язык придаточными предложениями. **We insisted on their chartering a vessel at once.** (Мы настаивали на том, чтобы они зафрахтовали судно немедленно.)

We objected to the buyer's paying only part of the invoice amount. (Мы возражали против того, чтобы покупатель заплатил только часть суммы фактуры.)

Значение форм инфинитива

Indefinite Infinitive обозначает действие или состояние, одновременное с действием или состоянием, выраженным глаголом в личной форме.

I'm very glad to see you.

I don't like to be interrupted.

I'm sorry to be late.

Continuous Infinitive употребляется для выражения действия, длящегося в момент (период), к которому относится другое действие, выраженное глаголом в личной форме.

It was a real pleasure to be swimming in the sea on such a hot day.

Perfect Infinitive обозначает действие (состояние), предшествующее действию (состоянию), выраженному личной формой глагола.

I'm glad to have bought this book.

It's awfully nice of you to have come.

После глаголов *to hope, to mean, to expect* в *Past Indefinite* и модальных глаголов *should, could, ought (to), to be (to)* употребление

Perfect Infinitive обозначает, что действие (намерение, обязательство) не было выполнено.

I hoped to have come in time. (Я надеялся прийти вовремя (но не пришёл).)

He could have written the composition much better. (Он мог бы написать сочинение гораздо лучше.)

She was to have come yesterday. (Она должна была приехать вчера (но не приехала).)

Формы инфинитива действительного залога описывают действие, совершаемое самим подлежащим.

I want to finish this work today.

Формы инфинитива страдательного залога описывают действие, совершаемое (кем-либо или чем-либо) над подлежащим.

This Work must be finished today.

Nothing can be done, I'm afraid.

Инфинитив может определяться наречием.

I can't speak so fast.

Инфинитив переходных глаголов может принимать прямое, косвенное и предложное дополнение.

I'll be glad to keep you company (you – косвенное дополнение, company – прямое дополнение).

I'm not going to wait for you (for you – предложное дополнение)

Функции инфинитива в предложении

1. Чаще всего инфинитив выполняет в предложении роль части модального сказуемого:

1) без частицы to после модальных глаголов can – could, may – might, must, should, would;

2) с частицей to после модальных глаголов ought, have, have got и be.

May I come in?

We must find out what to do next.

Is there anything I can do for you?

You needn't have hurried.

We ought to leave early tomorrow morning.

I think you should have told him you were sorry.

Do you have to come here every day?

Инфинитив в пассиве:

This work must be done as soon as possible.

It can't be helped.

You'll have to be examined again.

The question should have been settled long ago.

2. В сочетании со вспомогательными глаголами shall, will, should, would, do (did) инфинитив образует личные глагольные формы, выполняющие роль простого сказуемого.

What did you say?

Shall I read?

Инфинитив может быть:

1) подлежащим:

To know English means first of all to be able to speak English.

To say such a thing would be unfair.

С вводным it инфинитив – подлежащее стоит после сказуемого.

It would be unfair to say such a thing.

It's impossible to understand what you say.

It's so good to see you again.

It's so kind of you to help me.

В этом случае образуется инфинитивный оборот вместе с относящимися к нему словами, который можно поставить вместо it, например:

To say such a thing would be unfair.

To understand what you say is impossible.

Как часть сложного подлежащего (*Nominative with the Infinitive Construction*, именительный падеж с инфинитивом);

2) дополнением к глаголу в качестве прямого беспредложного дополнения после глаголов: to agree, to advise, to allow, to begin, to continue, to decide, to expect, to forget, to hope, to hate, to intend, to learn, to like, to love, to manage, to need, to offer, to promise, to refuse, to remember, to try, to want, to wish и др.

I like to speak English.

I hate to argue.

We promised to be home by seven и т.д.;

3) дополнением к прилагательному после прилагательных: afraid, able, delighted, eager, glad, pleased, ready, sorry, unable.

I'm glad to see you. I'm sorry to be late. I'm always ready to help you. I'm very pleased to meet you и т.д.;

4) частью сложного дополнения;

5) определением (постпозитивным) к существительному или местоимению.

Come on, we've no time to waste. (Пойдем, нам нельзя терять времени.)

Please give me some water to drink. (Дай мне, пожалуйста, воды напиться.)

He was the first to arrive and the last to leave.

Mark Twain and his friend were the first to be invited.

Mark Twain was the first to speak.

В данной функции за инфинитивом может следовать предлог.

Will you give me a knife to cut the bread with?

What a fine garden to play in.

6) предикативом (частью сказуемого):

Our plan is to start at once.

7) обстоятельством цели:

I've come here to work, not to play. We stopped to have a rest.

8) обстоятельством результата (после наречий степени too или enough)

I'm too busy to go to the match today. You are clever enough to do the job yourself. It's never too late to learn. My sister is too young to go to school.

Модальные глаголы и их эквиваленты

Модальные глаголы показывают отношение говорящего к действию, выраженному инфинитивом. Например, сравните:

You can speak English. Вы можете (умеете) говорить по-английски.

You must speak English. Вы должны говорить по-английски. ***You may speak English.*** Вы можете говорить по-английски. (Вас поймут.)

Как видим, в одном и том же предложении изменение модального глагола меняет смысл всего предложения, т.е. меняется отношение к действию, выраженному инфинитивом.

Модальные глаголы не имеют форм во всех временах, для этого употребляются их эквиваленты (заменители).

Вопросительные и отрицательные предложения с модальными глаголами строятся без вспомогательных глаголов: *Can you help me?* – *Yes, I can.* – *No, I can't.* Вы можете помочь мне? – Да. – Нет.

К основным модальным относятся глаголы:

can – мочь, быть в состоянии, *could* – прошедшее время предполагает наличие физической, умственной и прочих возможностей, позволяющих сделать что-либо:

I can swim. – Я могу (я умею) плавать.

I could translate this text. – (Я мог, был в состоянии) перевести этот текст.

В будущем времени у глагола *can* есть заменитель – конструкция *to be able to* (быть в состоянии что-либо сделать): *I shall be able to help you when I am free.* – Я смогу помочь тебе, когда освобожусь.

may – иметь возможность, получить разрешение (делать что-либо); прошедшее время – *might* – *May I help you?* – Можно вам помочь? – *Yes, you may.* – Да, можно.

В будущем времени у модального глагола *may* есть заменитель – конструкция *to be allowed to* (получить разрешение сделать что-либо).

He will be allowed to take the book. Ему разрешат взять книгу.

must – должен, обязан.

You must write it down now. – Вы должны написать это сейчас.

Заменителями глагола *must* являются глаголы *to have to* и *to be to*, которые имеют некоторые дополнительные оттенки значения.

Глагол *to have to* означает долженствование, вызванное обстоятельствами, вынужденную необходимость, в то время как глагол *to be to* – долженствование, связанное с расписанием, планом или заранее сделанной договоренностью.

She had to stay at home. – Она вынуждена была (ей пришлось) остаться дома.

The train was to arrive at 8 in the evening – Поезд должен был прибыть в 8 вечера. (По расписанию).

После модальных глаголов и некоторых их эквивалентов инфинитив употребляется без частицы *to*.

Заменителями модального глагола *must* являются также модальные глаголы *ought to*, *should* (в значении совета, рекомендации, упрека) и *shall* (испрашивается разрешение на совершение действия).

You should enter the Institute. Вам следует поступить в институт (рекомендация, совет),

В сочетании с перфектным инфинитивом глагол *should* выражает сожаление о невыполненном действии и переводится “следовало бы”.

You should have helped them. Вам следовало бы помочь им. (Но вы не сделали этого).

Shall I read? Мне следует читать?

Модальный глагол ***would*** может иметь следующие значения:

1) вежливая просьба. ***Would you help me?*** Не поможете ли вы мне?

2) повторяемость действия в прошлом. ***He would often help me.*** Он, бывало, часто помогал мне.

3) стойкое нежелание совершать какие-либо действия. ***He wouldn't listen to me.*** Он никак не хотел слушать меня.

Модальный глагол ***need*** – “нужно, надо” употребляется, в основном, в отрицательных предложениях. ***You needn't do it now.*** Вам не нужно делать это сейчас.

Имена существительные в роли определения

Существительное в притяжательном падеже служит определением к другому, следующему за ним существительному: **the manager's signature** *подпись заведующего*; **the captain's cabin** *капитанская каюта (каюта капитана)*. Однако существительное может служить определением к другому существительному, когда оно стоит перед ним и в общем падеже, т.е. без всякого изменения своей формы. Такое существительное переводится на русский язык прилагательным или существительным в одном из косвенных падежей:

an iron bridge	железный мост
cane sugar	тростниковый сахар
sugar cane	сахарный тростник
life insurance	страхование жизни
a payment agreement	соглашение о платежах
the cotton market	рынок хлопка
tin trade	торговля оловом

Во многих случаях существительному предшествует не одно, а два или более существительных в роли определения. При переводе на

русский язык одни определения могут переводиться прилагательными, а другие – существительными в одном из косвенных падежей:

home market prices	цены внутреннего рынка
meat price decrease	уменьшение цены на мясо
cotton yarn production figures	цифры производства хлопчатобумажной пряжи

Существительное с предшествующим числительным, служащее определением, обычно стоит в форме единственного числа:

the five-year plan	пятилетний план
a ten-year old girl	десятилетняя девочка
a ten-pound note	банкнота в десять фунтов

Степени сравнения прилагательных и наречий

1. Односложные (и некоторые двусложные) прилагательные и наречия образуют **сравнительную** степень путем прибавления суффикса **-er**, **превосходную** – путем прибавления суффикса **-est**:

high – higher – the highest (высокий – выше – самый высокий),
big – bigger – the biggest (большой – больше – самый большой).

Прилагательные и наречия, оканчивающиеся на **-y**, меняют окончание на **-ier** и **-iest**.

Конечная согласная у односложных прилагательных и наречий удваивается.

Например: *happy – happier – the happiest*, *hot – hotter – the hottest*

2. Многосложные прилагательные и наречия, оканчивающиеся на **-ly**, образуют

сравнительную степень путем прибавления слов *more (less)*,
превосходную – путем прибавления слов *most (least)*
interesting – more (less) interesting – most (least) interesting,
easily – more (less) easily – most (least) easily.

3. Ряд прилагательных и наречий являются исключениями:

good, well (хороший, хорошо) – *better* (лучше) – *the best* (самый хороший)

bad (плохой) – *worse* (хуже) – *the worst* (самый плохой)

little (маленький, мало) – *less* (меньше) – *the least* (наименьший)

many (much) – *more* – *the most*

far – farther (further) – the farthest (furthest)

Существительное, определяемое прилагательным в превосходной степени, всегда имеет определенный артикль: *the largest building*.

Некоторые прилагательные образуют степени сравнения от другого корня, как и соответствующие слова в русском языке:

Положительная степень	Сравнительная степень	Превосходная степень
good хороший	better лучше	best самый
bad плохо	worse хуже	лучший, лучший
little мало	less меньше	worst самый
much, many много	more больше	плохой, худший
		least меньше всего
		most больше всего

ПРИМЕЧАНИЕ. Слову *меньше* соответствует в английском языке:

а) **less** – в том случае, когда *меньше* является сравнительной степенью от *мало* и б) **smaller** – в том случае, когда *меньше* является сравнительной степенью от *маленький*:

У меня **меньше** времени, чем у него.
Моя комната **меньше** вашей.
yours.

I have **less** time than he.
My room is **smaller** than

Слову *больше* соответствует в английском языке:

а) **more** – в том случае, когда *больше* является сравнительной степенью от *много* и б) **bigger** или **larger** – в том случае, когда *больше* является сравнительной степенью от *большой*:

У меня **больше** времени, чем у нее.
Моя комната **больше** вашей.

I have **more** time than he.
My room is **larger** than yours.

ЛЕКСИЧЕСКИЙ СЛОВАРЬ

А а

Acceleration		ускорение
accept	v	принимать
accurate		точный
achieve	v	достигать
according to		согласно
acid		кислота
across		параллельно, через, сквозь
act	v	действовать
action		действие
activate	v	привести в действие, возбудить
add	v	добавлять, прибавлять, присоединять
adjust	v	регулировать
advanced		передовой
advantage		преимущество
advise	v	советовать
affect	v	воздействовать, влиять
age		возраст
agitation		возбуждение
ago		тому назад
air		воздух
alter	v	менять, изменять(-ся)
alternating		переменный (ток)
ampere		ампер
angle		угол
animal		животное
another		другой
apparatus		прибор, аппарат
application		применение
apply	v	применять, употреблять
apply voltage		подавать (прикладывать) напряжение
area		площадь, район, область
arise	v	возникать, появляться
arrange	v	монтировать, приспособлять
around		вокруг, вблизи
artificial		искусственный

art		искусство
assist	v	помогать
attach	v	прикреплять, присоединять
auter		внешний, наружный
automatic		автоматический
auxiliary		вспомогательный
average		средний

В в

Basic		основной
Bearing		подшипник
because		потому что
believe	v	верить, полагать
between		между
bind (bound)		связывать
braze	v	сваривать, спаивать
brake torque		тормозной момент
breaker		прерывать, переключать
brooder		брудер (аппарат для выращивания цыплят)

С с

Carbon		углерод
calibrate	v	градуировать
call		звать, называть
capable		способный
capacitance		емкость, емкостное сопротивление
capacitor		конденсатор
capacity		способность, мощность, выработка
carefully		тщательно, осторожно
carry		нести
carry over		переносить
carry on		продолжать, заниматься ч.-л.
case		случай
cause	v	вызывать
certain		определенный
change	v	менять, изменять (-ся)
cheap		дешевый

charge	n	заряд
	v	заряжать
chick		цыпленок
choose (chose, chosen)		выбирать
circuit		цепь
clod		ком
close		закрывать, замыкать
closed		закрытый
coil		катушка, виток
collect	v	собирать
column		столбик
combine	v	объединять, сочетать
common		обычный, широко распространенный
communication		средство связи, сообщение
community		объединение, община
compare	v	сравнивать
complete	v	заканчивать
complicated		сложный
component		составная часть
compose	v	составлять
compress	v	сжимать
comprise	v	заключать в себе, охватывать
condition		условие, состояние
concern		касаться, иметь отношение
conduct		вести, руководить
conductor		проводник
connect	v	соединять, связывать, подключать
consider	v	считать, рассматривать
consist of	v	состоять из
consume	v	потреблять
contain	v	содержать
contamination		загрязнение, заражение
continue	v	продолжать
contribution		вклад
convenient		удобный
convert	v	превращать
cool		прохладный
core		сердечник

copper		медь
corresponding		соответствующий
cotton		хлопок
coulomb		кулон
cover	v	охватывать
crop		культура, урожай
cross-section		поперечное сечение
current		ток
cut	v	отключать, отсоединять

D d

damage	v	повреждать
data		данные
decrease	n	уменьшение
	v	уменьшать
define	v	определять
definite		определенный
deflection		отклонение
depend on	v	зависеть от
deposit	v	отлагать, давать осадок
design	v	проектировать
	n	конструкция
detailed		подробный, обстоятельный
detect	v	обнаруживать
determine	v	определять
develop	v	разрабатывать, развивать
device		механизм, прибор, устройство
diameter		диаметр
dielectric		диэлектрик, непроводник
difference		разница
differentiate	v	различать, отличать
diffuse	v	рассеивать
direct		прямой
discharge	v	разряжать
discovery		открытие
distance		расстояние
distribution		распределение
divide	v	делить

double	v	удваивать
	a	двойной
drift		движение (электронов)
drop		падение, перепад
due to		благодаря
duration		продолжительность, длительность
dynamo		динамо-машина

Е е

each		каждый
either		любой, оба, также
either.. or		или... или
effect		действие
electroplating		гальванопокрытие
employ	v	использовать
energize	v	(по)ставить под напряжение
entertainment		развлечение
equal	v	равняться
	a	равный, одинаковый
equation		уравнение
equipment		оборудование
essential		существенный
estimate	v	оценивать
evaluate	v	оценивать
every		каждый
exact		точный
excessive		чрезмерный
excite	v	возбуждать
exclude	v	исключать
exist	v	существовать
expert	v	ожидать, полагать
express	v	выражать
extend	v	увеличивать, удлинять
extreme		чрезмерный
extensively		широко
eye		глаз

F f

Factor		коэффициент
power factor		коэффициент мощности
fall	v	падать, понижаться, опускаться
fall upon		наталкиваться
fan		вентилятор
farmstead		хозяйство, усадьба
fashion		образ, манера, вид
field		область
field winding		обмотка возбуждения
finally		под конец, в конечном счете
find (found)	v	находить
fix	v	укреплять, закреплять
fluoresce	v	флюоресцировать
fluorescent lamp		лампа дневного света
flow		течь, поток
flux		поток, течение
follow		следовать
following		следующий
force	n	сила
	v	заставлять
form	v	создавать, образовывать
frequency		частота, повторяемость
further		дополнительный, дальше, более отдаленный
fuse		плавка, плавкий предохранитель

G g

gain	v	получать
gear		шестерня, зубчатая передача
general		главный, основной
generate	v	вырабатывать, производить
generation		размножение, воспроизводство
germanium		германий
generator		генератор, источник энергии
govern	v	управлять, руководить
ground	n	земля
	v	заземлять
growth		рост

Н н

happen	v	случаться
heat	v	нагревать
	n	теплота
heater		нагревательный прибор
high		высокий
hit upon		найти, натолкнуться
however		однако, тем не менее
human		человеческим
humidity		влажность
hydrogen		водород

I i

illumination		освещение
immediately		немедленно, тот час же
immerse	v	погружать, окунать
impeller		приводной
incandescence		накал, накаливание
inch		дюйм
include	v	включать
income		прибыль, доход
increase	v	увеличивать, усиливать
indentify	v	устанавливать, определять
induce	v	индуктировать, вызывать
induction		индукция
induction motor		асинхронный двигатель
inefficient		коэффициентный, непроизводительный
inexpensive		недорогой, дешевый
insect		насекомое
install	v	устанавливать
instrumentation		контрольно-измерительные приборы, оборудование
insulate	v	изолировать
insulating		изоляционный
insulation		изоляция, изоляционный материал
intensity		напряженность
interaction		взаимодействие
interconnection		взаимосвязь, объединение
invent	v	изобретать
iron		железо

J j		
job		работа
joule		джоуль
K k		
keep (kept)	v	держать, хранить
L l		
labour		труд, работа
latter		последний
lazy		ленивый
lead	v	вести
	n	свинец, грузило, проводник
length		длина
lethal		смертельный
level		уровень
light	v	освещать
	a	легкий
link		соединение, связь
likely		вероятно
load	v	грузить, заряжать
	n	груз, нагрузка, заряд
long ago		давно
loop		виток
lose		терять
loss		потеря, убыток
lower	v	понижать
luminous		световой
M m		
magnitude		величина
main		главный, основной
majority		большинство
manufacture		производство, изготовление
matter		вещество, предмет
mean	v	значить
	a	средний
measure	v	измерять

measurement		измерение
meet	v	встречать, удовлетворять
melt	v	плавить
mention	v	упоминать
mercury		ртуть
meter		(электро)измерительный прибор
metre		метр
mica		слюда
micro ammeter		микроамперметр
mile		миля
mill		дробить, молоть
mind	v	обращать внимание, иметь в виду
mode	v	способ, режим
modify	v	изменять
mold		плесень
monitor	v	контролировать, проверять
mounting		монтаж
move		двигаться
multiplier		увеличитель диапазона измерений
mutual		взаимный

N n

nameplate		фирменная дощечка, марка изготовителя
nature		природа
needle		стрелка
need	v	нуждаться
negative		отрицательный
network		сеть, энергосистема
note	v	обращать внимание
nowhere		никуда
number		число
nuclear		ядерный
nucleus		ядро атома

O o

observe	v	наблюдать
obtain	v	получать

occupy	v	занимать
occur	v	иметь место, случаться
offer	v	предлагать
only		единственный
opposite		противоположный
operate	v	работать, действовать
otherwise		иначе, в противном случае
outermost		наиболее удаленный от середины
outdoor		наружный, внешний
own	v	владеть
	a	собственный
oxygen		кислород

Р р

parent		основной
particle		частица
pass	v	проходить
per		на, в, за
percentage		процент, процентное отношение
perfect	v	улучшать
	a	идеальный, прекрасный
permit	v	позволять
persistent		настойчивый
phenomenon		явление
photocell		фотоэлемент
piezoelectricity		пьезоэлектричество
place	v	помещать
pace in a circuit		включать в цепь
plant		завод, станция, силовая установка
plate		пластина, обкладка конденсатора
point		точка
pole		полюс
pollution		загрязнение
poor		плохой
possess	v	обладать
potential		потенциал, напряжение
poultry		домашняя птица, птицеводство
power		сила, энергия

precipitation		выпадение в осадок
predict	v	предсказывать
pressure		давление
prevent	v	предотвращать
primary		первичная обмотка, основной
principle		принцип (работы)
process	v	обрабатывать
produce	v	производить
product		результат, произведение
proper		правильный, надлежащий, соответствующий
property		свойство
provide	v	снабжать
pump	v	качать
purpose		цель

Q q

quite		полностью, почти
quantity		количество
quartz		кварц

R r

radiate	v	излучать
radiant		лучистый
raise	v	поднимать, повышать
range		спектр, диапазон, предел измерений
rapid		быстрый
rate		скорость
rating		мощность
ratio		отношение. пропорция
reason		причина
receive	v	получать
recognize	v	признавать, узнавать
rectifier		выпрямитель (тока), детектор
reduce	v	уменьшать, сокращать
reduction		уменьшение
refer to		относиться (к), ссылаться
reflection		отражение

regard	v	рассматривать, считать
region		область, сфера
regulation		регулирование
relate		быть связанным
relation		отношение
relative		относительный
reliable		надежный
remote		отдаленный
remove	v	устранять, удалять
replace	v	заменять
require	v	требовать
requirement	v	требование
research		научные исследования
resistor		резистор
responsible		ответственный
be responsible for	v	отвечать за ...
result in		приводить к ч.-л., иметь результат
resultant		резльтирующий
reverse		обратный
reversible		реверсивный, обратимый
ring		кольцо
rise		повышение, увеличение
rotate		вращать(-ся)
rotation		вращение
r p s (revolution per second)		оборотов в секунду
rubber		мусор, резина
run		работать (в машинах)
rural		сельский

S s

same		тот же (самый), одинаковый
save		экономить, беречь
science		наука
scud		нестись, лететь, скользить
search	v	искать
secondary	a	вторичный
	n	вторичная обмотка
seem	v	казаться

self-induction		самоиндукция
semiconductor		полупроводник
send	v	посылать
sensitive		чувствительный, восприимчивый
serve	v	обслуживать
set		ряд
set in motion		приводить в движение
several		несколько
shaft		вал
sheet		лист
shell		оболочка
short-circuited		короткозамкнутый
separate		отдельный
side		сторона
sign		знак
silicon		кремний
silver		серебро
similar		похожий, подобный
simple		простой
single		один, единственный, отдельный
single-range		однодиапазонный
size		размер, величина
slip		скольжение
slot		паз, щель
sodium	v	натрий
solder		паять
solid		твердый, прочный
solution		раствор, решение
solve	v	решать
some		какой-нибудь, некоторый, несколько
soon		скоро
sort		сортировать
source		источник
special		особый, особенный
specialize		специализироваться, определять
specific		специальный, специфический
specify	v	точно определять
speed		скорость

spot		пятно
standardize	v	стандартизировать
starting torque		пусковой крутящий момент
step	v	трансформировать
step-down transformer		понижающий трансформатор
step-up transformer		повышающий трансформатор
store	v	хранить (на складе)
strengthen	v	усиливать
subject		предмет
such		такой
suggest	v	предлагать
suite	v	гордиться, подходить
sulphur		сера
sum	v	суммировать
	n	сумма
supply	v	снабжать, обеспечивать
surround	v	окружать
switch	v	переключать

T t

task		задача
tension		напряжение
terminal		клемма, зажим, ввод или вывод
thermal		тепловой
thin	v	прореживать
through		из-за, через
thus		итак, таким образом
tie	v	связывать
tightly		прочно, крепко
time		раз
tool		рабочий(ручной) инструмент
torque		крутящий, вращающий момент
total		весь, суммарный
toward		к, по направлению к
trend		тенденция
transfer	v	переносить, передавать
transmit	v	передавать, проводить
true		верный, правильный

turn	v	поворачивать, вращать
	n	оборот
turkey		индюк

U u

understand (understood)		понимать
uniform		одинаковый, однородный, равномерный
unite		единица измерения
unload		загружать
use	v	использовать
usually		обычно
utilization		использование

V v

value		ценность, важность, величина
variable		переменная величина
variation		изменение, колебание
variety		разнообразие, ряд, множество
various		различный
vary	v	менять, изменять
velocity		скорость
versatile		универсальный
visible		видимый
voltage		напряжение

W w

wander	v	блуждать, бродить (без цели)
wave		волна
wavelength		длина волны
way		путь, способ
weld	v	сваривать
well-being		благополучие
while		в то время как
wind (wound)		наматывать
winding		обмотка
wire		провод, проволока
within		внутри
without		без

КЛЮЧИ К ТЕСТАМ

№ п/п	Тест										
	1	2	3	4	5	6	7	8	9	10	11
1	В	А	А	В	В	В	В	С	С	С	А
2	А	В	С	С	В	А	А	А	А	С	А
3	С	В	А	А	В	А	А	В	А	А	В
4	В	В	В	В	С	В	С	В	В	А	В
5	А	А	А	С	В	В	А	А	А	С	А
6	В	В	В	А	А	А	А	В	А	А	С
7	С	В	В	В	С	А	С	В	А	В	С
8	С	В	С	В	С	В	А	В	С	А	А
9	С	В	В	В	В	С	С	А	С	В	В
10	С	С	А	В	В	В	А	С	А	А	С
11	А	А	С	В	С	А	С	А	В	А	В
12	В	В	С	А	С	А	В	В	С	В	С
13	С	С	В	А	В	С	В	С	А	А	В
14	А	В	А	В	А	В	В	В	В	В	А
15	В	В.	В	С	С	А	А	А	С	С	А

ВОПРОСЫ К ЭКЗАМЕНУ

1. Why does electricity have advantages over other kinds of energy?
2. Where is electrical energy used in agriculture?
3. Are electrical or mechanical instruments characterized by high accuracies and speeds of measurements?
4. How are electric and electronic control systems used in animal husbandry and plant production?
5. What do electronic air cleaners use to collect solid matter?
6. What kind of electric current does a power station generate?
7. When was the first transformer developed?
8. What principle does a transformer operate on?
9. How are windings differentiated?
10. What electrical charge has a normal atom?
11. What materials are good electrical conductors?
12. What are semiconductors?
13. What factors are responsible for the heating process?
14. Who discovered the chemical effect of an electric current?
15. What instrument is used for the measurement of voltage?
16. Can electric motors operate in a wide range of temperatures?
17. Whom was the asynchronous machine invented by?
18. How are field windings connected for low and high voltage operation?
19. What motor characteristics must we take into consideration while selecting a motor?
20. What types of stations are generating plants represented by?

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АНГЛИЙСКИЙ ЯЗЫК

Учебное пособие

Т.А. Сугоняко
Е.В. Чантурия

Редактор Н.В. Красовская

Санитарно-эпидемиологическое заключение № 24.49.04.953.П. 000381.09.03 от 25.09.2003 г.

Подписано в печать 23.08.2011. Формат 60х84/16. Бумага тип. № 1.

Печать – ризограф. Усл. печ. л. 8,0 Тираж 110 экз. Заказ № 1324

Издательство Красноярского государственного аграрного университета

660017, Красноярск, ул. Ленина, 117

Т.А. Сугоняко, Е.В. Чантурия

АНГЛИЙСКИЙ ЯЗЫК

Учебное пособие

Красноярск 2011