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«КАМЧАТСКИЙ ГОСУДАРСТВЕННЫЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ»
(ФГБОУ ВО «КамчатГТУ»)

Мореходный факультет

ранные языки»

УТВЕРЖДАЮ
Декан мореходного факультета

_____ Труднев С. Ю.

«23» октября 2024 г.

РАБОЧАЯ ПРОГРАММА ДИСЦИПЛИНЫ

«Профессиональный английский язык»

направление подготовки
13.03.02 Электроэнергетика и электротехника

направленность (профиль):
«Электрооборудование и автоматика судов»

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2024

Рабочая программа составлена на основании требований ФГОС ВО направления подготовки 13.03.02 «Электроэнергетика и электротехника».

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Рабочая программа рассмотрена на заседании кафедры «Иностранные языки» «23» октября 2024 г., протокол № 3.

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«23» октября 2024 г.

1 Цели и задачи учебной дисциплины

Курс «Профессиональный английский язык» ппо направлению подготовки 13.03.02 «Электроэнергетика и электротехника», направленность (профиль) «Электрооборудование и автоматика судов», ставит своей целью обучение дисциплине в сфере профессиональной деятельности.

Владение иностранным языком позволит выпускнику по данному направлению подготовки осуществлять профессиональную деятельность в областях и сферах: образования и науки (научные исследования), строительства и жидищно-коммунального хозяйства (проектирование и эксплуатация объектов энергетики), транспорта (проектирование и эксплуатация электротехнического оборудования электрического транспорта), добыча, переработка, транспортировка нефти и газа (эксплуатация газотранспортного оборудования и газораспределительных станций), электроэнергетика (электроэнергетика и электротехника); атомная промышленность (проектирование и эксплуатации объектов электроэнергетики; технического обслуживания и ремонта электромеханического оборудования); металлургическое производство (эксплуатация электротехнического оборудования); сквозные виды профессиональной деятельности в промышленности (производство волоконно-оптических кабелей; проектирование и эксплуатация электроэнергетических систем, электротехнических комплексов, систем электроснабжения, автоматизации и механизации производства).

Задачи дисциплины:

- научить обучающихся вести беседы на профессиональную тематику, используя профессиональную лексику;
- дать лексический минимум, необходимый для составления документации по профессиональной тематике на английском языке;
- овладеть грамматическими навыками, обеспечивающими коммуникацию при письменном и устном общении;
- научить пользоваться инструкциями к электрооборудованию на английском языке;
- обучить говорению, диалогической и монологической речи с использованием наиболее употребительных лексико-грамматических средств в коммуникативных ситуациях;
- обучить аудированию – прослушивание текстов с целью применения полученной информации для самостоятельного высказывания по теме (лабораторные упражнения);
- привить навыки устного профессионального общения на английском языке в объеме материала, предусмотренного программой, ведения дискуссии с несколькими партнерами;
- обучить ведению профессиональной корреспонденции.

В курсе обучения материал подобран и систематизирован по степени нарастания языковых трудностей. При изучении материала соблюдается логическая последовательность: текстовый материал, лексический минимум, прямой и обратный перевод в системе упражнений, закрепление лексики в диалогической и монологической речи.

В результате изучения данной дисциплины ***обучающийся должен знать***:

- активную лексику по изучаемым темам;
- как вести беседу, используя накопительный лексический материал;
- основные грамматические явления, характерные для профессиональной речи;
- правила построения предложений и фраз на английском языке.

Обучающийся должен уметь:

- в области аудирования:
- воспринимать на слух и понимать основное содержание профессиональных текстов по специальности: «The Profession of Electrician» («Профессия Электрика»), «Electric

Circuit» («Электрическая Цепь»), «Ship’s Power Plants and Networks» («Судовые Электростанции и Сети») и др., а также выделять значимую/запрашиваемую информацию;

- в области чтения:
- понимать основное содержание информационных буклетов, инструкций, указаний, проспектов, оригинальных английских пособий;
- определять значимую/запрашиваемую информацию из текстов справочно-информационного характера.
- в области говорения:
- вести/поддерживать диалог-расспрос об увиденном, прочитанном, диалог – обмен мнениями, диалог-интервью/собеседование при устранении неполадок электрооборудования, соблюдая нормы речевого этикета;
- задавать вопросы и отвечать на них, высказывая свое мнение, просьбу, отвечать на предложение собеседника;
- делать сообщение и выстраивать монолог-описание, монолог-повествование и монолог-рассуждение.
- в области письма:
- при необходимости письменно составлять ведомость на ремонт электрооборудования;
- вести запись основных мыслей и фактов по изучаемой проблематике.

В результате обучения ***обучающийся должен овладеть навыками***:

- активного владения языковым материалом по специальности;
- связанной диалогической речи по профессиональной тематике;
- письма (составления ремонтной ведомости и т.д.);
- аудирования (понимание диалогической и монологической речи в пределах изученного материала);
- устного профессионального общения на английском языке в объеме материала, предусмотренного программой, ведения дискуссии с несколькими партнерами;
- чтения и перевода текстов по профессиональной тематике.

2 Требования к результатам освоения дисциплины

В результате освоения данной дисциплины формируется следующая универсальная ***компетенция*** – способность осуществлять деловую коммуникацию в устной и письменной формах на государственном языке Российской Федерации и иностранном(ых) языке(ах) (УК-4).

Планируемые результаты обучения при изучении дисциплины, соотнесенные с планируемыми результатами освоения образовательной программы, представлены в таблице 1.

Таблица 1 – Планируемые результаты обучения при изучении дисциплины, соотнесенные с планируемыми результатами освоения образовательной программы

Код компетенции	**Планируемые результаты освоения образовательной программы**	**Код и наименование индикатора достижения профессиональ-ной компетенции**	**Планируемый результат обучения по дисциплине**	**Код показа-теля освоения**
УК-4	способность осуществлять деловую коммуникацию в устной и письменной формах на	**ИД-1$_{УК-4}$**: Знает литературную форму государственногояз ыка, основы устной и письменной	**Знать:** - активную профессиональную терминологию по изучаемым темам; - как вести беседу с использованием	З(УК-4)1 З(УК-4)2 З(УК-4)3

	государственном языке Российской Федерации и иностранном(ых) языке(ах)	коммуникации на иностранном языке, функциональные стили родного языка, требования к деловой коммуникации	профессиональной терминологии; - основные грамматические явления, характерные для профессиональной речи - Стандартный морской разговорник ИМО в объеме изученных фраз	
		ИД-2$_{УК-4}$: Умеет выражать свои мысли на государственном, родном и иностранном языке в ситуациях деловой коммуникации **ИД-3$_{УК-4}$**: Владеет навыками составления текстов на государственном и родном языках, имеет опыт перевода текстов с иностранного языка на родной, опыт говорения на государственном и иностранном языках	**Уметь:** - воспринимать на слух и понимать основное содержание текстов на профессиональную тематику; - понимать основное содержание информационных буклетов, инструкций, указаний, проспектов, оригинальных английских пособий; - вести и поддерживать диалог на профессиональные темы, при необходимости использовать Стандартный морской разговорник ИМО в объеме изученных фраз; - делать сообщение и выстраивать монолог-описание, монолог-повествование и монолог-рассуждение на профессиональные темы	У(УК-4)1 У(УК-4)2 У(УК-4)3 У(УК-4)4
			Владеть: - навыками чтения	В(УК-4)1

			и перевода текстов по профессиональной тематике. - связанной диалогической речью по изученной профессиональной тематике; - монологической речью на уровне самостоятельно подготовленного высказывания; - навыками письма (составления текстов на профессиональные темы)	В(УК-4)2 В(УК-4)3 В(УК-4)4

3 Место дисциплины в структуре образовательной программы

Учебная дисциплина «Профессиональный английский язык» является дисциплиной обязательной части в структуре образовательной программы бакалавриата по направлению подготовки 13.03.02 «Электроэнергетика и электротехника», направленность (профиль) «Электрооборудование и автоматика судов».

4 Содержание дисциплины

4.1 Тематический план дисциплины

Тематический план дисциплины представлен в таблице 2.

Таблица 2 - Тематический план дисциплины

Заочная форма обучения

Наименование тем	**Всего часов**	**Контактная работа**	**Контактная работа по видам учебных занятий**	**Самостоятельная работа**	**Формы текущего контроля**	**Итоговый контроль знаний по дисциплине**

			Лекции	**Семинары**	**Практические занятия**			
Тема 1. The Profession of Electrician (Профессия Электрика)	32	2	-	-	2	30	Чтение, перевод текста; беседа по изученной теме; лексико-грамматические упражнения; составление диалогов, сообщения по теме	-
Тема 2. Electric Circuit (Электрическая Цепь)	52	6	-	-	6	46		
Тема 3. Ship's Power Plants and Networks (Судовые Электростанции и Сети)	52	6	-	-	6	46		
Зачет с оценкой	8	-		-	-	-	-	8
Всего часов	**144**	**14**			**14**	**122**		**8**

4.2 Содержание дисциплины

Раздел 1

Практическое занятие 1
Тема 1. The Profession of an Electrician (Профессия Электрика)
Лексика к теме, стр. 38 [1]. Объяснение темы по тексту на стр. 38 [1], Чтение и перевод, вопросно-ответная работа по тексту с опорой на упр. 1.1. на стр. 40 [1]. Работа в лингафонном мультимедийном классе.

Практические занятия 2, 3, 4
Тема 2. Electric Circuit (Электрическая Цепь)
Лексика к теме, стр. 44-46 [2]. Чтение и перевод текста на стр. 44-46 [2], вопросно-ответная работа по тексту с опорой на вопросы на стр. 46-47 [2]. Выполнение лексико-грамматических упражнений на закрепление темы: упр. 1.1.-1.5., стр. 47-49 [2]. Составление сообщения по теме с опорой на изученный материал.

Практические занятия 5, 6, 7
Тема 3. Ship's Power Plants and Networks (Судовые Электростанции и Сети)
Лексика к теме, стр. 45-52 [1]. Чтение и перевод текстов, стр. 45-46, 47-48, 50 [1]. Вопросно-ответная работа по текстам с опорой на упр. 1.6. (стр. 47), 1.3. (стр. 48-49), 1.5. (стр. 51-52) [1]. Выполнение лексико-грамматических упражнений на закрепление темы: упр. 1.1.-1.3, 1.7 (стр. 46-47); упр. 1.1.-1.2., 1.4.-1.6. (стр. 48-49); упр. 1.1.-1.3., 1.6. (стр. 51-52), [1]. Составление сообщения по теме с опорой на изученный материал.

СРС:
I. Выучить профессиональный лексический минимум по темам 1-3;
II. Подготовить сообщения (доклады) по теме:
1. Electric Circuit

5 Учебно-методическое обеспечение для самостоятельной работы обучающихся

5.1 Внеаудиторная самостоятельная работа

В целом, внеаудиторная самостоятельная работа обучающихся при изучении курса включает в себя следующие виды работ:
- проработка (изучение) материалов лабораторных занятий;
- чтение и переработка рекомендованной основной и дополнительной литературы;
- подготовка к лабораторным занятиям;
- поиск и проработка материалов из Интернет-ресурсов, периодической печати;
- выполнение домашних заданий в форме творческих заданий, докладов;
- подготовка к текущему и итоговому (промежуточная аттестация) контролю знаний по дисциплине.

5.2 Контроль

Контроль освоения дисциплины «Профессиональный английский язык» подразделяется на текущий контроль успеваемости и итоговую аттестацию обучающихся (зачет с оценкой).

Текущий контроль позволяет оценивать степень восприятия учебного материала и проводится для оценки результатов изучения разделов/тем дисциплины. Текущий контроль проводится как контроль тематический (по итогам изучения определенных тем дисциплины) и рубежный (контроль определенного раздела или нескольких разделов, перед тем, как приступить к изучению очередной части учебного материала).

5.3 Письменные доклады (письменные сообщения)

Письменный доклад – это сообщение на определенную тему в виде краткого изложения в письменном виде содержания и результатов индивидуальной учебно-исследовательской деятельности.

Оформление доклада

Доклад должен быть соответствующим образом оформлен. Он может быть написан аккуратным почерком или напечатан с помощью компьютера (на печатной машинке). К печатному оформлению предъявляются следующие требования:

1. Доклад должен быть напечатан через 1,5 интервала; формат текста: Word of Windows - 97/2000. Формат страницы: А4 (210 х 297 мм). Шрифт: размер (кегль) – 14; тип – Times New Roman.
2. Доклад выполняется на одной странице листа.
3. При написании текста, составления таблиц и графиков использование подчеркиваний и выделений текста не допускается.
4. Страницы доклада нумеруются арабскими цифрами и внизу посередине.
5. Каждая страница должна иметь поля шириной: верхнее – 20 мм; нижнее – 20 мм; правое -10 мм; левое – 30 мм.
6. Нумерация страниц должна быть сквозной. Первой страницей является титульный лист, второй – содержание. На титульном листе и содержании номер страницы не ставится.
7. С правой стороны страницы необходимо оставить широкие поля, на которых преподаватель пишет свои замечания.

Доклад, выполненный небрежно или не полностью, возвращается обучающемуся без проверки. Работа над замечаниями выполняется на листах доклада.

Доклад должен быть подписан обучающимся с указанием даты выполнения. Доклад сдается преподавателю на проверку в установленные сроки и защищается до итогового контроля знаний по дисциплине. После проверки и защиты доклад визируется преподавателем.

Темы докладов:

1. Electric Circuit

2. Ship’s Power Plants and Networks

6 Фонд оценочных средств для промежуточной аттестации обучающихся по дисциплине

Фонд оценочных средств для промежуточной аттестации обучающихся по дисциплине «Профессиональный английский язык» представлен в приложении к рабочей программе дисциплины и включает в себя:
- описание показателей и критериев оценивания компетенции на различных этапах ее формирования, описания шкал оценивания;
- материалы, необходимые для оценки знаний, умений, навыков, характеризующие этапы формирования компетенции в процессе освоения образовательной программы;
- методические материалы, определяющие процедуры оценивания знаний, умений, навыков, характеризующих этапы формирования компетенции.

Вопросы итогового контроля знаний по дисциплине (зачет с оценкой, курс III)

1. Перечень тем, выносимых на текущую аттестацию:
1. The Profession of an Electrician
2. Electric Circuit
3. Ship’s Power Plants and Networks

2. Выполнение контрольных заданий. Примеры заданий представлены в ФОС.

7 Основная литература

7.1 Основная литература

1. *Иваненко Т.И.* Английский язык: Учебное пособие. – Петропавловск-Камчатский: КамчатГТУ, 2017. – 121 с. – 35 экз.
2. *Тюнина Е.В.* Electrical Engineering: Учебное пособие М.: Флинта: Наука 2009. – 23 экз.

7.2 Дополнительная литература

3. *Фурс О.А., Кочарян Ю.Г.* Английский язык. Сборник текстов и упражнений: Учебное пособие. – Петропавловск-Камчатский: КамчатГТУ, 2019. – 135с. – 41 экз.
4. *Рубцова И.А., Гогина Н.А.* Деловой английский язык для судовых механиков: Учебно-методическое пособие. – М.: Издательство "ТрансЛит", 2012. – 128 с. – 40 экз.
5. *Кущ Т.Ю., Воловник М.С.* Основы английского языка для судовых электриков - Москва: «МГАВТ», 2000. – 205 с. – 30 экз.
6. *Репринцева Н.И.* «Английский язык. Методические указания к изучению дисциплины для студентов специальности «Эксплуатация судового электрооборудования и средств автоматики» заочной формы обучения». – Петропавловск-Камчатский: КамчатГТУ, 2013. – 31 с.
7. *Фурс О.А., Дьякова Н.П., Архипова В.П.* Морской практический английский язык: Сборник текстов и упражнений для студентов специальностей «Техническая эксплуатация транспортного радиооборудования» «Эксплуатация судового электрооборудования и средств автоматики» «Судовождение»«Эксплуатация судовых энергетических установок» «Техника и физика низких температур» очной и заочной формы обучения. – Петропавловск-Камчатский: КамчатГТУ, 2013- 155с.
8. Стандартные Фразы ИМО для Общения на Море = IMO Standard Marine Commun-ication Phrases. – 4-е изд.. перераб. – СПб.: ЗАО «ЦНИИМФ», 2015. – 400 с. (Серия «Судо-

владельцам и капитанам», вып. 9). (https://deckofficer.ru/titul/study/item/standartnye-frazy-imo)

9.International Convention on Standards of Training, Certification and Watchkeeping for Seafarers INCLUDING 2010 MANILA AMENDMENTS Consolidated edition, 2017 (Международная конвенция о подготовке и дипломировании моряков и несении вахты) (https://deckofficer.ru/titul/resolutions/item/imo-stcw-convention-and-stcw-code)

8 Перечень ресурсов информационно-телекоммуникационной сети «Интернет»

1. Электронно-библиотечная система «eLibrary: [Электронный ресурс]. Режим доступа: http://www.elibrary.ru

2. Электронно-библиотечная система «Лань»: [Электронный ресурс]. Режим доступа: http://e.lanbook.com/

3. Электронная библиотека GrebennikOn: [Электронный ресурс]. Режим доступа: http://grebennikon.ru/

9 Методические указания для обучающихся по освоению дисциплины

Методика преподавания данной дисциплины предполагает проведение практических (семинарских) занятий, групповых и индивидуальных консультаций по отдельным (наиболее сложным) специфическим проблемам дисциплины. Предусмотрена самостоятельная работа обучающихся, а также прохождение аттестационных испытаний промежуточной аттестации.

Целью проведения лабораторных занятий является развитие языковых навыков обучающихся, полученных ими как в ходе изучения дисциплины, так и самостоятельно.

Внеаудиторная самостоятельная работа обучающегося при изучении курса включает в себя виды работ, представленные в п.5.1 данной рабочей программы.

Основная доля самостоятельной работы обучающихся приходится на подготовку к практическим занятиям, тематика которых полностью охватывает содержание курса. Самостоятельная работа по подготовке к практическим занятиям по дисциплине «Профессиональный английский язык» предполагает умение работать с первичной информацией.

10 Курсовой проект (работа)

Выполнение курсового проекта (работы) не предусмотрено учебным планом.

11 Перечень информационных технологий, используемых при осуществлении образовательного процесса по дисциплине, включая перечень программного обеспечения и информационно-справочных систем

11.1 Перечень информационных технологий, используемых при осуществлении образовательного процесса

- электронные образовательные ресурсы, представленные в п. 8 данной рабочей программы;
- интерактивное общение с обучающимися и консультирование посредством электронной почты;
- работа с обучающимися в ЭИОС ФГБОУ ВО «КамчатГТУ».

11.2 Перечень программного обеспечения, используемого при осуществлении образовательного процесса

При освоении дисциплины используется лицензионное программное обеспечение:

- операционные системы Astra Linux (или иная операционная система, включенная в реестр отечественного программного обеспечения);
- комплект офисных программ Р-7 Офис (в составе текстового процессора, программы работы с электронными таблицами, программные средства редактирования и демонстрации презентаций);
- программа проверки текстов на предмет заимствования «Антиплагиат».

11.3 Перечень информационно-справочных систем

- справочно-правовая система Консультант-плюс http://www.consultant.ru/online
- справочно-правовая система Гарант http://www.garant.ru/online

12 Материально-техническое обеспечение дисциплины

- для проведения лабораторных занятий, групповых и индивидуальных консультаций, текущего контроля и промежуточной аттестации учебная аудитория № 7-212 с комплектом учебной мебели на 13 посадочных мест;

- для самостоятельной работы обучающихся предусмотрены аудитории:

1) № 7-305, оборудованная 5 рабочими станциями с доступом к сети «Интернет», электронным библиотекам, электронной информационно-образовательной среде организации, комплектом учебной мебели на 29 посадочных места;

2) № 7-517, оборудованная 8 компьютерами с доступом к сети «Интернет», электронным библиотекам, электронной информационно-образовательной среде организации, комплектом учебной мебели на 12 посадочных мест;

3) № 3-411, оборудованная комплектом учебной мебели на 30 посадочных мест;

ФЕДЕРАЛЬНОЕ ГОСУДАРСТВЕННОЕ БЮДЖЕТНОЕ ОБРАЗОВАТЕЛЬНОЕ УЧРЕЖДЕНИЕ
ВЫСШЕГО ОБРАЗОВАНИЯ
«КАМЧАТСКИЙ ГОСУДАРСТВЕННЫЙ ТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ»
(ФГБОУ ВО «КамчатГТУ»)

ФАКУЛЬТЕТ «Мореходный»

КАФЕДРА «Иностранные языки»

Утверждаю
декан МФ
_____/С.Ю. Труднев/
«23» октября 2024 г.

ФОНД ОЦЕНОЧНЫХ СРЕДСТВ

по дисциплине

«ПРОФЕССИОНАЛЬНЫЙ АНГЛИЙСКИЙ ЯЗЫК»

направление подготовки 13.03.02
Электроэнергетика и электротехника
(уровень бакалавриата)

направленность (профиль): Электрооборудование и автоматика судов

Петропавловск-Камчатский,
2024

Составитель фонда оценочных средств

Зав. каф. ИЯ, к.ф.н., доцент ____ Волков В.С.
(должность, уч. звание, степень) (подпись) (Ф.И.О.)

Фонд оценочных средств рассмотрен на заседании кафедры «Иностранные языки» 23.10. 2024 г., протокол № 3.

Заведующий кафедрой
«Иностранные языки»,
к.ф.н., доцент

Волков В.С.

«23» октября 2024 г.

АКТУАЛЬНО НА

20__/20__ учебный год _____ Волков В.С.

20__/20__учебный год _____ Волков В.С.

1. Перечень компетенций с указанием этапов их формирования в процессе освоения образовательной программы

Заочная форма обучения

Схема формирования компетенций УК-4 в процессе освоения образовательной программы 13.03.02 Электроэнергетика и электротехника, направленность (профиль): Электрооборудование и автоматика судови						
Код дисциплины из УП	Наименование дисциплины (в соответствии с УП)	1 курс	2 курс	3 курс	4 курс	5 курс
УК-4 – способен осуществлять деловую коммуникацию в устной и письменной формах на государственном языке Российской Федерации и иностранном(ых) языке(ах)						
Б1.О.1.06	Русский язык и культура речи	Зачет				
Б1.О.1.07	Иностранный язык	Экзамен	Экзамен			
Б1.О.1.08	Профессиональный английский язык			Зачет с оценкой		
Б1.О.1.09	Морской английский язык				Зачет с оценкой	
Б3.02	Подготовка к процедуре и защита выпускной квалификационной работы					Защита ВКР

2. Паспорт фонда оценочных средств по дисциплине «ПРОФЕССИОНАЛЬНЫЙ АНГЛИЙСКИЙ ЯЗЫК»

№ п/п	**Контролируемые разделы (темы) дисциплины**	**Код контролируемой компетенции**	**Наименование оценочного средства**
1	**The Profession of Electrician (Профессия Электрика)**	УК-4	грамматические задания З (УК-4)3; У(УК-4)1; У(УК-4)2; Беседа по теме У(УК-4)3 Сообщение по теме В(УК-4)1; В(УК-4)2
2	**Electric Circuit (Электрическая Цепь)**	УК-4	грамматические задания З (УК-4)3; У(УК-4)1; У(УК-4)2; диалоги

			У(УК-4)3; В(УК-4)1 устные сообщения по теме В(УК-4)1; В(УК-4)2
3	**Ship's Power Plants and Networks (Судовые Электростанции и Сети)**	УК-4	грамматические задания З (УК-4)3; У(УК-4)1; У(УК-4)2; устные сообщения по теме В(УК-4)1; В(УК-4)2

3. Описание показателей и критериев оценивания компетенций на различных этапах их формирования, описание шкал оценивания, итоговое оценивание

3.1 Описание показателей и критериев оценивания компетенций на различных этапах их формирования

Код Компетенции	**Планируемые результаты обучения по дисциплине**	**Критерии оценивания результатов обучения**				
		1	2	3	4	5
УК-4 – способен осуществлять деловую коммуникацию в устной и письменной формах на государственном языке Российской Федерации и иностранном(ых) языке(ах)	**Знать:** - грамматические формы и конструкции, лексику в рамках обозначенной тематики	Неудовлетворительная оценка результатов обучения. Отсутствие знаний. Данный результат указывает на несформированность порогового уровня знаний.	Неудовлетворительная оценка результатов обучения. Фрагментарные знания.	Удовлетворительная оценка результатов обучения, неполные представления о представленном вопросе.	Достаточно высокая оценка результатов обучения. Определенные пробелы в знаниях	Высокая оценка результатов обучения. Сформированные систематические представления о методах и приемах саморазвития, самореализации, использования творческого потенциала
	Уметь: детально понимать тексты (научно-технические тексты по обозначенной тематике), понимать запрашиваемую информацию, искать нужную информацию на Вебсайтах	Неудовлетворительная оценка результатов обучения. Отсутствие умений. Данный	Неудовлетворительная оценка результатов обучения. Фрагментарные умения.	Удовлетворительная оценка результатов обучения. Несистематическое исполь	Достаточно высокая оценка результатов обучения. Определенные пробел	Высокая оценка результатов обучения. Сформированное умение использовать полученные знания

		результат указывает на несформированность порогового уровня умений.		зование знаний.	ы в умении использовать соотв. знания.	
	Владеть: навыками мнологической и диалогической речи, структурирования высказывание (введение темы, выражение мнения, подчеркивание основных мыслей, подведение итогов)	оценка результатов обучения. Отсутствие навыков. Данный результат указывает на несформированность порогового уровня навыков.	Неудовлетворительная оценка результатов обучения. Фрагментарные навыки.	Удовлетворительная оценка результатов обучения. В целом успешное, но не систематическое применение навыков.	Достаточно высокая оценка результатов обучения. В целом успешное, но содержащее определенные пробелы применения навыков.	Высокая оценка результатов обучения. Успешное и систематическое применение навыков.

3.2 Описание шкал оценивания

Формы контроля	**Шкала оценивания**
устный опрос	**Оценка «отлично» / «зачтено»:** ответы на поставленные вопросы излагаются четко, логично, последовательно и не требуют дополнительных пояснений, демонстрируются глубокие знания, соблюдаются нормы литературной речи. **Оценка «хорошо» / «зачтено»:** ответы на поставленные вопросы излагаются систематизировано и последовательно, материал излагается уверенно, демонстрируется умение анализировать материал, соблюдаются нормы литературной речи, обучающийся демонстрирует хороший уровень освоения материала. **Оценка «удовлетворительно» / «зачтено»**:допускаются нарушения в последовательности изложения ответов на поставленные вопросы, демонстрируются поверхностные знания вопроса, имеются затруднения с выводами, допускаются нарушения норм литературной речи. **Оценка «неудовлетворительно» / «не зачтено»:** материал излагается непоследовательно, сбивчиво, не представляет определенной системы знаний по дисциплине, имеются заметные нарушения норм литературной речи, обучающийся допускает существенные ошибки в ответах на вопросы, не ориентируется в

	понятийном аппарате.
доклад (сообщение)	**Критерии оценки доклада**: новизна текста, степень раскрытия сущности вопроса, соблюдения требований к оформлению. Оценка «**отлично**» – выполнены все требования к написанию доклада: обозначена проблема и обоснована ее актуальность; сделан анализ различных точек зрения на рассматриваемую проблему и логично изложена собственная позиция; сформулированы выводы, тема раскрыта полностью, выдержан объем; соблюдены требования к внешнему оформлению. Оценка «**хорошо**» – основные требования к докладу выполнены, но при этом допущены недочеты. В частности, имеются неточности в изложении материала; отсутствует логическая последовательность в суждениях; не выдержан объем доклада; имеются упущения в оформлении. Оценка «**удовлетворительно**» – имеются существенные отступления от требований к написанию доклада. Например: тема освещена лишь частично; допущены фактические ошибки в содержании доклада; отсутствуют выводы. Оценка «**неудовлетворительно**» – тема доклада не раскрыта, обнаруживается существенное непонимание проблемы или доклад не представлен вовсе.
выполнение заданий в виде самостоятельной работы	Для оценивания результатов ***самостоятельной работы*** возможно использовать следующие критерии оценивания: – правильность выполнения задания. – наличие правильных ответов во всех проверяемых заданиях (дидактических единицах) самостоятельной работы, Общее количество заданий принимается за 100%, оценка выставляется по значению соотношения правильно выполненных заданий к общему количеству заданий в процентах. **Оценка «отлично» / «зачтено»** - 85–100% правильно выполненных заданий; **Оценка «хорошо» / «зачтено»** - 70–84% правильно выполненных заданий; **Оценка «удовлетворительно»** / **«зачтено»**- 55–69% правильно выполненных заданий ; **Оценка «неудовлетворительно» / «не зачтено»** - 54% и менее правильно выполненных заданий;
зачет с оценкой	**Оценка «отлично»** выставляется, если обучающийся показывает всесторонние и глубокие знания программного материала, знание основной и дополнительной литературы; последовательно и четко отвечает на вопросы; уверенно ориентируется в проблемных ситуациях; демонстрирует способность применять теоретические знания для анализа практических ситуаций, делать правильные выводы, проявляет творческие способности в понимании, изложении и использовании программного материала; подтверждает полное освоение компетенций, предусмотренных программой. **Оценка «хорошо»** выставляется, если обучающийся показывает полное знание программного материала, основной и дополнительной литературы; дает полные ответы на теоретические вопросы, допуская некоторые неточности; правильно применяет теоретические положения к оценке практических ситуаций; демонстрирует хороший уровень освоения материала и в целом подтверждает освоение компетенций, предусмотренных программой. **Оценка «удовлетворительно»** выставляется, если обучающийся показывает знание основного материала в объеме, необходимом для предстоящей профессиональной деятельности; при ответе на вопросы

	не допускает грубых ошибок, но испытывает затруднения в последовательности их изложения; не в полной мере демонстрирует способность применять теоретические знания для анализа практических ситуаций, подтверждает освоение компетенций, предусмотренных программой на минимально допустимом уровне. **Оценка «неудовлетворительно»** выставляется, если обучающийся имеет существенные пробелы в знаниях основного учебного материала по разделу; не способен аргументировано и последовательно его излагать, допускает грубые ошибки в ответах, неправильно отвечает на задаваемые преподавателем вопросы или затрудняется с ответом; не подтверждает освоение компетенций, предусмотренных программой.

3.3. Итоговое оценивание обучающегося по дисциплине «Профессиональный английский язык»

Для оценки качества подготовки студента по дисциплине в целом составляется рейтинг – интегральная оценка результатов всех видов деятельности обучающегося, осуществляемых в процессе ее изучения.

Промежуточная аттестация для обучающихся по заочной форме обучения проводится по итогам изучения дисциплины во время сессии, в соответствии с рабочим учебным планом по направлению подготовки – в форме зачета с оценкой.

Преподаватель на первом занятии знакомит обучающихся группы с программой учебной дисциплины, в том числе с порядком определения количества ЗЕ, графиком, формами и процедурой прохождения текущего контроля, а также примерными вопросами для подготовки к итоговому контролю знаний по дисциплине (промежуточной аттестации).

Промежуточная аттестация – это форма контроля теоретических знаний, полученных студентом в процессе изучения всей учебной дисциплины или ее части, и умения их применять в практической деятельности. Он должен учитывать выполнение студентом всех видов работ, предусмотренных программой дисциплины, в том числе самостоятельную работу, активность на занятиях.

Показатели, критерии оценки сформированности компетенции, шкала оценивания результатов освоения компетенций по уровням освоения представлены в таблице.

Уровень освоения	**Критерии освоения**	**Показатели и критерии оценки сформированности компетенции**	**Шкала оценивания (традиционная оценка)**
Продвинутый	*Компетенции сформированы.* Демонстрируется высокий уровень самостоятельности, высокая адаптивность практического навыка	Содержание курса освоено полностью, без пробелов необходимые практические навыки работы с освоенным материалом сформированы, все предусмотренные программой обучения учебные задания выполнены, качество их выполнения оценено на «отлично».Обучаемый демонстрирует способность к полной самостоятельности	76-100 баллов / **«отлично»**
Базовый	*Компетенции сформированы.* Демонстрируется достаточный уровень самостоятельност	Содержание курса освоено полностью, без пробелов необходимые практические навыки работы с освоенным материалом сформированы недостаточно, все предусмотренные программой обучения учебные задания выполнены, качество	61-75 баллов / **«хорошо»**

Уровень освоения	**Критерии освоения**	**Показатели и критерии оценки сформированности компетенции**	**Шкала оценивания (традиционная оценка)**
	и устойчивого практического навыка	выполнения ни одного из них не оценено минимальной оценкой, некоторые виды заданий выполнены с несущественными ошибками. Качество выполнения заданий оценено преимущественно на «хорошо». Способность обучающегося продемонстрировать самостоятельное применение ***знаний, умений и навыков*** при выполнении заданий, аналогичных тем, которые представлял преподаватель при потенциальном формировании компетенции, подтверждает наличие сформированной компетенции.	
Пороговый	*Компетенции сформированы.* Демонстрируется недостаточный уровень самостоятельности и практического навыка	Содержание курса освоено частично, но пробелы не носят существенного характера, необходимые практические навыки работы с освоенным материалом в основном сформированы, большинство предусмотренных программой обучения учебных заданий выполнено, некоторые из выполненных заданий, возможно, содержат ошибки. Качество выполнения заданий оценено преимущественно на «удовлетворительно». Если обучаемый демонстрирует самостоятельность в применении ***знаний, умений и навыков*** к выполнению заданий в полном соответствии с образцом, данным преподавателем, следует считать, что компетенция сформирована, но ее уровень недостаточно высок.	4 6 - 6 0 баллов / **«удовлетворительно»**
Низкий	*Компетенции не сформированы* Демонстрируется отсутствие *или* фрагментарное наличие самостоятельности и практического навыка	Содержание курса не освоено, необходимые практические навыки не сформированы, выполненные задания содержат грубые ошибки. Неспособность обучаемого самостоятельно продемонстрировать наличие ***знаний*** при выполнении заданий, которые были представлены преподавателем вместе с образцом их выполнения, отсутствие самостоятельности в применении ***умения*** и неспособность самостоятельно проявить ***навык*** повторения выполнения задания по стандартному образцу свидетельствуют об отсутствии сформированной компетенции.	Менее 45 баллов / **«неудовлетворительно»**

4.Типовые контрольные задания или материалы, необходимые для оценки знаний, умений, навыков и (или) опыта деятельности, характеризующих этапы формирования компетенций

4.1. Вопросы для устного опроса по темам практических занятий

Раздел 1.

Тема 1. «The Profession of Electrician»

1. In what places do electricians work?
2. What professional papers do electricians read?
3. What gadgets and facilities do electricians connect? Replace or add?
4. What specialized equipment do they use?
5. As part of what units do electricians work? In coordination with whom?
6. Why do electricians know and follow building codes and regulations?
7. Why do electricians mind the details in a wiring project?
8. Why should electricians have strong manual dexterity?
9. Why should electricians be flexible?
10. How should they communicate with managers and members of construction teams?

Тема 2 "Electric Circuit"

1. What is discussed in the text?
2. What do we call an electric circuit?
3. What kinds of circuit do you know?
4. When is «a short» produced?
5. What do we mean by the term «short circuit»?
6. What does a short circuit often result from?
6. What safety device is used when the current in the circuit is too great?
8. What do we call a fuse?
7. What does the term «closed circuit» mean?
8. Why does the current flow when the circuit is closed?
9. Does the current flow when the switch is in an «open» poosition?

Тема 3. "Ship’s Power Plants and Networks"

1. How are ship’s power plants classified?
2. What modes of control are used for ship’s power plants?
3. What do switchgears serve for? What do they ensure?
4. What are the principles of classification of switchgears?
5. How are switchgears classified according to their function?
6. What is the function of the main distribution board?
7. What is the difference between the main distribution board and the emergency distribution board?
8. What current can switchgears run on?
9. What is the aim of the ship’s power network?
10. What are the power mains intended for?
11. How is the emergency lighting network supplied?
12. What does the light-current installations network include?

4.2. Задания для самостоятельной работы

Группа: 25ЭТб-ЗФО

Дисциплина: Профессиональный английский язык Курс: III

Форма контроля: самостоятельная работа

Для выполнения самостоятельной работы студент должен знать:

1. Лексический минимум, прилагаемый к данной самостоятельной работе.

2. Грамматическую модель страдательного залога (Passive Voice) в группе Simple, с модальными глаголами.

Для защиты самостоятельной работы студент должен уметь ответить на вопросы по тексту, знать содержание текста, перевести предложения с русского на английский, знать образование Passive Voice и знать лексический минимум.

Вариант №1

Задание №1: Прочитайте и переведите текст письменно.

STRUCTURE OF MATTER AND ELECTRICITY

To understand the electronic theory, it is necessary to have a clear understanding of the structure of matter. Matter consists of very small molecules. These molecules are the smallest physically divisible parts of matter. All molecules consist of atoms.

The atom is the most fundamental unit of all. The atom is still further divisible into smaller kinds of particles. The main of these are neutrons, protons and electrons. Neurons and protons are heaviest particles which make up the nucleus of the atom/ Neutrons have no electrical charge, while the protons are charged positively.

Outside the nucleus and very far apart from it move planetary electrons, which are negative particles of electricity. The atom as a whole is neutral since it contains an equal

number of protons and electrons. Protons and electrons have a strong attraction for each other. This attraction between the positive protons and negative electrons holds the atom together. If one of the electrons leaves the atom, it becomes positively charged. The displaced electron is called a “free” electron. The free electrons move and occupy vacant sports in adjoining atoms.

VOCABULARY

to understand	чтобы понять
structure	строение, структура
matter	материя, вещество
divisible part	делимая частица
particle	частица
physically divisible	физически делимый
subdivide	подразделять
means	средство
fundamental	основной, элементарный
unit	единица, частица
kind	вид
neutron	нейтрон
heavy	тяжелый
make up	составлять
nucleus	ядро
electrical charge	электрический заряд
while	тогда как
positive	положительный
outside	за пределами
planetary electrons	орбитальные электроны
negative	отрицательный

attractions	притяжение
leave	покидать
displaced electron	перемещенный электрон
free electron	свободный электрон
move	двигаться, перемещаться
occupy	занимать
vacant spots	свободные места
adjoining atoms	смежные (соседние) атомы

NOTES TO THE TEXT

have a clear understanding	- иметь ясное представление
the atom is still further divisible	- атом и далее делится
very far apart from it	- на очень большом расстоянии
as a whole	- в целом

Задание №2. Переведите слова и словосочетания:

electronic theory; structure of matter; consist of; molecule; divisible parts; matter; fundamental unit; divisible; kinds of particles; main particles; heaviest particles; neutron; proton; electrical charge; kind; outside; as a whole; equal number; attraction; leave; displaced electron; move; vacant spot; outside the nucleus and very far apart from it; contain equal number of protons and electrons; hold the atom together; occupy vacant spots in adjoining atoms; make up the nucleus of the atom; a strong attraction for each other.

Задание №3. Переведите слова и словосочетания:

материя (вещество); молекула; основная единица; виды частиц ; основные частицы; электрический заряд; нейтрон; протон; электрон; положительный; отрицательный; притяжение; покидать; перемещенный электрон; свободное место; двигаться; являться основной единицей материи; планетарные электроны вращаются;

делиться на более мелкие частицы; состоять из молекул; самые тяжелые частицы; частицы заряженные положительно; содержать одинаковое количество протонов и электронов; иметь электрический заряд.

Задание №4. Ответьте на вопросы:

1. What is the smallest physically divisible part of matter?
2. What do molecules consist of?
3. Is atom divisible into smaller particles?
4. What particles make up the nucleus of the atom?
5. What particles in the nucleus are charged positively?
6. Why is the atom neutral as a whole?
7. What holds the atom together?
8. In what case does the atom become positively charged?
9. What electron is called a free electron?
10. Do the free electrons move?

Задание №5. Переведите предложения на английский.

1. Вещество состоит из молекул.
2. Все молекулы состоят из атомов.
3. Атом – основная частица материи.
4. Атом делится на более мелкие частицы.
5. Нейтроны и протоны составляют ядро атома.
6. Нейтроны не имеют электрического заряда.
7. Протоны заряжены положительно.

Вариант №2

Задание №1. Прочитайте и переведите текст письменно:

ELECTRIC CURRENT

Some substances contain many free electrons. These electrons can move freely between the atoms from atom to atom. Such substances are called conductors of electricity. Copper is one of the best conductors.

An insulator is a substance which contains no free electrons. Glass, paper, rubber are the most common non-conductors.

Free electrons release electric energy which can do work. Electric energy can be released from matter by chemical reaction (batteries), heat (thermocouples), electromagnetic induction (generators), and friction (static generators).

In most cases an electric current is described as a flow of electrons along a conductor. The force that causes electrons to move is called the potential difference or electromotive force (e.m.f.). This force is measured in volts. Usually it is produced by batteries or electric generators.

To make an electric current flow continuously two conditions are needed: an electromotive force and an electric circuit. When electrons flow in one direction only, the current is called a direct current (d.c.). When electrons flow first in one direction then in another direction in a periodic manner, the current is called an alternating current (a.c.).

VOCABULARY

electric current	электрический ток
substance	вещество
contain	содержать
conductor	проводник
copper	медь
insulator	изолятор, диэлектрик
glass	стекло
rubber	резина

common	обычный
non-conductor	непроводник, диэлектрик
release	освобождать
heat	тепло
thermocouple	термопара
induction	индукция
friction	трение
describe	описывать
flow	поток, течение; течь
cause	заставлять
potential difference	разность потенциалов
electromotive force	электродвижущая сила
make	зд.: заставлять
continuously	непрерывно
electric circuit	электрическая цепь
direction	направление
direct current	постоянный ток
alternating current	переменный ток

Задание №2. Переведите слова и словосочетания:

conductor; insulator; substance; copper; glass; rubber; paper; release energy; heat; friction; induction; electric current; electromotive force; battery; flow continuously; electric circuit; direction; alternating current; direct current; contain no free electrons; cause electrons to move; electromotive force is measured; two conditions are needed; current is called; electromotive fore is produced; when electrons flow in one direction.

Задание №3. Переведите слова и словосочетания:

вещество; содержать; проводник; изолятор; резина; стекло; бумага; тепло; термопара; электромагнитная индукция; трение; описывать; электрическая цепь; электрический ток; постоянный ток; переменный ток; разность потенциалов; содержать свободные электроны; освобождаться посредством химической реакции; электромагнитной индукции и трения; заставлять электроны двигаться; двигаться свободно от атома к атому; самые лучшие проводники; непроводники электричества; протекание электронов по проводнику; вещество; которое не содержит свободных электронов.

Задание №4. Переведите предложения, обращая внимание на Страдательный Залог:

1. Such substances are called electric conductors.

2. Electric current is described as flow of electrons along a conductor.

3. The force that causes electrons to move is called electromotive force.

4. This force is measured in volts. It is produced by batteries or electric generators.

5. To make an electric current flow continuously two conditions are needed: an electromotive force and an electric circuit.

Задание №5. Переведите предложения на английский:

1. Некоторые вещества содержат много свободных электронов. 2. Такие вещества называются проводниками электричества. 3. Изолятор (диэлектрик) - вещество, которое не содержит свободные электроны. 4. Свободные электроны освобождают электрическую энергию. 5. Электрическая энергия может освобождаться посредством химической реакции, электромагнитной индукции и трения. 6. Электрический ток – это протекание электронов по проводнику. 7. Сила, которая заставляет электроны двигаться называется разностью потенциалов или электродвижущей силой (эдс). 8. Когда электроны текут в одном направлении, ток называется постоянным. 9. Когда электроны текут сначала в одном направлении, затем в другом направлении периодически, ток называется переменным.

Задание №6. Ответьте на вопросы:

1. What do we call the substances which contain many free electrons?

2. What is an insulator?

3. What insulators do you know?

4. What is an electric current?

5. What current is called a direct current?

6. What current is called an alternating current?

7. What conditions are needed to make an electric current flow?

Вариант №3

Задание №1. Прочитайте и переведите текст письменно:

RESISTANCE

When a conductor has different potentials at its ends, the free electrons of the conductor flow from one end to the other. For a continuous flow the potential difference must be maintained by some source of electricity such as a generator or battery. The conductor and the electrical source form an electric circuit. For practical needs a load is usually included into the circuit. You need to know three basic circuit properties to understand radio theory. They are: resistance, inductance and capacitance.

In 1827 George Ohm, a German physicist, discovered a relationship between current, electromotive force (voltage) and resistance. Ohm's law is expressed by the equation

$$I = \frac{E}{R}$$

(value of current equals electromotive force divided by resistance).

For instance, Ohm noticed that more current flows through a copper wire than through an iron wire of the same size, and that more current flows through a thick wire than through a thin wire of the same material. George Ohm discovered that some types of materials resist the flow of current more than others. Resistance tends to reduce the amount of current that is flowing through the circuit. The resistance of a conductor depends on the following parameters: the type of material, its cross-section and length.

Ohm then connected a cell with a higher e.m.f. (voltage) to the same conductor and he discovered that more current flowed into the circuit. In other words, resistance is a constant

ratio of electromotive force to current in this conductor:

$R = \frac{E}{I}$ or $R = \frac{V}{I}$ (which is the same)

George Ohm proved that only voltage and resistance affect the amount of current. In most conductors the resistance is greater when they are hot and less when they are cold.

VOCABULARY

end	конец
maintain	поддерживать
source	источник
electric circuit	электрическая цепь
form	образовывать
load	нагрузка
include	включать
inductance	индуктивность
capacitance	емкость
physicist	физик
discover	открыть, обнаружить
relationship	соотношение
express	выражать
equation	уравнение
value	величина
notice	замечать
copper wire	медный провод
iron wire	железный провод

thick	толстый
thin	тонкий
amount	количество, величина
cross-section	поперечное сечение
length	длина
connect	соединять
cell	элемент
ratio	отношение
prove	доказывать
affect	влиять

NOTES TO THE TEXT

for practical needs	для практических нужд (целей)
you need to know	нужно знать
basic circuit properties	основные свойства цепи
resistance tends to reduce	сопротивление стремится уменьшить..
in other words	иначе говоря; другими словами

Задание №2. Переведите слова и словосочетания:

resistance; electric circuit; electric source; potential difference; practical needs; load; basic circuit properties; inductance; capacitance; relationship; equation; copper wire; iron wire; cross-section; cell; amount of current; potential difference must be maintained; form an electric circuit; relationship between current, electromotive force and resistance; more current flow through a copper wire; less current flow through a thin wire; resist the flow of current.

Задание №3. Переведите слова и словосочетания:

электрическая цепь; разность потенциалов; сопротивление; основные свойства

цепи; емкость; индуктивность; открывать; взаимосвязь; управление; медный провод; поперечное сечение; количество тока; доказывать; влиять; уменьшать количество тока; влиять на количество тока; зависеть от материала, его сечения и длины; поддерживать разность потенциалов источником электричества; разность потенциалов должна поддерживаться; выражать уравнением.

Задание №4. Переведите предложения на английский:

1. Проводник и источник электричества образуют электрическую цепь. 2. В электрическую цепь обычно включается нагрузка. 3. Основными свойствами цепи являются сопротивление , индуктивность и емкость. 4. Георг Ом обнаружил (открыл) взаимосвязь между током, электродвижущей силой и сопротивлением. 5. Сопротивление стремится уменьшить количество тока, который протекает через цепь. 6. В большинстве проводников сопротивление больше , когда они горячие и меньше, когда они холодные. 7. Сопротивление проводника зависит также от материала, его сечения и длины.

Задание №5. Ответьте на вопросы:

1. What forms an electric circuit? 2. What are the three basic circuit properties? 3. When did George Ohm discover a relationship between current, electromotive force and resistance? 4. What parameters does the resistance of a conductor depend on? 5. What does resistance tend to do? 6. In what cases is the resistance of a conductor greater?

Вариант №4

Задание №1. Прочитайте и переведите письменно текст:

INDUCTANCE

Resistance opposes the flow of current while inductance opposes any change in current flow.

A magnetic field surrounds every current-carrying wire. In case of-direct current the flow of electrons is constant. However, alternating current always changes magnitude and

direction. The moving field cuts the conductor and sets up a voltage in the conductor.

As the field falls or increases the lines of force cut the conductor and induce a voltage in it. This voltage ca uses current to continue to flow in the same direction as before, though the applied voltage is changed.

A German scientist named Lenz found that the voltage induced in a conductor opposes the applied voltage, or e.m.f. This opposition is called counter e.m.f. or self-inductance. The symbol of self-inductance is L. Self-inductance has a unit of measurement called the henry, named after the American physicist Joseph Henry. The faster the rate of change of current, the greater the voltage that is induced in the conductor.

VOCABULARY

oppose	противодействовать
while	тогда как
current flow	протекание тока
magnetic field	магнитное поле
surround	окружать
constant	постоянный
however	однако
magnitude	величина
direction	направление
cut the conductor	пересекать проводник наводить, создав напряжение
set up a voltage	зд: когда
as	зд.: спадать
fall	силовые линии
lines of force	заставлять
cause	приложенное напряжение
applied voltage	находить, обнаруживать
find (found, found)	индуцировать, наводить

induce	противоэлектродвижущая сила
counter e.m.f.	собственная индуктивно самоиндуктивность
self-inductance	самоиндуктивность
unit of measurement	единица измерения

NOTES TO THE TEXT

current-carrying wire	провод, по которому протекает ток
in case of	при
named of	по имени
the faster…(the greater)	чем быстрее… (тем больше)

Задание №2. Переведите слова и словосочетания:

oppose; flow of current; direct current; alternating current; magnetic field; moving field; cut the conductor; set up a voltage; induce a voltage; applied voltage; self-inductance; unit of measurement; rate of change; magnetic field surrounds the wire; change magnitude and direction; oppose the applied voltage; lines of force cut the conductor; the faster….the greater.

Задание №3. Переведите слова и словосочетания:

индуктивность; противодействовать; протекание тока; величина; направление; постоянный ток; переменный ток; силовые линии; пересекать проводник; индуцировать напряжение; самоиндуктивность; приложенное напряжение; магнитное поле уменьшается или увеличивается; индуцировать напряжение в проводнике; оказывать противодействие любому изменению протекания тока; напряжение индуцированное в проводнике; обозначения самоиндуктивности.

Задание №4. Вставьте в пропуски подходящие слова:

1. Inductance opposes any change in… 2. Alternating current always changes… 3. Moving magnetic field… the conductor and sets up a …in the conductor. 4. The voltage induced in a conductor… the applied voltage, or e.m.f. 5. This opposition is called… 6. The faster the rate of change of current, the greater… that is induced in the conductor.

Задание №5. Переведите предложения на английский:

1. Магнитное поле окружает каждый проводник, по которому протекает ток. 2. Переменный ток всегда изменяет величину и направление. 3. Когда переменный ток изменяет величину и направление, магнитное поле уменьшается или увеличивается. 4. При этом (in this case) силовые линии пересекают проводник и индуцируют в нем напряжение. 5. Напряжение, индуцированное в проводнике, противодействует приложенному напряжению. 6. Это противодействие называется собственной индуктивностью (самоиндуктивностью). 7. Самоиндуктивность противодействует любому изменению протекания тока.

Задание №6. Ответьте на вопросы:

1. What surrounds every current-carrying wire?

2. What kind of current always changes magnitude and direction?

3. Does a magnetic field change in this case?

4. What is the result of this change?

Вариант №5

Задание №1. Прочитайте и переведите письменно текст:

CAPACITANCE

The third basic property of an electric circuit is capacitance. Capacitance is the property which makes it possible to store electricity by use of two conductors which are insulated from each other and have a potential difference between them. Capacitance is also

the property of a circuit which opposes any change of voltage in a circuit.

A simple capacitor has two plates and an insulator of air called dielectric. The capacitance of a simple capacitor is determined by the following factors: 1) the area of plates; 2) the distance between the plates; 3) the dielectric material.

Capacitance is directly proportional to the plate area: as the area of the plates increases, the capacitance increases. Capacitance is inversely proportional to the distance between the plates: as the distance between the plates increases the capacitance decreases. The third factor or the dielectric material also affects capacitance.

There are many dielectric materials, such as air, mica, glass and others. Just as the unit of measurement of resistance is the ohm, and the unit of inductance is the henry, the unit of capacitance is called the farad. Very often the capacitance of a capacitor is measured in microfarads.

VOCABULARY

capacitance	емкость
store	хранить
insulate	изолировать
plate	пластина
area	площадь
distance	расстояние
directly proportional	прямо пропорциональный
inversely proportional	обратно пропорциональный
affect	влиять
air	воздух
mica	слюда
dielectric material	диэлектрический материал
unit of measurement	единица измерения

NOTES TO THE TEXT

which makes it possible	которое дает возможность
by use	зд.: используя; посредством
just as	точно так же, как

Задание № 2. Переведите слова и словосочетания:

basic property; capacitance; store electricity; insulate; oppose; potential difference; plate; area; dielectric; material; distance; directly proportional; inversely proportional; affect; air; mica; unit of measurement; measure; dielectric material; the capacitance of a simple capacitor is determined; as the area of the plates increases; affect capacitance.

Задание №3. Переведите слова и словосочетания:

емкость; основное свойство; хранить электричество; разность потенциалов; пластина; расстояние; площадь; обратно пропорциональный; прямо пропорциональный; единица измерения; влиять; слюда; воздух; диэлектрик; противодействовать; два проводника изолированные друг от друга; емкость измеряется; если расстояние между пластинами увеличивается, емкость уменьшается; одно из основных свойств электрической цепи; иметь разность потенциалов между проводниками; диэлектрический материал влияет на емкость.

Задание №4. Переведите предложения на английский:

1. Емкость- свойство, которое дает возможность сохранять электричество.

2. Простой конденсатор имеет две пластины и изолятор, называемый диэлектриком. 3. Существует много диэлектриков: воздух, слюда, стекло и др. 4. Емкость простого конденсатора зависит от площади пластин, расстояния между пластинами и диэлектрика. 5. Очень часто емкость измеряется в микрофарадах.

Задание № 5. Заполните пропуски соответствующими словами:

1. Capacitance is the… which makes it possible to store electricity.

2. Capacitance is the third basic property of an… 3. Capacitance also opposes any change of… in circuit. 4. A sample capacitor has two… and an… 5. Air, mica and glass are…

Задание № 6. Ответьте на вопросы:

1. What is the third basic property of an electric circuit? 2. What kind of property is it? 3. What does a simple capacitor consist of? 4. What does the capacitance of a simple capacitor depend on?

5. Методические материалы, определяющие процедуры оценивания знаний, умений, навыков и (или) опыта деятельности, характеризующих этапы формирования компетенций

По дисциплине «Профессиональный английский язык» предусмотрены следующие формы контроля качества подготовки:

- текущий (осуществление контроля за всеми видами аудиторной и внеаудиторной деятельности обучающегося с целью получения первичной информации о ходе усвоения отдельных элементов содержания дисциплины);
- промежуточный (оценивается уровень и качество подготовки по конкретным темам дисциплины).
- контроль самостоятельной работы обучающегося.

Результаты текущего и промежуточного контроля качества выполнения студентом запланированных видов деятельности по усвоению учебной дисциплины являются показателем качества работы обучающего за время изучения дисциплины. Итоговый контроль проводится в форме промежуточной аттестации – дифференцированного зачета (зачета с оценкой).

Текущий контроль успеваемости предусматривает оценивание хода освоения дисциплины, промежуточная аттестация обучающихся – оценивание результатов обучения по дисциплине, в том числе посредством испытания в форме дифференцированного зачета (зачета с оценкой).

Оценивание знаний, умений и навыков по учебной дисциплине «Профессиональный английский язык» осуществляется посредством использования следующих видов оценочных средств:

- устные опросы;
- выполнение самостоятельной работы;
- выполнение практических заданий;
- дискуссии по вопросам для обсуждения;
- доклад;

Опросы

Устные опросы проводятся во время занятий и при проведении промежуточного контроля знаний по разделам дисциплины. Вопросы опроса, проводимого во время практических занятий, не должны выходить за рамки объявленной для данного занятия темы. Устные опросы необходимо строить так, чтобы вовлечь в тему обсуждения максимальное количество обучающихся в группе, проводить параллели с уже пройденным учебным материалом данной дисциплины и смежными курсами, находить удачные примеры из современной действительности, что увеличивает эффективность усвоения материала на ассоциациях. Основные вопросы для устного опроса доводятся до сведения студентов на предыдущем занятии. Индивидуальные устные блиц-опросы (по форме «вопрос-ответ») по разделам дисциплины проводятся с целью определения степени усвоения теоретического материала и понятийного аппарата по всему разделу дисциплины. Примерный перечень вопросов для индивидуального устного блиц-опроса представлены в рабочей программе дисциплины и доводятся до сведения студентов до начала курса. При оценке опросов анализу подлежит точность формулировок, связность изложения материала, обоснованность суждений, опора на методические материалы.

Выполнение самостоятельной работы

Проводится в течение изучения дисциплины. Каждому студенту предоставляется отдельный вариант самостоятельной работы. Оценка результатов самостоятельной работы производится преподавателем сразу после ее написания. Преподаватель комментирует правильное и неправильное выполнение заданий.

Выполнение практических заданий

Выполнение заданий осуществляется по предложенным преподавателям условиям. Задания выполняются индивидуально, при этом не запрещается обсуждение хода выполнения задания и результатов обучающимися.

Дискуссии по вопросам для обсуждения

Вопросы для обсуждения представлены в рабочей программе дисциплины. Обучающийся самостоятельно готовится к занятию по предложенным вопросам. Обучающийся может воспользоваться рекомендуемой литературой, самостоятельно подобранными источниками литературы, ресурсами сети Интернет.

Зачет с оценкой

Промежуточная аттестация по дисциплине «Профессиональный английский язык» завершает изучение курса и проходит в виде зачета с оценкой. Зачет проводится согласно расписанию зачетно-экзаменационной сессии. Зачет может быть выставлен автоматически по результатам текущего и промежуточного контроля знаний и достижений, продемонстрированных обучающимся на занятиях. Фамилии обучающихся, получивших зачет автоматически, объявляются в день проведения зачета до начала промежуточной аттестации.

Оценка знаний обучающегося носит комплексный характер и определяется его:

- ответом на зачетном занятии;
- оценкой самостоятельной работы (подготовка доклада);
- оценками, полученными обучающимися по итогам аудиторных занятий, решением тестовых заданий, опросов и т.д.

Основой для определения оценки служит уровень усвоения обучающимися материала, предусмотренного рабочей программой. В случае неудовлетворительного результата испытания назначается день и время повторного (по графику ликвидации задолженностей). Присутствие посторонних лиц в ходе проведения аттестационных испытаний без разрешения ректора или проректора по учебной работе не допускается (за исключением работников университета, выполняющих контролирующие функции в соответствии со своими должностными обязанностями). В случае отсутствия ведущего преподавателя аттестационные испытания проводятся преподавателем, назначенным письменным распоряжением декана факультета.

Инвалиды и лица с ограниченными возможностями здоровья, допускаются на аттестационные испытания в сопровождении ассистентов-сопровождающих.

Федеральное государственное бюджетное образовательное учреждение
высшего образования
«Камчатский государственный технический университет»

Кафедра «Иностранные языки»

Н.И. Репринцева

ПРОФЕССИОНАЛЬНЫЙ АНГЛИЙСКИЙ ЯЗЫК

Учебно-методическое пособие
для обучающихся по направлению подготовки
13.03.02 Электроэнергетика и электротехника

Петропавловск-
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Contents

Введение

Предлагаемое учебно-методическое пособие предназначено для обучающихся старших курсов , усвоивших программу общеобразовательного курса и продолжающих изучение ан-глийского языка в вузе. Цель пособия – подвести учащихся к самостоятельному чтению и пониманию научно-технической литературы по специальности на английском языке.

Пособие состоит из следующих разделов: 1) уроки, содержащие учебные тексты с упражнениями, 2) тексты для внеаудиторного чтения, 3) словарь.

Тексты сборника составлены на основе английских и американ-ских источников, носят познавательный характер.

Пособие содержит пятнадцать уроков и состоит из предтекстовых упражнений, основного текста, лексико-грамматических и речевых упражнений, предназначенных для развития навыков устной и пись-менной речи. При составлении текстов и упражнений автор уделяла особое внимание повторяемости лексических и грамматических явле-ний и придерживалась принципа постепенного нарастания трудностей.

Грамматический материал включен в первые тринадцать уроков, причем проработке каждой грамматической темы уделяется несколько уроков. Последние два урока включают весь пройденный грамматиче-ский материал.

Тексты для самостоятельного чтения способствуют развитию и закреплению навыков перевода научно-технической литературы по специальности, что является очень важным аспектом в будущей про-фессиональной деятельности.

CHAPTER I

UNIT 1

Grammar: The Participle. The Gerund. Set Expressions.

Class exercises

I. Translate the sentences and find non-finite forms of the verb:

1. You are the only engineer speaking both English and German.
2. Both Lomonosov and Rihman studied atmospheric electricity, the latter being Lomonosov's friend.
3. There are 26 letters in the English language, the latter being "z".
4. An air thermometer consists of a metal bulb containing mercury and connected to a glass tube.
5. Water is the very liquid used in thermometers.
6. Placing a kettle full of cold water on the fire is quite an ordinary thing.
7. Placing a finger into the kettle from time to time, we find that the water is gradually becoming hotter and hotter, until it boils at last.
8. Making the first measuring instrument was not an easy thing at all.

II. Guess the meaning of the following international words:

Electricity, electron, effect, structure, combination, material, mass, energy, atom, orbit, physical.

III. Practice the pronunciation of the words given below:

Theory, electrical, through, substance, scientist, broad, enough, confuse, occupy, nucleus, fashion.

IV. Learn the following words and phrases:

movement	движение
particle	частица
pressure	давление
to force	заставлять
to encounter	сталкиваться, встречаться
to state	заявлять, сообщать
to be composed of	состоять из
wire	провод
readily	легко, быстро
matter	вещество, материя
despite	несмотря на

to occupy	занимать
definition	определение
enough	достаточно
to be related to	относиться
to confuse	путать, перепутать
unit	единица, элемент
nucleus	ядро, центр
to orbit	вращаться
generally	вообще, в целом

V. Read and translate text 1:

TEXT 1
THE NATURE OF ELECTRICITY

Practical electricity is produced by small atomic particles known as electrons. It is the movement of these particles which produce the effects of heat and light.

The pressure that forces these atomic particles to move, the effects they encounter opposition and how these forces are controlled are some of the principles of electricity.

Accepted atomic theory states that all matter is electrical in structure. Any object is largely composed of a combination of positive and negative particles of electricity. Electric current will pass through a wire, a body, or along a stream of water. It can be established in some substances more readily than in others, that all matter is composed of electric particles despite some basic differences in materials. The science of electricity then must begin with a study of the structure of matter.

Matter is defined as any substance which has mass (or weight) and occupies space. This definition should be broad enough to cover all physical objects in the universe. Wood, water, iron, and paper are some examples of matter. Energy is closely related to, but not to be confused with, matter. Energy does not have mass, and it does not occupy space. Heat and light are examples of energy.

The smallest particle of matter which can be recognized as an original substance was thought to be a unit called the atom. Recently scientists have found particles even smaller than atoms, but our theories are still based on the atom. The atom consists of a nucleus and a cloud of electrons. It is generally agreed that the electrons are small particles of electricity, which are negative in nature. These particles orbit the nucleus in much the same fashion that planets orbit a sun.

VI. Give the English equivalents to the words below:

Производить; частица; тепло и свет; напряжение; сила; вещество; положительный; отрицательный; электрический ток; вес; ядро; электроны; движение; давление.

VII. Translate into Russian the words and expressions from the text:

Atomic particle; effects of heat and light; encounter opposition; principles of electricity; composed (of); pass through a wire; structure of matter; occupy space; physical objects; a cloud of electrons; in the same fashion.

VIII. Complete the sentences using the text:

1. Electricity is produced by …
2. The effects of heat and light are produced by …
3. According to the accepted atomic theory all matter is …
4. Any object is composed of …
5. Matter is defined as …
6. Energy must not be confused with …
7. The atom consists of …
8. The smallest particle of matter is …
9. Most theories are based on …
10. Electrons are …

IX. Answer the questions:

1) What are the principles of electricity?

2) What must the science of electricity begin with?

3) Are there any differences between energy and matter? What are they?

4) What is recognized as an original substance now?

5) What does the atom consist of?

X. Topics for discussion:

1. The nature of electricity;
2. The nature of matter;
3. Contents of atomic theory.

UNIT 2

Grammar: The Infinitive

Table 5

The Forms of the Infinitive

Indefinite		Continuous	Perfect	Perfect continuous
Simultaneous action			Priority	
Active	to write	to be writing	to have written	to have been writing
Passive	to be written	___	to have been written	___

Class exercises

I. Choose the sentences with the infinitive expressing: a) simultaneous action; b) prior action. Translate them into Russian:

1. We shall translate this article.
2. Do you know this man?
3. They can translate this text without a dictionary.
4. To translate this article is not an easy thing.
5. We want to translate this article.
6. I remember to have seen this man last year.
7. To study much is to learn much.
8. To muster a language one must work hard.
9. The professor to deliver a lecture at our institute is an outstanding scientist.
10. Can this work have been done in such a short time?

II. Guess the meaning of the following international words:

Static, voltage, control, contact, salt, disc, zinc, biography, lecture, civilization, vacuum, practical, crane, pyrometer, academician, chemical.

III. Practice the pronunciation of the words given below. Repeat them after the speaker:

Thus, ability, behaviour, phenomenon, previously, least, object, control, opposite, academician, another, result, unit, develop, dead, jump, thought, pair, layer, wire, continuous, biography, chemical, died, age.

IV. Learn the following words and word-combinations:

to obtain	получать
as well as	так же как
at rest	в покое
behaviour	поведение; режим (работы)
charge	заряд
to control	управлять, контролировать
copper	медь
to flow	течь
in motion	в движении
negative	отрицательный
opposite	противоположный
positive	положительный
previously	заранее, предварительно
to remember	помнить, вспоминать
the rest of	остаток; остальной
to travel	путешествовать
to try	пытаться, испытывать
unlike	разноименный
in no time	моментально, в мгновение ока

V. Read and translate text 2:

TEXT 2
FROM THE HISTORY OF ELECTRICITY

There are two types of electricity, namely, electricity at rest or in a static condition and electricity in motion, that is, the electric current. Both of them are made up of electric charges, static charges being at rest, while electric current flows and does work. Thus, they differ in their ability to serve mankind as well as in their behaviour.

Static electricity was the only electrical phenomenon to be observed by man for a long time. At least 2,500 years ago the Greeks knew how to get electricity by rubbing substances. However, the electricity to be obtained by rubbing objects cannot be used to light lamps, to boil water, to run electric

trains, and so on. It is usually very high in voltage and difficult to control, besides it discharges in no time.

As early as 1753, Franklin made an important contribution to the science of electricity. He was the first to prove that unlike charges are produced due to rubbing dissimilar objects. To show that the charges are unlike and opposite, he decided to call the charge on the rubber – negative and that on the glass – positive.

In this connection one might remember the Russian academician V. V. Petrov. He was the first to carry on experiments and observations on the electrification of metals by rubbing them one against another. As a result he was the first scientist in the world who solved that problem.

Volta's discovery of electric current developed out of Galvani's experiments with the frog. Galvani observed that the legs of a dead frog jumped as a result of an electric charge. He tried his experiment several times and every time he obtained the same result. He thought that electricity was generated within the leg itself.

Volta began to carry on similar experiments and soon found that the electric source was not within the frog's leg but was the result of the contact of both dissimilar metals used during his observations. However, to carry on such-experiments was not an easy thing to do. He spent the next few years trying to invent a source of continuous current. To increase the effect obtained with one pair of metals, Volta increased the number of these pairs. Thus the voltaic pile consisted of a copper layer and a layer of zinc placed one above another with a layer of flannel moistened in salt water between them. A wire was connected to the first disc of copper and to the last disc of zinc.

The year 1800 is a date to be remembered: for the first time in the world's history a continuous current was generated.

Volta was born in Como, Italy, on February 18, 1745. For some years he was a teacher of physics in his home town. Later on he became professor of natural sciences at the University of Pavia. After his famous discovery he traveled in many countries, among them France, Germany and England. He was invited to Paris to deliver lectures on the newly discovered chemical source of continuous current. In 1819 he returned to Como where he spent the rest of his life. Volta died at the age of 82.

VI. Translate the following words and expressions and use them in the sentences of your own:

Electricity at rest, electricity in motion, electric charges, flows and does work, to save mankind, the only electrical phenomenon, previously mentioned, by rubbing objects, to run electric trains, difficult to control, in no time, important contribution, unlike charges, dissimilar objects, opposite,

academician, to carry on experiments, one against another, to get the electric current, experiments with the frog, as a result of, the same result, within the leg itself, the electric source, the contact of dissimilar metals, trying to invent, a source of current, a copper layer, one above another, a teacher of physics, professor of natural science.

VII. Arrange the sentences in logical order according to the text:

1. He spent the next few years trying to invent the source of continuous current.
2. A wire was connected to the first disc of copper and to the last disc of zinc.
3. Volta began to carry on similar experiments.
4. However, to carry on such experiments was not an easy thing to do.
5. Thus the voltaic pile consisted of a copper layer and a layer of zinc placed one above another.

VIII. Fill in the blanks with the appropriate words and word-combinations given below:

Electricity, electric charges, at rest, in motion, dissimilar, contribution, scientist, to carry on experiments, unlike charges.

1) There are two types of _____, namely, electricity _____ or in static condition and electricity _____, that is, the electric current.
2) Both of them are made up of _____.
3) As early as 1753, Franklin made an important _____ to the science of electricity.
4) He was the first to prove that _____ are produced due to rubbing _____ objects.
5) V.V. Petrov was the first _____ and observations on the electrification of metals by rubbing them one against another.
6) As a result he was the first _____ in the world who solved that problem.

IX. Translate the following sentences using the infinitive:

1. В течение долгого времени статичное электричество было единственным электрическим феноменом, которое люди могли наблюдать.
2. Еще 2,500 лет назад греки знали, как получить электричество.
3. Франклин был первым ученым, кто доказал, что разноименные заряды образуются в результате трения несхожих предметов.
4. Первым ученым, получившим электрический ток, был Вольта.
5. Вольта начал проводить подобные эксперименты.
6. Однако проводить такие эксперименты было непростой задачей.
7. Его пригласили в Париж читать лекции.

X. Give antonyms to the following words:

North, pole, dark, on the one hand, small, arrangement, larger, magnetized, unfamiliar, like, positive, similar, to rest, in motion.

XI. Answer the questions:

1. What types of electricity do you know?
2. What is the difference between electricity at rest and electricity in motion?
3. What kind of experiments did Galvani carry on?
4. What did Franklin prove?
5. What are the two kinds of electrical charges?
6. Who was the first to produce a continuous current?
7. What was Volta?
8. What can you say about the behaviour of static charges?
9. What did Volta take interest in?
10. What did Volta's discovery result in?
11. What did Volta's device consist of?
12. Where did he spend the rest of his life?

XII. Speak on:

1) Two types of electricity.
2) Galvani's experiment with the frog.
3) Volta's invention of the continuous current.
4) Volta's biography.

UNIT 3

Grammar: The Subjective Infinitive Construction. The Objective Infinitive Construction.

Table

The Subjective Infinitive Construction. The Objective Infinitive Construction

The Subjective Infinitive Construction	1. He is supposed to work at this plant. – Полагают, что он работает на этом заводе. 2. He seems to know English well. – Кажется, он знает английский хорошо.

The Objective Infinitive Construction	1. We suppose him to work at this plant. – Мы полагаем, что он работает на этом заводе. 2. I saw the water boil. – Я видел, что вода кипит.

Class exercises

I. Choose the sentences with a) the Subjective Infinitive Construction; b) the Objective Infinitive Construction. Translate them into Russian:

1. Lightning proved to be a discharge of electricity.
2. The student is certain to know that alternating voltage can be increased and decreased.
3. Heat is known to be a form of energy.
4. We know the electrons to flow from the negative terminal of the battery to the positive one.
5. This scientist seems to have been working on the problem of splitting the atom.
6. The students saw the thermometer mercury fall to the fixed point.
7. Coal is considered to be a valuable fuel.
8. We expected many articles to have already been written on that subject.
9. The electrolytes appear to change greatly when the current passes through them.
10. The induced voltage causes the current to flow and the rotor to revolve.

II. Guess the meaning of the following international words:

Electric, ampere, symbol, proportional, industrial, metal, electrolyte, battery, generate, cycle, theory, contact.

III. Give all the meanings of the following words:

Current, table, iron, power, needle, pressure, wire, state, generation.

IV. Practice the pronunciation of the following words. Repeat them after the speaker:

Since, continuous, theory, subject, charge, famous, Ampere, unit, determine, circuit, negative, right, certainly, wrong, opposite, thought, wire, minute, particle, however, liquid, through, requirement, example, without,

themselves, others, electrolyte, alternating, purpose, cycle, advantage, voltage, high, although, practice.

V. Learn the following words and word-combinations:

ever since	с того времени, с тех пор
hence	следовательно; отсюда
alternating current	переменный ток
as well	также
to be certain	обязательно, несомненно
to consider	рассматривать; считать
to decrease	уменьшить, понижать
to determine	определять
direction	направление
direct current	постоянный ток
to increase	возрастать; увеличивать
to meet requirements	отвечать требованиям
particle	частица
to require	требовать
statement	утверждение; формулировка
subject	предмет; тема
terminal	зажим, клемма
voltage	напряжение
wire	проволока, провод
solids	твердые вещества

VI. Read and translate text 3:

TEXT 3
ELECTRIC CURRENT

Ever since Volta first produced a source of continuous current, men of science have been forming theories on this subject. For some time they could see no real difference between the newly-discovered phenomenon and the former understanding of static charges. Then the famous French scientist Ampere (after whom the unit of current was named) determined the difference between the current and the static charges. In addition to it, Ampere gave the current direction: he supposed the current to flow from the positive pole of the source round the circuit and back again to the negative pole.

We consider Ampere to be right in his first statement but he was certainly wrong in the second, as to the direction of the current. The student is certain to remember that the flow of current is in a direction opposite to

what he thought. Let us turn our attention now to the electric current itself. The current which flows along wires consists of moving electrons. What can we say about the electron? We know the electron to be a minute particle having an electric charge. We also know that that charge is negative. As these minute charges travel along a wire, that wire is said to carry an electric current.

The electric current is a quantity of electrons flowing in a circuit per second of time. The unit of measure for current is ampere. If one coulomb passes a point in a circuit per second then the current strength is 1 ampere. The symbol for current is I.

The current which flows along wires consists of moving electrons. The electrons move along the circuit because the e .m. f. drives them. The current is directly proportional to the e. m. f.

In addition to traveling through solids, however, the electric current can flow through liquids as well and even through gases. In both cases it produces some most important effects to meet industrial requirements.

Some liquids, such as melted metals for example, conduct current without any change to themselves. Others, called electrolytes, are found to change greatly when the current passes through them.

When the electrons flow in one direction only, the current is known to be d. c., that is, direct current. The simplest source of power for the direct current is a battery, for a battery pushes the electrons in the same direction all the time (i.e., from the negatively charged terminal to the positively charged terminal).

The letters a. c. stand for alternating current. The current under consideration flows first in one direction and then in the opposite one. The a. c. used for power and lighting purposes is assumed to go through 50 cycles in one second. One of the great advantages of a. c. is the ease with which power at low voltage can be changed into an almost similar amount of power at high voltage and vice versa. Hence, on the one hand alternating voltage is increased when it is necessary for long-distance transmission and, on the other hand, one can decrease it to meet industrial requirements as well as to operate various devices at home.

Although there are numerous cases when d. c. is required, at least 90 per cent of electrical energy to be generated at present is a. c. In fact, it finds wide application for lighting, heating, industrial, and some other purposes.

VII. Give the English equivalents to the words and word combinations below:

Течь, протекать; цепь, схема; единица измерения; провод; электродвижущая сила; твердое тело; жидкость; проводить (ток); источник энергии; постоянный ток; переменный ток; напряжение.

VIII. Give Russian equivalents to the following:

To meet industrial requirements; melted metals; to push in the same direction; negatively (positively) charged terminal; power and lightning purposes; long-distance transmission; to operate devices; to find wide application.

IX. Say whether these sentences are true or false:

1. The symbol for current is I.
2. The electric current can flow only through liquids.
3. The current can be of two types: direct current and alternating current.
4. The alternating current flows in one direction.
5. A battery is the simplest source of power for the direct current.
6. Direct current finds wider application than alternating current.
7. Electrolytes don't change greatly when current passes through them.
8. One of the great advantages of alternating current is the ease with which voltage can be changed.

X. Fill in the blanks, using the words from the box:

Direct current, solids, conduct, electric current, liquids, voltage, alternating current.

A quantity of moving electrons flowing in a circuit is the a) _____. The current can flow through b) _____ and c) _____. Some liquids d) _____ current without any change to themselves. When the electrons flow in one direction only, the current is known to be e) _____. The current flowing first in one direction and then in the opposite one is f) _____. Such advantage of alternating current as alternating g) _____ finds wide industrial and household application.

XI. State the questions to the underlined words:

1. Melted metals conduct current without any change to themselves.
2. Alternating voltage can be changed to operate various devices at home.
3. A battery pushes the electrons in the same direction.
4. The alternating current is used for power and lightning purposes.
5. Alternating current accounts for 90 per cent of electrical energy generated now.

XII. Say some sentences about the types of electric current and its properties.

UNIT 4

Grammar: The Infinitive (Revision).

Class exercises

I. Choose the sentences with the Infinitive Constructions and translate them:

1. I want to explain theory to him.
2. I want you to explain theory to him.
3. We heard our scientist speak over the radio.
4. We heard the latest news over the radio.
5. The students observed the liquid change.
6. The students observed the liquid changes.
7. The teacher made me speak English.
8. The teacher made a report in English.

II. Make up the sentences of your own using the Infinitive Constructions according to the models given below:

Model 1: *The factory is supposed to increase its production.*
Model 2: *We expected the delegation to arrive soon.*

III. Guess the meaning of the following international words:

Concept, potential, electrostatic generator, aluminum, parallel, typical, control, electrons, electrical.

IV. Practice the pronunciation of the following words. Repeat them after the speaker:

Charge, important, potential, conductor, maintain, battery, generator, circuit, everywhere, otherwise, switch, device, condition, series, typical, through, path, result, fault, fuse.

V. Learn the following words and word-combinations:

concept	понятие; концепция
electric charge	электрический заряд
conductor	проводник
potential	потенциал; электрический потенциал
to drift	дрейфовать; медленно течь
source	источник

electrostatic generator	электростатический генератор
to maintain	поддерживать; обслуживать; сохранять
open circuit	разомкнутая цепь
closed circuit	замкнутая цепь
series circuit	последовательная цепь
short circuit	короткое замыкание
electric device	электрическое устройство, прибор
bell circuit	цепь включения звонка
to provide	предоставлять, снабжать, обеспечивать
source of supply	источник питания
cable fault	повреждение кабеля
fuse	предохранитель

VI. Read and translate text 4:

TEXT 4
ELECTRIC CIRQUITS

The concepts of electric charge and potential are very important in the study of electric currents. When an extended conductor has different potentials at its ends, the free electrons of the conductor itself are caused to drift from one end to the other. The potential difference must be maintained by some electric source such as electrostatic generator or a battery or a direct current generator. The wire and the electric source together form an electric circuit, the electrons are drifting around it as long as the conducting path is maintained.

There are various kinds of electric circuits such as: open circuits, closed circuits, series circuits, parallel circuits and short circuits.

To understand the difference between the following circuit connections is not difficult at all. If the circuit is broken or «opened» anywhere, the current is known to stop everywhere. The circuit is broken when an electric device is switched off. The path along which the electrons travel must be complete otherwise no electric power can be supplied from the source to the load. Thus the circuit is “closed” when an electric device is switched on.

When electrical devices are connected so that the current flows from one device to another, they are said «to be connected in series». Under such conditions the current flow is the same in all parts of the circuit as there is only a single path along which it may flow. The electrical bell circuit is considered to be a typical example of a series circuit. The “parallel” circuit pro-

vides two or more paths for the passage of current. The circuit is divided in such a way that part of the current flows through one path and part through another. The lamps in the houses are generally connected in parallel.

The "short" circuit is produced when the current can return to the source of supply without control. The short circuits often result from cable fault or wire fault. Under certain conditions the short circuit may cause fire because the current flows where it was not supposed to flow. If the current flow is too great a fuse is used as a safety device to stop the current flow.

The fuse must be placed in every circuit where there is a danger of overloading the line. Then all the current to be sent will pass through the fuse.

VII. Give the English equivalents to the following words and word combinations:

Электрические цепи, электрический заряд, проводник, сопротивление, движение электронов, изолятор, короткое замыкание, энергия, замкнутая цепь, разомкнутая цепь, последовательная цепь, параллельная цепь, соединения, электрический прибор, от одного устройства к другому, типичный пример, прохождение тока, источник питания, происходит из-за повреждения кабеля, вызвать пожар, предохранительное устройство, остановить ток, проходить через, различные виды электрических цепей, проводник.

VIII. Say whether these sentences are true or false:

1. When an extended conductor has the same potential at its ends, free electrons are drifting from one end to another.
2. The wire and the electric source together form an electric circuit.
3. A path of any material will allow current to exist.
4. Silver, copper and gold oppose very strongly.
5. The slighter the opposition is, the better the insulator is.
6. There is only one type of electric circuit.
7. We close the circuit when we switch on our electric device.

IX. Complete the sentences using the text:

1. The potential difference must be maintained by …
2. Materials that offer slight opposition are called …
3. The best insulators are …
4. There are various kinds of electric circuits such as …
5. We "open" the circuit when …
6. We "close" the circuit when …
7. The "short" circuit is produced when …
8. A fuse is …

X. Answer the questions:

1. What concepts are very important in study of electric current?
2. What forms an electric circuit?
3. What materials are the best conductors and insulators?
4. What kinds of electric circuits do you know?
5. How can we open and close the circuit?
6. When are electrical devices connected in series?
7. What is an example of a series circuit?
8. What can you say about «parallel» circuits?
9. What does the short circuit often result from?

XI. Speak on the types of electric circuits.

UNIT 5

Grammar: The Attribute. Attributive clauses.

Class exercises

I. Apply suitable attributes to the following nouns:

Model: electric charge.

Wire, engineering, conductor, difference, opposition, material, line, insulator, light, cord.

II. Translate the sentences paying attention to the attribute and attributive clauses:

1. The methods of solving the problem were discussed at the lesson.
2. The problem solved opened up new possibilities of nuclear energy application.
3. The devices produced by Russia are known all over the world.
4. The date obtained helped the students in their research work.
5. The measuring instruments we use in the laboratory were produced in Germany.
6. The power generated was supplied to a number of factories.
7. The material the conductors are made of must withstand high temperatures.

III. Practice the pronunciation of the following words. Repeat them after the speaker:

Substance, differ, greatly, ease, freely, insulators, conductors, conductivity, constitution, transmit, resist, strongly, conductance, length, employ, readily, thin, certainly, passage, opposition, various, purpose, asbestos, plastics, rubber, cord, socket, wire, engineering.

IV. Learn the following words and word-combinations:

ability	способность
to conduct electric current	проводить
conductivity	проводимость
conductance	проводимость
ease	легкость, простота
to pass through	проходить через
conductor	проводник
insulator	изолятор
to be expressed	выражаться
to be transmitted	передаваться
to resist	сопротивляться; противостоять
resistance	сопротивление
to employ	использовать
readily	легко; быстро
in spite of	несмотря на
copper	медь
silver	серебро
nevertheless	однако, тем не менее
in its turn	в свою очередь
socket	розетка
purpose	цель
rubber	резина
asbestos	асбест
cord	шнур
bare wire	оголенный провод
leaking off	утечка

V. Read and translate text 5:

TEXT 5
CONDUCTORS AND INSULATORS

All substances have some ability of conducting the electric current, however, they differ greatly in the ease with which the current can pass through them. Solid metals conduct electricity with ease while non-metals do not allow it to flow freely. Thus, there are conductors and insulators.

What do the terms "conductors" and "insulators" mean?

This difference is expressed by what is called electrical conductivity of the body. It depends upon the atomic constitution of the body. Substances through which electricity is easily transmitted are called conductors. Any material that strongly resists the electric current flow is known as an insulator.

Conductance, that is the conductor's ability of passing electric charges, depends on the four factors: the size of the wire used, its length and temperature as well as the kind of material to be employed.

A large conductor will carry the current more readily than a thinner one. To flow through a short conductor is certainly easier for the current than through a long one in spite of their being made of similar material. Hence, the longer the wire, the greater is its opposition that is resistance, to the passage of current.

There is a great difference in the conducting ability of various substances. Almost all metals are good electric current conductors. The best conductors are silver, copper, gold and aluminum. Nevertheless, copper carries the current more freely than iron; and silver, in its turn, is a better conductor than copper. Copper is the most widely used conductor. The electrically operated devices are connected to the wall socket by copper wires.

A material which resists the flow of the electric current is called an insulator.

The higher the opposition is, the better the insulator is. There are many kinds of insulation used to cover the wires. The kind used depends upon the purposes the wire or cord is meant for. The insulating materials generally used to cover the wires are rubber, asbestos, glass, plastics and others. The best insulators are oil, rubber and glass.

Rubber covered with cotton, or rubber alone is the insulating material usually used to cover desk lamp cords and radio cords.

Glass is the insulator to be often seen on the poles that carry the telephone wires in city streets. One of the most important insulators of all, however, is air. That is why power transmission line wires are bare wires depending on air to keep the current from leaking off.

Conducting materials are by no means the only materials to play an important part in electrical engineering. There must certainly be a conductor that is a path, along which electricity is to travel and there must be insulators keeping it from leaking off the conductor.

VI. Give the Russian equivalents to the words and word combinations below and use them in the sentences of your own:

Conductors; insulators; transmit; resistance; passage of current; socket; to connect to; cord; high voltage transmission line; leak off; conducting materials; telephone wires; desk lamp cords; rubber; depends upon the purposes; asbestos; plastics; various substances; electrically operated devices; in spite of; differ greatly; the ease.

VII. Find in the text the sentences with the following related words and translate them:

Conducting – conductor – conductivity – conductance.

VIII. Make up sentences corresponding to the information given in the text:

Copper		used to cover desk lamp cords.
Silver		one of the most important insu-
	is	lators of all.
Rubber		the most widely used conductor.
Glass		a better conductor than copper.
Iron		not so good conductor as cop-
		per.
Air		the insulator usually used on the
		city street poles and high volt-
		age transmission lines.

IX. Put questions to the underlined words:

1) Solid metals conduct electricity <u>with ease</u>.
2) Conductance depends on the <u>four</u> factors.
3) There are many kinds of insulation used <u>to cover the wires</u>.
4) Insulators keep electricity <u>from leaking off the conductor</u>.
5) Conductors play an important role in <u>electrical engineering</u>.

X. Say whether these sentences are true or false:

1) Electrical conductivity of a body depends upon its atomic constitution.

2) There is no difference in the conducting ability of various substances.

3) The longer the wire is the weaker its opposition is.

4) The kind of the insulating material depends upon the purpose it is meant for.

5) Conductors are substances through which electricity is easily transmitted.

6) Insulators do not allow the electric current to flow freely.

XI. Speak on the conducting ability of various substances and their appliance in electrical engineering. Use the table in Task VIII.

UNIT 6

Grammar: Conditional Sentences. Emphatic Constructions.

Table

Conditional Sentences. Emphatic Constructions

I. If atomic energy *replaces* the present source of energy, we *shall get* more energy than we produce at present. – Если атомная энергия заменит существующие источники энергии, мы получим больше энергии в настоящее время.
II. If atomic energy *replaced* the present source of energy, we *should get* more energy. – Если *бы* атомная энергия заменила существующие источники энергии, мы *бы* получили больше энергии.
III. If professor Rihman *had thought* of the possible danger, lightning *would not have killed* him. – Если *бы* профессор Рихман подумал о возможной опасности, молния не убила *бы* его.

Class exercises

I. Choose the sentences which can be translated with "*бы*":

1. Were the resistance lower, the current would be larger.

2. In case the material offers a high resistance we consider it to be a good insulator.

3. There will be no electron flow between the two charged bodies provided they are connected by a glass rod.

4. Unless they apply new devices, they will not be able to obtain good results.

5. Had the laboratory test been successful, the electric machine would be put into operation.

6. If we change the e. m. f., the electric current changes as well.

II. Guess the meaning of the following international words and translate them:

Reaction, electrostatic, electromagnetic, electroscope, volt, metallic, magnetic, induction, atom, form, energy, stationary, generator.

III. Practice the pronunciation of the following words. Repeat them after the speaker:

Dislodged, release, reaction, friction, induction, electromotive, exertion, alternating, sources, cell, unidirectional, whenever, electrostatic, detect, electroscope, measure, surrounding, produce, expose, strength, without, circuit, flux, stationary, rotate, angle, parallel, across, actual, measurable, reference, influence, passage, amount.

IV. Learn the following words and word-combinations:

to be dislodged	смещаться
to be released	освобождаться
friction	трение
whenever	всякий раз, когда
electromotive force (=e. m. f.)	электродвижущая сила (ЭДС)
cell	элемент
unidirectional	однонаправленный
alternating force	переменно действующая сила
cut	сокращать; резать; рассекать
electrostatic field	электростатическое поле
to be detected	обнаруживаться
electrometer	электрометр
surrounding	окружающий
to be exposed	подвергаться действию
motion	движение, перемещение
magnetic flux	магнитный поток
to rotate	вращаться
lines of force	силовые линии
measurable	измеримый

photocell	фотоэлемент
potential difference	разность потенциалов
to make reference	ссылаться
to influence	влиять
provided	при условии
passage	проход; прохождение

V. Read and translate text 6:

TEXT 6
ELECTROMOTIVE FORCE AND RESISTANCE

When free electrons are dislodged from atoms, electrical energy is released. Chemical reaction, friction, heat and electromagnetic induction will cause electrons to move from one atom to another. Whenever energy in any form is released, a force called electromotive (e. m. f.) is developed.

If the force exerts its effort always in one direction, it is called direct; and if the force changes its direction of exertion periodically, it is called alternating. The chemical reaction in a dry cell, heat and friction are sources of a unidirectional force. Electromagnetic induction produces an alternating force. The direction of force depends on the direction in which the field is cut. Whenever an e. m. f. is developed, there is also a field of energy called an electrostatic field, which can be detected by an electroscope and measured by an electrometer.

An electromotive force is induced in the conductor when there is a change in the magnetic field surrounding a conductor. This induced electromotive force may be produced in several ways as follows:

a. A conductor may move in a stationary magnetic field of constant strength.

b. A stationary conductor may be exposed to a moving magnetic field of constant strength.

c. The strength of the field surrounding the conductor may change without any motion of conductor or magnetic circuit.

The electromotive force induced by motion of a conductor or a magnetic flux is the same when the conductor rotates and the flux is stationary or the flux rotates and the conductor is stationary. If both, conductor and flux, rotate in the same direction at the same speed, no electromotive force will be produced, if they rotate at the same speed but in opposite directions, the electromotive force induced would be twice as that which would be induced, if one of them was stationary. An electromotive force is not induced when a conductor is moved parallel to the lines of force, but only when it moves at an angle with these lines.

Any motion across the direction of the lines, however, will produce an electromotive force in the conductor. For this reason, the conductor is said to «cut» the lines of force. The actual electromotive force induced in the conductor depends upon the nature at which the flux is cut.

The electromotive force is the very force that moves the electrons from one point in an electric circuit towards another. In case this e. m. f. is direct, the current is direct. On the other hand, were the electromotive force alternating, the current would be alternating, too. The e. m. f. is measurable and it is the volt that is the unit used for measuring it. A current is unable to flow in a circuit consisting of metallic wires alone. A source of an e. m. f. should be provided as well. The source under consideration may be a cell or a battery, a generator or a photocell, etc.

In addition to the electromotive force and the potential difference reference should be made to another important factor that greatly influences electrical flow, namely, resistance. This resistance may be high or low depending on the type of circuit and the material employed. Glass and rubber offer a very high resistance and, hence, they are considered as good insulators. All substances do allow the passage of some current provided the potential difference is high enough.

Certain factors can greatly influence the resistance of an electric circuit. They are the size of the wire, its length, and type. In short, the thinner or longer the wire, the greater is the resistance offered.

VI. Give the English equivalents to the words below. Find in the text the sentences with these words and translate them:

Трение; электродвижущая сила; элемент; параллельное соединение; сопротивление; электромагнитная индукция; переменный ток; постоянное напряжение; фотоэлемент; определенные факторы; все вещества; разность потенциалов; сильно влияет; единица, используемая для измерения; движение проводника; магнитный поток; магнитное поле; электростатическое поле; в противоположном направлении; свободные электроны; химическая реакция; переменно действующая сила.

VII. Say whether these sentences are true or false:

1. Alternating force always exerts its effort in one direction.
2. Alternating force is produced by electromagnetic induction.
3. The electromotive force is induced by motion of a conductor.
4. Resistance is an important factor that greatly influences electrical flow.
5. The type of the material employed doesn’t influence the resistance.

VIII. Fill in the blanks with prepositions:

1. Chemical reaction, friction, heat and electromagnetic induction will cause electrons to move … one atom … another.

2. The direction … force depends … the direction in which the field is cut.

3. For this reason, the conductor is said to «cut» the lines … force.

4. This resistance may be high or low depending … the type … circuit and the material employed.

5. Certain factors can greatly influence the resistance … an electric circuit.

6. The e. m. f. is measurable and it is the volt that is the unit used … measuring it.

7. The actual electromotive force induced … the conductor depends … the nature at which the flux is cut.

8. A conductor may move … a stationary magnetic field … constant strength.

IX. Answer the questions:

1) What factors cause the motion of electrons from one atom to another?

2) When is the electromotive force developed?

3) When does an electrostatic field appear?

4) How is the electromotive force induced?

5) What unit is used for measuring the electromotive force?

6) What are the sources of electromotive force?

7) What is called “resistance”?

8) How do the types of circuit and material influence the resistance?

9) Name the factors that influence the resistance of an electric circuit.

X. Speak on the Electromotive force.

UNIT 7

Grammar: Emphatic Constructions.

I. Translate the following sentences and change them according to the model:

Model: The sun is an unlimited source of almost all kinds of energy. → *It is the sun that* is an unlimited source of almost all kinds of energy.

1. Electric energy is changed into heat in the electrical appliances.

2. An increase in temperature increases the molecular motion.

3. Ampere showed the difference between the current and the charges.
4. Electricity is produced at steam power plants.
5. The heating effect of the current is the subject of this article.
6. Overheating in transmission lines is most undesirable.
7. Work produces heat directly or indirectly.
8. The heat engine turns heat into work.

II. Guess the meaning of the following international words:

Transformation, temperature, chemical, magnetic, special, practical, motor, electrode.

III. Practice the pronunciation of the following words. Repeat them after the speaker:

Measure, important, manifest, chemical, production, condition, increase, perhaps, owing, generally, thinner, wire, negligible, decrease, efficiency, industrial, requirement, irreplaceable, widely, transfer, electrode, liquid.

IV. Learn the following words and word-combinations:

to detect	обнаруживать; замечать
to accompany	сопровождать
to be manifested	проявляться
perhaps	возможно, может быть
familiar	знакомый
to occur	происходить, случаться
owing to	вследствие
continual	непрерывный
transformation	преобразование, превращение
incandescent filament lamp	лампа накаливания
to carry	нести; проводить; проходить
negligible	незначительный, пренебрежимо малый
waste	потеря, пустая трата
heat loss	тепловые потери
efficiency	эффективность; производительность
practical importance	практическая значимость
appliance	прибор
to meet requirements	отвечать требованиям
irreplaceable	незаменимый
to serve mankind	служить человечеству
although	хотя

to deal with	иметь дело с
to transfer	перемещать, переносить
to comprise	включать (в себя)
above mentioned	вышеупомянутый

V. Read and translate text 7:

TEXT 7
EFFECTS PRODUCED BY CURRENT

The current flow is detected and measured by any of the effects that it produces. There are three important effects accompanying the motion of electric charges: the heating, the magnetic, and chemical effects, the latter is manifested under special conditions.

The production of heat is perhaps the most familiar among the principal effects of an electric current. The heating effect of the current is found to occur in the electric circuit itself. It is detected owing to an increase in the temperature of the circuit. This effect represents a continual transformation of electric energy into heat. For instance, the current which flows through the filament of an incandescent lamp heats that filament to a high temperature.

The heat produced per second depends both upon the resistance of the conductor and upon the amount of current carried through it. The thinner the wire is, the greater the developed heat is. On the contrary, the larger the wire is, the more negligible the heat produced is. Heat is greatly desirable at times but at other times it represents a waste of useful energy. It is this waste that is generally called "heat loss" for it serves no useful purposes and decreases efficiency.

The heat developed in the electric circuit is of great practical importance for heating, lighting and other purposes. Owing to it people are provided with a large number of appliances, such as: electric lamps that light our homes, streets and factories, electrical heaters that are widely used to meet industrial requirements, and a hundred and one other necessary and irreplaceable things which have been serving mankind for so many years.

The electric current can manifest itself in some other way. It is the motion of the electric charges that produces the magnetic forces. A conductor of any kind carrying an electric current, a magnetic field is set up about that conductor. This effect exists always whenever an electric current flows, although in many cases it is so weak that one neglects it in dealing with the circuit. An electric charge at rest does not manifest any magnetic effect. The use of such a machine as the electric motor has become possible owing to the electromagnetic effect.

The last effect to be considered is the chemical one. The chemical effect is known to occur when an electric current flows through a liquid. Thanks to it a metal can be transferred from one part of the liquid to another. It may also effect chemical changes in the part of the circuit comprising the liquid and the two electrodes which are found in this liquid. Any of the above mentioned effects may be used for detecting and measuring current.

VI. Insert words and expressions:

1. The current flow is (выявляется и измеряется) by any of the effects that it produces.
2. There are three important effects accompanying the motion of (электрическиех зарядов).
3. The current which flows through the (нить накала лампы накаливания) heats that filament to a high temperature.
4. Heat represents (потерю полезной энергии) at times.
5. Electric lamps (освещают) our homes, streets and factories.
6. The electric current can (проявлять) magnetic effect.

VII. Choose the correct translation:

A. *The heating effect of the current is found to occur in the electric circuit itself.*

1) Установлено, что тепловой эффект электрического тока обнаруживается в самой электрической цепи.

2) Тепловой эффект электрического тока может появляться в самой электрической цепи.

3) Установлено, что тепловой эффект электрического тока должен обнаруживаться в самой электрической цепи.

B. *Когда в любом проводнике появляется электрический ток, вокруг него возникает магнитное поле.*

1) A conductor of any kind carrying an electric current, a magnetic field was set up about that conductor.

2) A conductor of any kind have been carrying an electric current, a magnetic field is set up about that conductor.

3) A conductor of any kind carrying an electric current, a magnetic field is set up about that conductor.

C. *Последний эффект, который необходимо рассмотреть – химический эффект.*

1) The last effect is considered to be the chemical one.

2) The last effect to be considered is the chemical one.

3) The last effect would be considered the chemical one.

D. *Известно, что химический эффект возникает, когда электрический ток проходит через жидкость.*

1) The chemical effect is known to occur when an electric current flows through a liquid.

2) The chemical effect is famous to occur when an electric current flows through a liquid.

3) The chemical effect may be known to occur when an electric current flows through a liquid.

E. *Именно движение электрических зарядов порождает магнитные силы.*

1) The motion of the electric charges produces the magnetic forces.

2) It is the motion of the electric charges that produces the magnetic forces.

3) The motion of the electric charges is certain to produce the magnetic forces.

VIII. Answer the questions:

1. What effects does the current flow produce?
2. How is the heating effect detected?
3. What does the heat produced depend upon?
4. What is called “heat loss”?
5. How is the magnetic effect set up?
6. What is the main condition of the magnetic effect existence?
7. When does the chemical effect occur?

IX. Fill in the chart:

Electric current effect	Practical application
1. heating effect	…..
2. …..	use of electric
3. chemical	motor
effect	…..

X. Speak about the principal effects of the electric current, using the text and chart above.

UNIT 8

Grammar: The Complex Sentences.

I. Translate the following sentences paying attention to the subordinate clauses:

1. A current-carrying coil of wire which is long in comparison with its diameter is called a solenoid.

2. The experiments Oersted carried on attracted Ampere's attention.

3. The electric circuit can be closed, if necessary.

4. It was Ampere who showed the difference between the current and the static charges.

5. That the unit of current is named after the famous French physicist Ampere is probably known to you.

6. When placing an iron core within a solenoid, we obtain an electromagnet.

7. The phenomenon Oersted pointed at interested Ampere greatly.

II. Guess the meaning of the following international words:

Magnetic, compass, parallel, effect, magnet, magnetism, solenoid, electromagnet, process, electricity, class, magneto-motive, Ampere.

III. Practice the pronunciation of the following words. Repeat them after the speaker:

Cell, effect, source, voltaic, establish, deflect, brought, adjust, chance, right, angle, towards, reverse, highly, throughout, straight, amount, magneto-motive, double, other, winding, electromagnet, controllable, through, behaviour, turn.

IV. Learn the following words and word-combinations:

to add	прибавлять, вкладывать
at right angles	под прямым углом
to adjust	регулировать; устанавливать
as soon as	как только
coil	катушка
constant	постоянный
core	сердечник
to establish	устанавливать, основывать
to find out	выяснять; понимать
needle	стрелка
to reverse	изменять на обратное, реверсировать
to repel	отталкивать
rule	правило
straight	прямой
turn	виток
to turn on	включать
to deflect	отклоняться
solenoid	соленоид; соленоидный

V. Read and translate text 8:

TEXT 8
MAGNETIC EFFECT OF AN ELECTRIC CURRENT

The invention of the voltaic cell in 1800 gave electrical experimenters a source of a constant flow of current. Seven years later the Danish scientist and experimenter Oersted, decided to establish the relation between a flow of current and a magnetic needle. It took him at least 13 years more to find out that a compass needle is deflected when brought near a wire through which the electric current flows. At last, during a lecture he adjusted, by chance, the wire parallel to the needle. Then, both he and his class saw that when the current was turned on, the needle deflected almost at right angles towards the conductor. As soon as the direction of the current was reversed, the direction the needle pointed in was reversed too. Oersted also pointed out that provided the wire were adjusted below the needle, the deflection was reversed.

The above-mentioned phenomenon highly interested Ampere who repeated the experiment and added a number of valuable observations and statements. He began his research under the influence of Oersted's discovery and carried it on throughout the rest of his life.

Everyone knows Ampere's rule thanks to which the direction of the magnetic effect of the current can always be found. Ampere established and proved that magnetic effects could be produced without any magnets by means of electricity alone. He turned his attention to the behaviour of the electric current in a single straight conductor and in a conductor that is formed into a coil, i.e. a solenoid.

When a wire conducting a current is formed into a coil of several turns, the amount of magnetism is greatly increased.

It is not difficult to understand that the greater the number of turns of wire, the greater is the m.m.f. (that is the magneto-motive force) produced within the coil by any constant amount of current flowing through it. In addition, when doubling the current, we double the magnetism generated in the coil.

A solenoid has two poles which attract and repel the poles of other magnets. While suspended, it takes up a north and a south direction exactly like the compass needle. A core of iron becomes strongly magnetized if placed within the solenoid while the current is flowing.

VI. Translate the following words and word-combinations and use them in the sentences of your own:

Electrical experimenters, scientist, to establish the relation, magnetic needle, wire, adjusted, parallel to the needle, almost at right angles, the direction of the current, deflection, the above-mentioned phenomenon, a number of valuable observations, research, throughout the rest of his life, magnetic effect, the behaviour of the electric current, several turns, amount, to understand, constant amount of current.

VII. Give English equivalents to the words and expressions given below:

Соленоид, притягивают и отталкивают, как стрелка компаса, железный сердечник, правило, ток, электричество, обратил внимание, в проводнике, катушка, вышеупомянутый, как только, датский ученый, источник, благодаря которому, установил и доказал, магнитодвижущая сила.

VIII. Arrange the sentences in a logical order according to the text:

1. Ampere established and proved that magnetic effects could be produced without any magnets by means of electricity alone.
2. It is not difficult to understand that the greater the number of turns of wire, the greater is the m.m.f. (that is the magneto-motive force) produced within the coil.
3. Everyone knows Ampere's rule thanks to which the direction of the magnetic effect of the current can always be found.
4. Ampere established and proved that magnetic effects could be produced without any magnets by means of electricity alone.

IX. Fill in the blanks with the appropriate words and phrases:

Phenomenon, magnetism, current, needle, magnetic effect, solenoid, repel.

1. As soon as the direction of the _____ was reversed, the direction the _____ pointed in was reversed too.
2. The above-mentioned _____ highly interested Ampere.
3. Everyone knows Ampere's rule thanks to which the direction of the _____ of the current can always be found.
4. When doubling the current, we double the _____ generated in the coil.
5. A _____ has two poles which attract and _____ the poles of other magnets.

X. Answer the following questions:

1. When was the voltaic cell invented?
2. What did Oersted decide to establish?
3. What did he find out?
4. When did the needle deflect?
5. Who repeated Oersted's experiments?
6. Do you know Ampere's rule?
7. What did Ampere establish and prove?
8. When is magnetism greatly increased?

XI. Compare:

1) potential energy and kinetic energy;
2) a series circuit and a parallel circuit;
3) a conductor and an insulator;
4) the magnetic effect of an electric current and the heating effect of an electric current.

XII. Give a short summary of Text 8.

UNIT 9

Grammar: The Complex Sentences (Revision)

I. Translate the following sentences paying attention to the subordinate clauses:

1. The plants which supply electricity over long distances are equipped with large alternators.
2. When asked about the dynamo, the student mentioned its inventor.
3. The experiments Oersted made attracted Ampere's attention.
4. The armature and the electromagnet are the principal parts the generator consists of.
5. That the electromagnets are controllable is a very important thing, since they can attract and repel magnetic materials.
6. The alternator is a machine that generates a. c.
7. A bar of iron becomes strongly magnetized if inserted into the solenoid while the current is flowing.

II. Guess the meaning of the following international words:

Generator, machine, battery, electricity, energy, element, commutator, automobile, special.

III. Practice the pronunciation of the following words. Repeat them after the speaker:

Powerful, efficient, scale, per cent, alternator, continuously, outside, mechanical, turbine, provide, construction, consist, stationary, yoke, flux, rectify, polarity, extensive.

IV. Learn the following words and word-combinations:

alternator	генератор переменного тока
dynamo	динамо
invented	изобретенный
to supply	снабжать, подавать, поставлять
on a large scale	в большом масштабе
to produce	производить
former	первый из упомянутых
latter	последний из упомянутых
continuously	непрерывно; постоянно
outside source	внешний источник
mechanical energy	механическая энергия
steam engine	паровой поршневой двигатель
steam turbine	паровая турбина
to convert	преобразовывать, превращать
to be alike	быть подобным
rotating	вращающийся
stationary	неподвижный
yoke	ярмо
frame	рама; корпус
field structure	индукторная станина
armature	якорь
commutator	коммутатор
shaft	вал
core	сердечник
winding	обмотка
brush	щетка
to conduct	проводить
external circuit	внешняя цепь
essential	существенный; основной; необходимый
to rectify	исправлять; выпрямлять
electrolytic	электролитический
electroplating	гальванопокрытие
welding	сварка

extensive use	широкое применение

V. Read and translate text 9:

TEXT 9
GENERATORS

The powerful, highly efficient generators and alternators that are in use today operate on the same principle as the dynamo invented by the great English scientist Faraday in 1831.

Dynamo-electric machines are used to supply light, heat and power on a large scale. These are the machines that produce more than 99.99 per cent of all the world's electric power.

There are two types of dynamos – the generator and the alternator. The former supplies d. c. which is similar to the current from a battery and the latter provides a. c. To generate electricity both of them must be continuously provided with energy from some outside source of mechanical energy such as steam engines, steam turbines or water turbines.

A generator is an electric machine, which converts mechanical energy into electric energy. There are direct-current (d. c.) generators and alternating-current (a. c.) generators. Their construction is much alike. A d. c. generator consists of stationary and rotating elements. The stationary elements are: the yoke or the frame and the field structure. The yoke forms the closed circuit for the magnetic flux. The function of the magnetic structure is to produce the magnetic field.

The rotating elements are: true armature and the commutator. They are on the same shaft. The armature consists of the core and the winding. The winding is connected to the commutator. With the help of the brushes on the commutator that conduct the electric current to the line the winding is connected to the external circuit. The stationary element of an a. c. generator is called a stator. The rotating element is called a rotor.

The essential difference between a d. c. generator and a. c. generator is that the former has a commutator by means of which the generated e. m. f. is made continuous, i. e. the commutator mechanically rectifies the alternating e. m. f. so that it is always of the same polarity.

D. c. generators are used for electrolytic processes such as electroplating. Large d. c. generators are employed in such manufacturing processes as steel making. The d. c. generator of small capacities is used for various special purposes such as arc welding, automobile generators, train lighting systems, etc. It also finds rather extensive use in connection with communication systems.

VI. Give the Russian equivalents to the following English words and word combinations:

Generator; alternator; steam engine; steam turbine; water turbine; armature; rotor; stationary; commutator; stator; yoke; brushes; core; frame; winding; manufacturing processes; special purposes; welding; train lighting systems; rather extensive use; essential difference; conduct the electric current; mechanical energy; dynamo-electric machines; highly-efficient generators; on the same principle.

VII. Fill in the blanks:

1. A generator is an electric machine, which _____ mechanical energy into electrical energy.
2. A direct-current generator consists of _____.
3. The rotating elements are: true armature and the _____.
4. The d.c. generator is used for various purposes such as _____.

VIII. Form five sentences combining suitable parts of the sentences given in columns I and II:

1. The electric circuit	1. is a temporary magnet provided by electricity.
2. The e. m. f.	2. is an electrical appliance used in daily life.
3. The heat engine	3. is a path to be followed by the current from the source and back to the source.
4. The iron	4. is the force that makes electrons move along a conductor.
5. The electromagnet	5. is a device by means of which heat is turned into work.

IX. Work out the plan of the text.

X. Speak on the following points:

1. The construction of a generator.
2. The direct current generators and their industrial application.

UNIT 10

Word-building

I. Translate the following words paying attention to the suffixes and prefixes:

Countless, distance, education, impossible, sparkles, cylindrical, operation, observation, unusual, invaluable, possibility, useful, discovery, magnetic, structural, transformation, protection, development, requirement, molecular, application.

II. Practice the pronunciation of the following words. Repeat them after the speaker:

Consist, stationary, usually, magnetic, rotating, armature, flux, commutating, interposed, sparkles, impossible, without, operation, brushes, commutator, laminated, core, coil, cylindrical, comprising, ensure, gear, means, bedplate, portion, path, yoke, circuit, winding, attached, frame, know, inserted, bearings, shields, machine.

III. Learn the following words and word-combinations:

d. c. = direct current	постоянный ток
magnetic flux	магнитный поток
armature	якорь
air-gap	воздушный зазор
pole	полюс
commutating poles	вспомогательный полюс; добавочный полюс
interposed	вставленный; расположенный
to create	создавать
frame	рама; корпус
sparkless	безыскровый
brush	щетка
laminated core	пластинчатый сердечник; слоистый сердечник
pole shoe	полюсный наконечник
field coil	катушка возбуждения; обмотка возбуждения
slotted	оснащенный пазами
slot	прорезь, щель, паз
inserted	вставленный
brush gear	щеточное устройство

to be bolted	прикрепляться болтами
bedplate	станина; основание; опорная плита
ring-shaped portion	кольцеобразная часть
yoke	ярмо
pole core	магнитный сердечник
coil	катушка

IV. Read and translate text 10:

TEXT 10
MAIN STRUCTURAL ELEMENTS OF A D. C. MACHINE

A direct-current machine consists of two main parts, a stationary part, usually called the stator, designed mainly for producing a magnetic flux, and a rotating part, called the armature or the rotor. The stationary and rotating parts should be separated from each other by an air-gap. The stationary part of a d.c. machine consists of main poles, designed to create the main magnetic flux; commutating poles interposed between the main poles; and a frame. It should be noted here that sparkless operation of the machine would be impossible without the commutating poles. Thus, they should ensure sparkless operation of the brushes at the commutator.

The main pole consists of a laminated core the end of which facing the armature carries a pole shoe and a field coil through which direct current passes. The armature is a cylindrical body rotating in the space between the poles and comprising a slotted armature core, a winding inserted in the armature slots, a commutator, and a brush gear.

The frame is the stationary part of the machine to which are fixed the main and commutating poles and by means of which the machine is bolted to its bedplate. The ring-shaped portion which serves as the path for the main and commutating pole fluxes is called the yoke.

Of these main structural elements of the machine the yoke, the pole cores, the armature core and the air-gap between the armature core and the pole core are known to form the magnetic circuit while the pole coils, the armature windings, the commutator and brushes should form the electric circuit of the machine.

V. Translate the following phrases, using the given variants of translation:

to consist – состоять : to consist of a stationary part and a rotating part;

separated – отдельный, изолированный: the stationary and rotating parts should be separated from each other by an air gap;

to serve – служить в качестве чего-либо: the ringshaped portion or yoke serves as a path for the main and commutating pole fluxes.

VI. Find in the text the English equivalents to the words and word-combinations given below:

Неподвижная часть, магнитный поток, вращающаяся часть, якорь, воздушным зазором, вспомогательные полюса, щетки коммутатора, пластинчатый сердечник, полюсный наконечник и катушка возбуждения, вращающийся в пространстве между полюсами, оснащенный пазами сердечник якоря, щеточное устройство, пазы якоря, крепится болтами к основанию, кольцеобразный, ярмо, электрическая цепь.

VII. Join the beginnings and the ends::

Beginnings	Ends
The stationary parts of a d. c. machine are	a laminated core the end of which carries a pole shoe and a field coil.
The two main parts of a direct current machine are	main poles, commutating poles and a frame.
The main pole consists of	a stationary part or stator and a rotating part, called the armature or the rotor.

VIII. Arrange synonyms in pairs and memorize them:

a) to consist of; to be separated from; to create; to be interposed between; to pass; to rotate;

b) to be divided with; to produce; to introduce into; to permeate; to roll; to revolve; to comprise.

IX. Write out the names of the machine parts and describe their operational characteristics.

UNIT 11

Word-building (Revision)

I. a) Form verbs using the prefix *over-:*

Load, throw, grow, come, estimate, power, take, heat.

b) Form verbs using the suffix *–ize:*

Civil, revolution, equal, neutral, modern.

c) Form nouns using the suffixes *–or, -er:*

Work, translate, act, speak, steam, boil, conduct, engine, fact, heat.

II. Guess the meaning of the following international words:

Machine, electric, magnetic, special, synchronous, polarity, generator, mechanical, energy, motor, structure, vertical, horizontal, type, turbine, diesel, element.

III. Practice the pronunciation of the following words. Repeat them after the speaker:

Alternator, motion, stationary, armature, synchronous, excited, conductor, lighting, mostly, reversible, source, mechanical, magnetized, winding, advantages, relatively, exceeding, continuously, insulated, desirable, common, further, suitable, such.

IV. Learn the following words and word-combinations:

relative motion	относительное движение
synchronous alternator	синхронный генератор переменного тока
to excite	возбуждать
to pass	проходить
polarity	полярность
revolving armature	вращающийся якорь
reversible	реверсивный
to be driven	приводиться в движение
to deliver	поставлять, доставлять; предоставлять
source	источник
field structure	индукторная станина
advantage	преимущество
ring	кольцо
relatively	относительно
to exceed	превышать
insulation	изоляция
slip ring	контактное кольцо
to require	требовать
lead	проводник
switchboard	распределительный щит
bare conductor	неизолированный проводник; оголенный провод
to be divided	подразделяться
water wheel	водяное колесо

drive	привод
steam turbine	паровая турбина

V. Read and translate text 11:

TEXT 11
THE ALTERNATOR

The alternator is an electric machine for generating an alternating current by a relative motion of conductors and a magnetic field. The machine usually has a rotating field and a stationary armature. In a synchronous alternator the magnetic field is excited with a direct current. The direction of an induced e.m.f. is reversed each time when a conductor passes from a pole of one polarity to a pole at another polarity. Most machines of this type are used for lighting and power, but there are alternators with a revolving armature and a stationary field. They are used in small sizes mostly for special purposes.

Any electrical machine is reversible. When a machine is driven by a source of mechanical power, it works as a generator and delivers electrical power. If it is connected to a source of electrical power, it produces mechanical energy, and operates as a motor. The alternator may also be operated as a motor.

The a. c. generator, or alternator, does not differ in principle from the d. c. generator. The alternator consists of a field structure and an armature. The field structure is magnetized by a field winding carrying a direct current. In alternators the field is usually the rotating element and the armature is stationary. This construction has a number of advantages. Only two rings are needed with a rotating field. These rings carry only a relatively light field current, at a voltage generally of 125, and seldom exceeding 250. The insulation of such rings is not difficult. A stationary armature requires no slip rings. The leads from the armature can be continuously insulated from the armature winding to the switchboard, leaving no bare conductor. The alternator with a rotating field may be further divided into the vertical and the horizontal types.

The vertical type is usually applied for large water-wheel generators where it is desirable to mount the water turbine below the generator. The more common horizontal type is used with diesel and steam engine drive. A low-speed alternator of this type is suitable for a diesel engine drive, a high speed alternator is suitable for a steam turbine drive.

VI. Form nouns, denoting devices with the help of the suffix – or. Translate them:

To alternate, to commute, to conduct, to generate.

VII. Read the text and write out the key words, characterizing the alternator.

VIII. Give English equivalents to the words and expressions given below:

Переменный ток, магнитное поле, постоянный ток, неподвижный якорь, неподвижное поле, источник электроэнергии, как двигатель, генератор постоянного тока, генератор переменного тока, индукторная станина, преимущества, кольца, напряжение, изоляция таких колец, распределительный щит.

IX. Translate the following word-combinations paying attention to the Participle II:

The leads from the armature can be continuously insulated from….., the vertical type of alternator applied for large water-wheel generator; alternators with a revoking armature and a stationary field used in small sizes mostly for special purposes; a machine driven by a source of mechanical power; the direction of an induced e. m. f. …

X. State 5 questions to the text.

X. Points for discussion:

1) The structure of the alternator.
2) The application of the alternator.

UNIT 12

Grammar: Impersonal Constructions

I. Translate the following sentences paying attention to the Impersonal Constructions:

1. It is easy to understand Ampere's rule.
2. It was desirable to compare the results obtained.
3. One can say that there are unlimited sources of energy.
4. There are so many atoms in a water drop that if one could count one atom a second, day and night, it would take one hundred milliard years.
5. They employ different methods to obtain better results.

6. They produce modern machines at our plant.

7. It is supposed that people learn to protect their houses from thunderstorms.

II. Give all the meanings of the following words consulting a dictionary:

Scale, generation, armature, revolution, commutator, amplitude, iron, needle, second.

III. Practice the pronunciation of the following words:

Transmission, ago, away, comparatively, achieve, quite, kilometer, then, suitable, locality, whenever, undesirable, process, equipment, growth, while, interchangeable, circle, consumer, expensive, distribution, successfully.

IV. Learn the following words and word-combinations:

to amount to	доходить до
at will	по желанию
considerable	значительный
distribution	распределение
to emit	излучать, выделять, испускать
equipment	оборудование
expensive	дорогой
growth	рост, увеличение
range	диапазон
to reduce	понижать, уменьшать
to result in	приводить к; заканчиваться
successfully	успешно
transmission	передача
tension	напряжение
wave	волна
to require	требовать
heating losses	тепловые потери

V. Read and translate text 12.

TEXT 12
POWER TRANSMISSION

They say that about a hundred years ago, power was never carried far away from its source. Later on, the range of transmission was expanded to a

few miles. And now, in a comparatively short period of time, electrical engineering has achieved so much that it is quite possible, at will, to convert mechanical energy into electrical energy and transmit the latter over hundreds of kilometers and more in any direction required. Then in a suitable locality the electric energy can be reconverted into mechanical energy whenever it is desirable. It is not difficult to understand that the above process has been made possible owing to generators, transformers and motors as well as to other necessary electrical equipment. In this connection one cannot but mention the growth of electric power generation in this country. The longest transmission line in pre-revolutionary Russia was that connecting the Klasson power-station with Moscow. It is said to have been 70 km long, while the present Volgograd–Moscow high-tension transmission line is over 1000 kilometres long. (The reader is asked to note that the English terms "high-tension" and "high-voltage" are interchangeable.)

It goes without saying that as soon as the electric energy is produced at the power-station, it is to be transmitted over wires to the substation and then to the consumer. However, the longer the wire, the greater is its resistance to current flow. On the other hand, the higher the offered resistance, the greater are the heating losses in electric wires. One can reduce these undesirable losses in two ways, namely, one can reduce either the resistance or the current. It is easy for us to see how we can reduce resistance: it is necessary to make use of a better conducting material and as thick wires as possible. However, such wires are calculated to require too much material and, hence, they will be too expensive. Can the current be reduced? Yes, it is quite possible to reduce the current in the transmission system by employing transformers. In effect, the waste of useful energy has been greatly decreased due to high-voltage lines. It is well known that high voltage means low current, low current in its turn results in reduced heating losses in electrical wires. It is dangerous, however, to use power at very high voltages for anything but transmission and distribution. For that reason, the voltage is always reduced again before the power is made use of.

VI. Translate the following word-combinations and use them in the sentences of your own:

As soon as, at the power-station, to be transmitted over wires, its resistance to current flow, the heating losses in electric wires, undesirable losses, reduce resistance, conducting material, as thick wires as possible, in the transmission system, the waste of useful energy, high voltage, to use power, far away from its source, the range of transmission, in a comparatively short period of time, electrical engineering, mechanical energy, electrical energy, the above process, owing to generators, the longest transmission line, high-tension, high-voltage, mention the growth.

VII. For the terms given in A find the Russian equivalents in B:

A. Power plant, power supply, power generation, power source, power transmission, power unit, power installation, power substation, power transformer, power factor, power engineering, power capacity, power distribution, power loss.

B. Выработка электроэнергии, потеря энергии, электроподстанция, силовой трансформатор, коэффициент мощности, производительность, источник энергии, распределение энергии, электростанция, передача электроэнергии, силовая установка, источник питания, энергетика, энергоблок.

VIII. Complete the following sentences according to the text:

1. The longest transmission line in pre-revolutionary Russia was … .
2. However, the longer the wire, the greater is … .
3. The higher the offered resistance, the greater are … .
4. The waste of useful energy has been greatly decreased due to … .
5. It is well known that high voltage means … .

IX. Translate the sentences into English:

1. Чем сильнее магнитное поле, тем больше ток.
2. Чем больше ток, текущий по проводнику, тем выше температура проводника.
3. Чем меньше труба, тем меньше воды проходит через нее.
4. Чем больше скорость движения между магнитным полем и проводниками, тем больше ток.
5. Чем короче проводник, тем меньше сопротивление проходящему току.

X. Answer the following questions:

1. What made it possible to transmit electric energy over hundreds of kilometers?
2. Can electric energy be reconverted into mechanical energy?
3. What are transformers used for?
4. What do you know about the longest transmission line in pre-revolutionary Russia?
5. How long is the Volgograd – Moscow high-tension transmission line?
6. In what way can the heating losses be reduced in transmission lines?
7. How can resistance be reduced in electric wires?
8. Why are high-voltage lines used for power transmission?

XI. Retell text 12.

UNIT 13

Grammar: The Passive Voice

I. Translate the sentences paying attention to the Passive Voice:

1. The students were asked to carry on the experiment.
2. You will be given two new magazines.
3. I was told to translate the instructions.
4. The questions were answered at once.
5. The theory was followed by a number of experiments.

II. Practice the pronunciation of the following words:

Advantage, relatively, device, variety, application, voltage, increasing, decreasing, requirement, equipment, through, induction, primary, secondary, source, winding, coil, supply, thus, circuited, external, flux, core, insulation, improve.

III. Guess the meaning of the international words given below:

Transformer, electric, function, system, elementary, construction, electromagnetic induction, principle, type.

IV. Learn the following words and word-combinations:

advantage	преимущество
ease	легкость, простота
by means of	посредством, при помощи
relatively	относительно
great variety	большое разнообразие
in each case	в каждом случае
increasing	увеличение
decreasing	уменьшение
to meet requirements	отвечать требованиям
equipment	оборудование
moving parts	движущиеся части
through	через
electromagnetic induction	электромагнитная индукция
principle	основной
core	сердечник
winding	обмотка
insulated	изолированный
primary coil	первичная обмотка
secondary coil	вторичная обмотка

magnetic flux	магнитный поток
external	внешний
to tend to	иметь тенденцию, склоняться

V. Read and translate text 13:

TEXT 13
TRANSFORMERS

One of the great advantages in the use of the alternating current is the ease with which the voltage may be changed by means of a relatively simple device known as a transformer. Although there are many different types of transformers and a great variety of different applications, the principles of action are the same in each case.

The transformer is a device for changing the electric current from one voltage to another. It is used for increasing or decreasing voltage. So the function of a transformer is to change voltage and current of an alternating system to meet requirements of the equipment used. It is known to be simple in construction and it involves no moving parts. Transformers change voltage through electromagnetic induction.

The principle parts of a transformer are: an iron core and, usually, two coils of insulated windings. One of them is called primary, another is called the secondary. The primary coil is connected to the source of power. The secondary coil is connected to the load. Thus, the primary is the coil to which power is supplied. The secondary is the coil from which power is taken. In scientific terms to produce an alternating magnetic flux in the iron core an alternating current must be passed through the primary coil. This flux is considered to induce electromotive force in both primary and secondary coils. The secondary coil is open – circuited. Current flows in the secondary coil when the latter is connected to the external circuit or load. The flow of current in the secondary coil tends to reduce the flux in the core. Transformers are placed inside a steel tank usually with oil to improve the insulation and also to cool the device.

VI. Translate into Russian the words and expressions from the text:

1) advantage; 2) voltage; 3) relatively simple; 4) application; 5) increase; 6) to decrease; 7) to meet requirements; 8) moving parts; 9) iron core; 10) insulated windings; 11) load; 12) electromotive force; 13) to induce.

VII. Give the English equivalents to the words below:

1) переменный ток; 2) прибор; 3) принцип работы (действия); 4) электромагнитная индукция; 5) катушка; 6) первичная (вторичная) обмотка; 7) источник питания; 8) магнитный поток; 9) стальной контейнер; 10) остужать.

VIII. State questions to the underlined words:

1. Voltage may be changed by a transformer. (General Question).
2. Transformers change voltage through electromagnetic induction. (How …)
3. Transformer is used for increasing or decreasing voltage. (What …)
4. The primary winding is connected to the source of power. (…or…)
5. Transformers are placed inside a steel tank. (Tail question)

IX. Answer the questions:

1. What kind of device is a transformer?
2. What are the functions of a transformer?
3. What are the principle parts of a transformer?
4. What is the primary coil connected to?
5. What is the secondary coil connected to?
6. What are the principles of action of a transformer?
7. Where are transformers usually placed?

X. Topics for discussion:

1) Transformer as an electric device.
2) Main parts and principles of a transformer action.

UNIT 14

Grammar: the Subjective Infinitive Construction. The Passive Voice (Revision)

I. Translate the following sentences paying attention to the Subjective Infinitive Construction and the Passive Voice:

1. Local transformers are expected to decrease the 2,300 volts to lower voltages.
2. All radio sets are known to use two or more kinds of transformers.
3. A simple transformer is known to have no moving parts.
4. The students were asked a lot of questions.
5. You were given many facts illustrating the wide use of transformers and their great importance.

II. Guess the meaning of the following international words:

To classify; method; phase; instrument; system; process; radio; television.

III. Practice the pronunciation of the following words:

Purpose, output, input, turn, primary, fewer, surround, equivalent, mechanical, potential, installed, value, negligible, quantity, power, without, secondary, voltage.

IV. Learn the following words and word-combinations:

purpose	цель; назначение
step-up transformer	повышающий трансформатор
step-down transformer	понижающий трансформатор
output voltage	выходное напряжение
input voltage	входное напряжение
the number of turns	количество витков
secondary winding	вторичная обмотка
primary winding	первичная обмотка
core-type transformer	стержневой трансформатор
shell-type transformer	броневой трансформатор
to surround	окружать
air-cooled transformer	трансформатор с воздушным охлаждением
water-cooled transformer	трансформатор с водяным охлаждением
single-phase	однофазный, монофазный
poly-phase	полифазный
instrument transformer	измерительный трансформатор
proportionate	пропорциональный
in conjunction with	вместе с
meter	измеритель; измерительный прибор
current transformer	трансформатор тока
voltage transformer (=potential transformer)	трансформатор напряжения
transformation	преобразование; превращение
negligible quantity	незначительное количество

V. Read and translate text 14.

TEXT 14
TYPES OF TRANSFORMERS

There are different types of transformers. By the purpose they are classified into step-up transformers and step-down transformers. In a step-up transformer the output voltage is larger than the input voltage, because the number of turns on the secondary winding is greater than that of the primary. In a step-down transformer the output voltage is less than input voltage as the number of turns on the secondary is fewer than that on the primary.

By the construction transformers are classified into core-type and shell-type transformers. In the core-type transformers the primary and the secondary coils surround the core. In the shell type transformers the iron core surrounds the coils. Electrically they are equivalent. The difference is in the mechanical construction.

By the methods of cooling transformers are classified into air – cooled, oil – cooled and water – cooled transformers.

By the number of phases transformers are divided into single – phase and poly-phase transformers.

Instrument transformers are of two types, current and potential.

A current transformer is an instrument transformer used for the transformation of a current at a high voltage into proportionate current at a low voltage. Current transformers are used in conjunction with a. c. meters or instruments where the current to be measured must be of low value. They are also used where high – voltage current has to be metered. A voltage transformer, which is also called a potential transformer, may be defined as an instrument transformer for the transformation of voltage from one value to another. This transformer is usually of a step – down type because it is used when a meter is installed for use on a high – voltage system.

Transformers operate equally well to increase the voltage and to reduce it. The above process needs a negligible quantity of power.

Transformers are widely used in our everyday life. All radio – sets and all television sets are known to use two or more kinds of transformers. These are familiar examples showing that electronic equipment cannot do without transformers.

VI. Give the English equivalents to the words given below:

Цель; повышающий / понижающий трансформатор; выходящее / входящее напряжение; число витков; механическое устройство; монофазные / полифазные трансформаторы; высокое / низкое напряжение; определять; работать; незначительное количество; трансформатор с водяным охлаждением; измерительный трансформатор; броневой трансформатор; преобразование.

VII. Translate into Russian the words and expression from the text and use them in the sentences of your own:

Core-type / shell-type transformers; air-cooled / oil – cooled / water – cooled transformers; current / potential transformers; in conjunction with smth.; to reduce; electronic equipment; high voltage; potential transformer; transformation of voltage; step-down transformer; step-up transformer.

VIII. Complete the sentences using the text:

1. By the purpose transformers are …
2. By the construction transformers are …
3. By the methods of cooling transformers are …
4. By the number of phases transformers are …
5. Transformers operate equally well…
6. Process of voltage changing needs…
7. Familiar examples of transformer applications are …

IX. Answer the questions:

1. What voltage is larger in a step-up transformer and why?
2. What voltage is less in a step – down transformer and why?
3. What is the construction of a core – type transformer?
4. What is the construction of a shell – type transformer?
5. What are the two types of instrument transformers?
6. What are current transformers used for?
7. What are potential transformers used for?

X. Topics for discussion:

1) Types of transformers.
2) Use of transformers in everyday life.

UNIT 15

Grammar revision (Unit 1 – 14)

I. Translate the following sentences:

1. After studying the properties of solids we shall deal with the properties of liquids.
2. The problem to be dealt with will require much time.
3. Thermodynamics is the subject the scientists will deal with in the next article.
4. Before dealing with this new device one should study all its parts.

5. The next problem the professor dealt with was connected with the application of semiconductor laser.

6. The work the students deal with is difficult but interesting.

7. Under ordinary conditions the only current one could deal with is a. c.

II. Guess the meaning of the international words:

Instrument; fact; abbreviation; voltmeter; ohm; ohm-meter; wattmeter; galvanometer; shunt.

III. Practice the pronunciation of the following words:

Measure, values, difference, across, resistance, thousandth, micro, series, parallel, prevent, calibrated, armature, coil, tire, additional, resulting, permanent, fundamentally.

IV. Learn the following words and word-combinations:

to measure	измерять
value	величина
meter	измерительный прибор
ammeter	амперметр
voltmeter	вольтметр
potential difference	разность потенциалов
to be determined	определяться
resistance	сопротивление
unit	единица
wattmeter	ваттметр
scale	шкала
to calibrate	градуировать
whenever	всякий раз, когда; когда
in series	последовательно
in parallel	параллельно
to prevent	предотвращать
shunt	шунт
deflecting torque	отклоняющий момент
hot wire	провод под напряжением
moving iron instrument	электромагнитный измерительный прибор
moving coil instrument	магнитоэлектрический прибор
consequently	следовательно; поэтому

V. Read and translate text 15:

TEXT 15
ELECTRICAL MEASURING INSTRUMENTS AND UNITS

Any instrument which measures electrical values is called a meter. An ammeter measures the current in amperes. The abbreviation for the ampere is amp. A voltmeter measures the voltage and the potential difference in volts.

The current in a conductor is determined by two things – the voltage across the conductor and the resistance of the conductor. The unit by which resistance is measured is called the ohm. The resistance in practice is measured with the ohm-meter. A wattmeter measures electrical power in watts. Very delicate ammeters are often used for measuring very small currents. A meter whose scale is calibrated to read a thousandth of an ampere is called a micro ammeter or galvanometer.

Whenever an ammeter or voltmeter is connected to a circuit to measure electric current or potential difference, the ammeter must be connected in series and the voltmeter in parallel. To prevent a change in the electric current when making such an insertion, all ammeters must have a low resistance. Hence, most ammeters have a low resistance wire, called a shunt, connected across the armature coil.

A voltmeter, on the other hand, is connected across that part of the circuit for which a measurement of the potential difference is required. In order that the connection of the voltmeter to the circuit does not change electric current in the circuit, the voltmeter must have high resistance. If the armature coil does not have large resistance of its own, additional resistance is added in series.

The heating effect, electrostatic effect, magnetic and electromagnetic effects of electric current are used in order to produce the deflecting torque. The resulting measuring instruments are called: (a) hot wire, (b) electrostatic, (c) moving iron, (d) moving coil, and (e) induction. Various types are used with both d. c. and a. c., but the permanent-magnet moving coil instrument are used only with d. c., and the induction type instruments are limited to a. c.

All, except the electrostatic type instruments, are current measuring devices, fundamentally ammeters. Consequently, most voltmeters are ammeters designed also to measure small values of current directly proportional to voltage to be measured.

VI. Give the Russian equivalents to the words below:

Resistance; to offer; scale; to prevent; armature; connection; heating effect; wattmeter; voltmeter; ammeter; wire; coil; galvanometer; circuit; to

measure; torque; consequently; devices; fundamentally; potential; limited; induction; meter; value.

VII. Give the English equivalents to the words and word-combinations:

Амперметр, разница потенциалов, определят, градуировать, вставка, катушка, переменный ток, измерительные устройства, различные типы, сопротивление, отклоняющийся момент, параллельно, часть цепи, большое сопротивление, измеряет ток в амперах, изменение, магнитный эффект, тепловой эффект, постоянный ток.

VIII. Finish the following sentences:

1. An ammeter measures … .
2. A voltmeter measures … .
3. A wattmeter measures … .
4. To prevent a change in the electric current … .
5. A voltmeter, on the other hand, is connected … .
6. The heating effect, electrostatic effect, magnetic and electromagnetic effects of electric current are used … .

IX. Answer the questions:

1. How are electrical values measuring instruments called?
2. How must the ammeter and the voltmeter be connected?
3. What resistance must the ammeter and the voltmeter have?
4. What resulting measuring instruments do you know?
5. What types of instruments are used with both d. c. and a. c.?
6. What instruments are used only with d. c. and limited to a. c.?

X. Make up sentences corresponding to the contents of the text:

1. A meter 2. An ammeter 3. An ohmmeter 4. A voltmeter 5. A galvanlmeter	measures	the resistance very small currents electrical values the current the potential difference in volts

1. The voltage 2. The current 3. The resistance	is measured	in ohms in volts

		in amperes

XI. Describe different types of measuring instruments and units, using the table in Task V.

CHAPTER II

SUPPLEMENTARY TEXTS

UNIT 1. OUTSTANDING SCIENTISTS AND DISCOVERIES

TEXT 1
Ohm's Law

One of Ohm's major contributions was the establishment of a definite relationship between voltage, resistance and current in a closed circuit. A circuit consists of a voltage source and a complete path for current. Ohm stated this relationship as follows:

Current is directly proportional to voltage and inversely proportional to resistance.

As a formula, it appeals like this:

$$\text{Current (in amperes)} = \frac{\text{Voltage (in volts)}}{\text{Resistance (in ohms)}}.$$

This formula is commonly known as Ohm's Law.

About 1817 Ohm discovered that a simple correlation exists between resistance, current and voltage. That is: the current that flows in the circuit is directly proportional to the voltage and inversely proportional to the resistance. A current is measured in amperes, a voltage, or potential difference is measured in volts. A resistance is measured in ohms.

TEXT 2
Faraday's Law

MICHEL FARADAY was a great British physicist, the founder of the theory of electron field, a member of the London Royal Society. He was born in London in the family of a smith. Spending a few years in the primary school, he continued his studies all by himself, reading books and listening public lectures. Greatly impressed by lectures of a well-known English chemist H. Davy, he sent him a letter asking for a job at the Royal Institute. In 1813 Davy gave him a job of a laboratory assistant. Thanks to the brilliant talent of an experimenter, Faraday soon made himself known. All his future scientific work was carried out in the Royal Institute laboratories.

Faraday's law is formulated as follows: (a) the induced E.M.F. in a conductor is proportional to the rate at which the conductor cuts the magnetic lines of force. (b) The induced E.M.F. in a circuit is proportional to the rate of

change of the rate of change of the number of lines of force threading the circuit.

Faraday's Law (a) The induced E M.F. in a conductor is proportional to the rate at which the conductor cuts the magnetic lines of force, (b) The induced E. M. F. in a circuit is proportional to the rate of change of the number of lines of force threading the circuit.

TEXT 3
EMIL LENZ. Lenz's Law

EMIL LENZ was born on the 12 of February 1804 and died on the 29 of January 1865 in Derpt. He became a prominent Russian physicist, an Academician.

At the age of 16 he entered the Derpt University. In 1823, when being a student, he joined a 3 year round-the-world trip on board of the ship "Enterprise" as a physicist. The chief of the expedition was Kotzebu, a famous Russian seaman and explorer. In 1828 Lenz was elected adjunct-professor of the St. Petersburg Academy of Sciences for his outstanding investigations in geophysics.

In the 30ies of the 19th century, Lenz reorganized a physical laboratory of the Academy of Sciences where he began his famous studies on electricity and magnetism. He discovered the law of the electric current emitting heat in conductors. This law laid the foundation for the discovery of the Law of conservation and conversion of energy.

The direction of the induced current is such that its effect opposes the change producing it. The right-hand rule enables one to predict the direction of the induced current, and may be shown to conform with Lenz's law.

The induction coil, the dynamo, the transformer and the telephone are practical application of electromagnetic induction.

TEXT 4
Kirchhoff's Laws

GUSTAV ROBERT KIRCHHOFF (1824–1887) is a famous German scientist. He graduated from the Kênigsberg University in 1846. Since 1850 he had been an extraordinary professor of physics at the University of Breslau, and since 1854 – an ordinary professor of experimental and theoretical physics in Heidelberg University, in 1875 he became the chief of the Chair of mathematical physics in Berlin University.

His first works (1845–49) were dedicated to studies of the electric current in various kinds of conductors, series and parallel circuits, and to distribution of electricity in the conductors. Together with Bunsen, he was the author of spectral analysis.

G. R. Kirchhoff expanded and clarified Ohm's law with two statements which may be paraphrased as follows:

1. The current entering a point is equivalent to the current leaving the point.

2. The sum of the voltage drops around a closed loop is equal to the applied voltage.

Kirchhoff intended his statements to apply to all circuits. The formulas /=/j=/$_2$=... and $E_a = E1 + E_2 + E_3 + ... + E_n$ are true expressions of Kirchhof's laws as fair as series circuits are concerned.

The two main principles of circuit analysis are:

(1) Kirchhoff's Current Law. The sum of the currents directed away from the junction is equal to the sum of the currents directed toward the junction.

(2) Kirchhoff's E. M. F. Law. The sum of the voltage drops around any closed loop of a network equals the sum of the voltage rises around this loop.

TEXT 5
A Great Invention of a Russian Scientist

Radio occupies one of the leading places among the greatest achievements of modern engineering. It was invented by Professor A. S. Popov, a talented Russian scientist, who demonstrated the first radio – receiving set in the world on May 7, 1895.

And it is on this day that the anniversary of the birth of the radio is marked.

By his invention Popov made a priceless contribution to the development of world science.

A. S. Popov was born in the Urals, on March 16, 1859. For some years he had been studying at the seminary in Perm, and then went to the University of St. Petersburg. In his student days he worked as a mechanic at one of the first electric power – plants in St. Petersburg which was producing electric lights for Nevsky Prospekt.

After graduating from the University in 1882, A. S. Popov remained there as a post – graduate at the Physics Department. A year later he became a lecturer in Physics and Electrical Engineering in Kronstadt. By this time he had already gained recognition among specialists as an authority in this field.

After Hertz had published his experiments proving the existence of electromagnetic waves, A. S. Popov thought of the possibility of using Hertz waves for transmitting signals over a distance. Thus the first wireless (radio) receiving set was created. Then Popov developed his device and on March 24, 1896 he demonstrated the transmission and reception of a radiogram consisting of two words: Heinrich Hertz. On that day the radio-telegraphy was converted from an abstract theoretical problem into a real fact.

A. S. Popov did not live to see the great progress of his invention. In the first decrees the Soviet Government planned the development of an industry for producing radio equipment, the construction of radio stations. All this was put into practice on a scale which had greatly surpassed plans for the radiofication of the country.

Popov's invention laid the foundation for further inventions and improvements in the field of radio engineering. Since that time scientists all over the world have been developing the modern systems of radiotelegraphy, broadcasting, television, radiolocation, radio-navigation and other branches of radio-electronics.

TEXT 6
CHARLES COULOMB

CHARLES COULOMB (1736–1806), a member of the Paris Academy of Sciences, an outstanding French physicist in the period from 1785 to 1789 stated the law of electrostatic and magnetic interaction. His work in this field laid foundation for the future theoretic investigations in the electrostatics and magnetstatics.

Coulomb's law is one of the principal laws of electrostatics. It established a relationship between the force of interaction of two static electric charges, their quantities, and the distance between them. According to Coulomb's law the absolute value of the force of repulsion of two like charges or the force of attraction between two unlike charges e l and e 2, which size is much less than the distance between them, is inversely proportional to the square of the distance between them. He also stated the laws of rotation, dry friction, laws of interaction between magnetic poles. All these laws were named in honor of Ch. Coulomb.

TEXT 7
ANDRE MARIE AMPERE

ANDRE MARIE AMPERE (1775–1836) was an outstanding physicist and mathematician of French origin. He is one of the founders of modern electrodynamics. He was born in aristocratic family in Lyon. By the age of 14

he has read all the 20 volumes of «The Encyclopedia» by Diderot and D'Alambert. His scientific interests were very diverse.

In 1801 Ampere headed the Chair of Physics in Burge, in 1805 he became a teacher of physics at the Polytechnical School in Paris. Since 1814 he was elected Member of The Institute, which later transformed into the French Academy of Sciences. After 1824 he occupied the post of professor at the Ecole Normale in Paris.

Ampere's studies on the effects of the electric current flow on the magnetic needle were his greatest contribution to physics. In 1820 in the report to the Paris Academy, he made the announcement of the so-called "Ampere Rule", which is since used to define the deflection of the needle affected by the electric current. This led him to the discovery of interactions between electric currents. The fundamental laws of this interaction got his name.

TEXT 8
GEORGE SYMON OHM

GEORGE SYMON OHM (1784–1854) is a famous German physicist. In 1805 he entered the Erlangen University. Though he did not graduate from this University, he managed to write and defend a thesis in 1811. Later, he was a teacher at the gymnasiums of Gottstadt and Wamburg. Beginning from 1833 he became professor at the Polytechnical School in Nürenberg, and since 1849 – at the München University.

He is most famous for establishment of the general law of the electric circuit, stating the relation between resistance, electromotive force, and strength of the current in the electric circuit. The law was discovered experimentally and first formulated in 1826. Further investigations made use of this law. The unit of resistance was named after Ohm at the International Congress of Electricians in 1881.

TEXT 9
JAMES CLERC MAXWELL

JAMES CLERC MAXWELL, a British physicist, was born in 1831. In 1847–1850, he studied at the Edinborough University and later in Cambridge. On graduating from the Cambridge University, he was offered a post of a teacher there. In 1860 he headed the Chair of Physics in the King's College in London. In 1871 he went back to Cambridge where he headed a newly-organized laboratory named in honor of H. Cavendish.

His scientific interests lay in the field of electro-magnetism, molecular physics, optics, mechanics and other. Maxwell published his first scientific

paper when he was only 15. He founded the theory of electro-magnetic field, the electromagnetic theory of light. He is credited with the studies of the Saturnus rings. He described all known facts of electrodynamics by means of system of equations, known as Maxwell's equations of electrodynamics.

TEXT 10
The World's Brightest Lamp

The world's brightest lamp, able to light an area of 250 acres was produced by the Moscow Electric Lamp Works not long ago. It was designed by Victor Vasiliyev.

The lamp, which is named after the bright star Sirius is a three – phase 200 – kilowatt discharge lamp. The working part of the lamp is a double walled quartz tube which is 10 inches in diameter and about 40 inches long. The lamp is started by a special high voltage flash and cooled by water circulating between the inner and outer tubes.

One of these lamps is now installed nearly 200 feet above ground level in the engineering pavilion of the Industrial Exhibition Moscow. The Sirius lamp can be particularly useful on big construction sites.

TEXT 11
EARLY HISTORY OF ELECTRICITY

History shows us that at least 2,500 years ago the Greeks were already familiar with the strange force (as it seemed to them) which is known today as electricity. Generally speaking, three phenomena made up all of man's knowledge of electrical effects. The first phenomenon was the familiar lightning flash – a dangerous power which could both kill people and burn or destroy their houses. The second manifestation of electricity was more or less familiar to people: a strange yellow stone which looked like glass was sometimes found in the earth. On being rubbed, that strange yellow stone – amber – obtained the ability of attracting light objects of a small size. The third phenomenon was connected with the so-called electric fish which possessed the property of giving more or less strong electric shocks which could be obtained by a person coming into contact with it.

Nobody knew that the above phenomena were due to electricity. People could neither understand their observations nor find any practical applications for them. All of man's knowledge in the field of electricity has been obtained during the last 370 years. It took a long time before scientists learned how to make use of electricity. Most of the electrically operated devices, such as the electric lamp, the refrigerator, the tram, the lift, the radio are less than one

hundred years old. In spite of their having been employed for such a short period of time, they play a most important part in man's everyday life all over the world.

Famous names are connected with the scientific research on electricity, its history. As early as about 600 B. C. the Greek philosopher Phales discovered that when amber was rubbed, it attracted and held minute light objects. However, he could not know that amber was charged with electricity owing to the process of rubbing. Then Gilbert, the English physicist, began the first systematic scientific research on electrical phenomena. He discovered that various substances possessed the property similar to that of amber: they generated electricity when they were rubbed. He gave the name "electricity" to the phenomenon he was studying. He got this word from the Greek "electrum" meaning «amber».

Many learned men of Europe began to use the new word «electricity» in their conversation as they were engaged in research of their own. Scientists of Russia, France and Italy made their contribution as well as the Englishmen and the Germans.

TEXT 12
FROM THE HISTORY OF ELECTRICITY

There are two types of electricity, namely, electricity at rest or in a static condition and electricity in motion, that is, the electric current. Both of them are made up of electric charges, static charges being at rest, while electric current flows and does work. Thus, they differ in their ability to serve mankind as well as in their behaviour.

Static electricity was the only electrical phenomenon to be observed by man for a long time. At least 2,500 years ago the Greeks knew how to get electricity by rubbing substances. However, the electricity to be obtained by rubbing objects cannot be used to light lamps, to boil water, to run electric trains, and so on. It is usually very high in voltage and difficult to control, besides it discharges in no time.

As early as 1753, Franklin made an important contribution to the science of electricity. He was the first to prove that unlike charges are produced due to rubbing dissimilar objects. To show that the charges are unlike and opposite, he decided to call the charge on the rubber-negative and that on the glass-positive.

In this connection one might remember the Russian academician V. V. Petrov. He was the first to carry on experiments and observations on the electrification of metals by rubbing them one against another. As a result he was the first scientist in the world who solved that problem.

Volta’s discovery of electric current developed out of Galvani's experiments with the frog. Galvani observed that the legs of a dead frog jumped

as a result of an electric charge. He tried his experiment several times and every time he obtained the same result. He thought that electricity was generated within the leg itself.

Volta began to carry on similar experiments and soon found that the electric source was not within the frog's leg but was the result of the contact of both dissimilar metals used during his observations. However, to carry on such-experiments was not an easy thing to do. He spent the next few years trying to invent a source of continuous current. To increase the effect obtained with one pair of metals, Volta increased the number of these pairs. Thus the voltaic pile consisted of a copper layer and a layer of zinc placed one above another with a layer of flannel moistened in salt water between them. A wire was connected to the first disc of copper and to the last disc of zinc.

The year 1800 is a date to be remembered: for the first time in the world's history a continuous current was generated.

Volta was born in Como, Italy, on February 18, 1745. For some years he was a teacher of physics in his home town. Later on he became professor of natural sciences at the University of Pavia. After his famous discovery he traveled in many countries, among them France, Germany and England. He was invited to Paris to deliver lectures on the newly discovered chemical source of continuous current. In 1819 he returned to Como where he spent the rest of his life. Volta died at the age of 82.

TEXT 13
NATURE OF ELECTRICITY

The first recorded observation on electricity was made by the ancient Greek philosopher Phales. He stated that a piece of amber rubbed with fur attracted light objects. But more than 22 centuries passed before the study of magnetism and of electrical phenomena began by Galileo and other scientists.

It was well known that not only amber, but many other substances having been rubbed behave like amber i. e. can be electrified. It was discovered that any 2 dissimilar substances forced into contact and then separated became electrified, or acquired electrical charges.

During the 19^{th} century the idea of the nature of electricity was completely revolutionized. The atom was regarded as the ultimate subdivision of matter. Today the atom is regarded as an electrical system. In this electrical system there is a nucleus containing positively charged particles called protons. The nucleus is surrounded by lighter negatively charged units – electrons. So the most essential constituent of matter is made up of electrically

charged particles. Matter is neutral and produces no electrical effects when it has equal amounts of both charges.

But when the number of negative charge is unlike the number of positive ones, matter will produce electrical effects. Having lost some of its electrons, the atom has a positive charge: having an excess of electrons – it has a negative charge.

TEXT 14
ATMOSPHERIC ELECTRICITY

Electricity plays such an important part in modern life that in order to get it, men have been burning millions of tons of coal. Coal is burned instead of its being mainly used as a source of valuable chemical substances which it contains. Therefore, finding new sources of electric energy is a most important problem that scientists and engineers try to solve.

Hundreds of millions of volts are required for a lightning spark about one and a half kilometre long. However, this does not represent very much energy because of the intervals between single thunderstorms. As for the power spent in producing lightning flashes all over the world, it is only about 1/10,000 of the power got by mankind from the sun, both in the form of light and that of heat. Thus, the source in question may interest only the scientists of the future.

Atmospheric electricity is the earliest manifestation of electricity known to man. However, nobody understood that phenomenon and its properties until Benjamin Franklin made his kite experiment. On studying the Leyden jar (for long years the only known condenser), Franklin began thinking that lightning was a strong spark of electricity. He began experimenting in order to draw electricity from the clouds to the earth. The story about his famous kite is known all over the world.

On a stormy day Franklin and his son went into the country taking with them some necessary things such as: a kite with a long string, a key and so on. The key was connected to the lower end of the string. "If lightning is the same as electricity," Franklin thought, "then some of its sparks must come down the kite string to the key." Soon the kite was flying high among the clouds where lightning flashed. However, the kite having been raised, some time passed before there was any proof of its being electrified. Then the rain fell and wetted the string. The wet string conducted the electricity from the clouds down the string to the key. Franklin and his son both saw electric sparks which grew bigger and stronger. Thus, it was proved that lightning is a discharge of electricity like that got from the batteries of Leyden jars.

Trying to develop a method of protecting buildings during thunderstorms, Franklin continued studying that problem and invented the lightning conductor. He wrote necessary instructions for the installation of his invention,

the principle of his lightning conductor being in use until now. Thus, protecting buildings from strokes of lightning was the first discovery in the field of electricity employed for the good of mankind.

TEXT 15
MAGNETISM

In studying the electric current, the following relation between magnetism and the electric current can be observed; on the one hand magnetism is produced by the current and on the other hand the current is produced from magnetism.

Magnetism is mentioned in the oldest writings of man. Romans, for example, knew that an object looking like a small dark stone had the property of attracting iron. However, nobody knew who discovered magnetism or where and when the discovery was made. Of course, people could not help repeating the stories that they had heard from their fathers who, in their turn, heard them from their own fathers and so on.

One story tells us of a man called Magnus whose iron staff was pulled to a stone and held there. He had great difficulty in pulling his staff away. Magnus carried the stone away with him in order to demonstrate its attracting ability among his friends. This unfamiliar substance was called Magnus after its discoverer, this name having come down to us as "Magnet".

According to another story, a great mountain by the sea possessed so much magnetism that all passing ships were destroyed because all their iron parts fell out. They were pulled out because of the magnetic force of that mountain.

The earliest practical application of magnetism was connected with the use of a simple compass consisting of one small magnet pointing north and south.

A great step forward in the scientific study of magnetism was made by Gilbert, the well-known English physicist (1540–1603). He carried out various important experiments on electricity and magnetism and wrote a book where he put together all that was known about magnetism. He proved that the earth itself was a great magnet.

Reference must be made here to Galileo, the famous Italian astronomer, physicist and mathematician. He took great interest in Gilbert's achievements and also studied the properties of magnetic materials. He experimented with them trying to increase their attracting power.

At present, even a schoolboy is quite familiar with the fact that in magnetic materials, such as iron and steel, the molecules themselves are minute magnets, each of them having a north pole and a south pole.

TEXT 16
MAGNETIC EFFECT OF AN ELECTRIC CURRENT

The invention of the voltaic cell in 1800 gave electrical experimenters a source of a constant flow of current. Seven years later the Danish scientist and experimenter Oersted, decided to establish the relation between a flow of current and a magnetic needle. It took him at least 13 years more to find out that a compass needle is deflected when brought near a wire through which the electric current flows. At last, during a lecture he adjusted, by chance, the wire parallel to the needle. Then, both he and his class saw that when the current was turned on, the needle deflected almost at right angles towards the conductor. As soon as the direction of the current was reversed, the direction the needle pointed in was reversed too.

Oersted also pointed out that provided the wire were adjusted below the needle, the deflection was reversed.

The above-mentioned phenomenon highly interested Ampere who repeated the experiment and added a number of valuable observations and statements. He began his research under the influence of Oersted's discovery and carried it on throughout the rest of his life.

Everyone knows Ampere's rule thanks to which the direction of the magnetic effect of the current can always be found. Ampere established and proved that magnetic effects could be produced without any magnets by means of electricity alone. He turned his attention to the behaviour of the electric current in a single straight conductor and in a conductor that is formed into a coil, i.e. a solenoid.

When a wire conducting a current is formed into a coil of several turns, the amount of magnetism is greatly increased.

It is not difficult to understand that the greater the number of turns of wire, the greater is the m.m.f. (that is the magnetomotive force) produced within the coil by any constant amount of current flowing through it. In addition, when doubling the current, we double the magnetism generated in the coil.

A solenoid has two poles which attract and repel the poles of other magnets. While suspended, it takes up a north and a south direction exactly like the compass needle. A core of iron becomes strongly magnetized if placed within the solenoid while the current is flowing.

UNIT 2.INTERESTING FACTS
ON ELECTRICITY AND ELECTRONICS

TEXT 1
ELECTRICITY MAY BE DANGEROUS

Many people have had strong shocks from the electric wires in a house. The wires seldom carry current at a higher voltage than 220, and a person who touches a bare wire or terminal may suffer no harm if the skin is dry. But if the hand is wet, he may be killed. Water is known to be a good conductor of electricity and provides an easy path for the current from the wire to the body. One of the main wires carrying the current is connected to earth, and if a person touches the other one with a wet hand, a heavy current rill flow through his body to earth and so to the others. The body forms part of an electric circuit.

When dealing with wires and fuses carrying an electric current, it is best to wear rubber gloves. Rubber is a good insulator and will not let the current pass to the skin. If no rubber gloves can be found in the house, dry cloth gloves are better than nothing. Never touch a bare wire with the wet hand, and never, in any situation, touch a water pipe and an electric wire at the same time.

People use electricity in their homes every day but sometimes forget that it is a form of power and may be dangerous. At the other end of the wire there are great generators driven by turbines turning at high speed. One should remember that the power they generate is enormous. It can burn and kill, but it will serve well if it is used wisely.

TEXT 2
POWER TRANSMISSION

They say that about a hundred years ago, power was never carried far away from its source. Later on, the range of transmission was expanded to a few miles. And now, in a comparatively short period of time, electrical engineering has achieved so much that it is quite possible, at will, to convert mechanical energy into electrical energy and transmit the latter over hundreds of kilometres and more in any direction required. Then in a suitable locality the electric energy can be reconverted into mechanical energy whenever it is desirable. It is not difficult to understand that the above process has been made possible owing to generators, transformers and motors as well as to other necessary electrical equipment. In this connection one cannot but mention the growth of electric power generation in this country. The longest transmission line in pre-revolutionary Russia was that connecting the Klasson power-station with Moscow. It is said to have been 70 km

long, while the present Volgograd–Moscow high-tension transmission line is over 1000 kilometres long. (The reader is asked to note that the English terms "high-tension" and "high-voltage" are interchangeable.)

It goes without saying that as soon as the electric energy is produced at the power-station, it is to be transmitted over wires to the substation and then to the consumer. However, the longer the wire, the greater is its resistance to current flow. On the other hand, the higher the offered resistance, the greater are the heating losses in electric wires. One can reduce these undesirable losses in two ways, namely, one can reduce either the resistance or the current. It is easy for us to see how we can reduce resistance: it is necessary to make use of a better conducting material and as thick wires as possible. However, such wires are calculated to require too much material and, hence, they will be too expensive. Can the current be reduced? Yes, it is quite possible to reduce the current in the transmission system by employing transformers. In effect, the waste of useful energy has been greatly decreased due to high-voltage lines. It is well known that high voltage means low current, low current in its turn results in reduced heating losses in electrical wires. It is dangerous, however, to use power at very high voltages for anything but transmission and distribution. For that reason, the voltage is always reduced again before the power is made use of.

TEXT 3
HYDROELECTRIC POWER-STATION

Water power was used to drive machinery long before Polzunov and James Watt harnessed steam to meet man's needs for useful power.

Modern hydroelectric power-stations use water power to turn the machines which generate electricity. The water power may be obtained from small dams in rivers or from enormous sources of water power like those to be found in Russia. However, most of our electricity, that is about 86 per cent, still comes from steam power-stations.

In some other countries, such as Norway, Sweden, and Switzerland, more electric energy is produced from water power than from steam. They have been developing large hydroelectric power-stations for the past forty years, or so, because they lack a sufficient fuel supply. The tendency, nowadays, even for countries that have large coal resources is to utilize their water power in order to conserve their resources of coal. As a matter of fact, almost one half of the total electric supply of the world comes from water power.

The locality of a hydroelectric power plant depends on natural conditions. The hydroelectric power plant may be located either at the dam or at a considerable distance below. That depends on the desirability of using the head supply at the dam itself or the desirability of getting a greater head. In

the latter case, water is conducted through pipes or open channels to a point farther downstream where the natural conditions make a greater head possible.

The design of machines for using water power greatly depends on the nature of the available water supply. In some cases great quantities of water can be taken from a large river with only a few feet head. In other cases, instead of a few feet, we may have a head of several thousands of feet. In general, power may be developed from water by action of its pressure, of its velocity, or by a combination of both.

A hydraulic turbine and a generator are the main equipment in a hydroelectric power-station. Hydraulic turbines are the key machines converting the energy of flowing water into mechanical energy. Such turbines have the following principal parts: a runner composed of radial blades mounted on a rotating shaft and a steel casing which houses the runner. There are two types of water turbines, namely, the reaction turbine and the impulse turbine. The reaction turbine is the one for low heads and a small flow. Modified forms of the above turbine are used for medium heads up to 500-600 ft, the shaft being horizontal for the larger heads. High heads, above 500 ft, employ the impulse type turbine.

Hydropower engineering is developing mainly by constructing high capacity stations integrated into river systems known as cascades. Such cascades are already in operation on the Dnieper, the Volga and the Angara.

TEXT 4
NUCLEAR POWER PLANT

The heart of the nuclear power plant is the reactor which contains the nuclear fuel. The fuel usually consists of hundreds of uranium pellets placed in long thin cartridges of stainless steel. The whole fuel cell consists of hundreds of these cartridges. The fuel is situated in a reactor vessel filled with a fluid. The fuel heats the fluid and the super-hot fluid goes to a heat exchanger i.e. steam generator, where the hot fluid converts water to steam in the heat exchanger. The fluid is highly radioactive, but it should never come into contact with the water that is converted into steam. Then this steam operates steam turbines in exactly the same way as in the coal or oil fired power-plant.

A nuclear reactor has several advantages over power-plants that use coal or natural gas. The latter produce considerable air pollution, releasing combusted gases into atmosphere, whereas a nuclear power plant gives off almost no air pollutants. As to nuclear fuel, it is far cleaner than any other fuel for operating a heat engine. Furthermore, our reserves of coal, oil and gas are decreasing so nuclear fuel is to replace them.

TEXT 5
ELECTRONICS AND TECHNICAL PROGRESS

Large – scale application of electronic techniques is a trend of technical progress capable of revolutionizing many branches of industry.

Electronics as a science studies the properties of electrons, the laws of their motion, the laws of the transformation of various kinds of energy through the media of electrons.

At present it is difficult to enumerate all branches of science and technology which are based on electronic technique.

Electronics make it possible to raise industrial automation to a higher level, to prepare conditions for the future technical retooling of the national economy. It is expected to revolutionize the system of control over mechanisms and production processes. Electronics greatly helps to conduct fundamental research in nuclear physics, in the study of the nature of matter, and in realization of controlled thermonuclear reactions.

An ever greater role is being played by electronics in the development of the chemical industry.

Electronics embrace many independent branches. The main among them are vacuum, semiconductor, molecular and quantum electronics.

TEXT 6
PROTECTION AND CONTROL EQUIPMENT

In electrical systems for the generation, distribution and use of electrical energy, considerable control equipment is necessary. It can be divided into two classes:

a) equipment used at the generating and distributing end;

b) equipment used at the receiving end of the system.

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

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

TEXT 7
THE NUCLEUS

The nucleus is composed of protons, neutrons, and other subatomic particles. The proton is a relatively heavy positive particle. It has exactly the same quantity of electrical charge as the electron although its sign (or value)

is opposite. The proton weighs the same as approximately 1845 electrons, and the atom contains a like number of protons and electrons. The neutron is so named because it is electrically neutral, that is, it is neither positive nor negative. The neutron adds weight to the atom and tends to prevent movement of the protons.

When the parts of the atom are examined, there can be found minute particles with positive and negative electrical charges. The basic difference between lead and gold lies in the number of electrons and protons in the atoms which compose these materials (metals).

The simplest atom consists of a nucleus which contains one proton, which is orbited by a single electron. This is the hydrogen atom. One of the more complex atoms is californium. This atom contains 98 photons and 98 electrons with the electrons orbiting the nucleus in seven different and distinct energy shells.

TEXT 8
WHAT IS AN ELECTRON?

What is an electron? It is a very small, indivisible, fundamental particle – a major constituent of all matter. All electrons appear to be identical and to have properties that do not change with time.

Two essential characteristics of the electron are its mass and its charge. Qualitatively, an electron is a piece of matter that has weight and is affected by gravity. Just as the mass of any object is defined, the mass of the electron can be defined by applying a force and measuring the resulting rate of change in the velocity of the electron, that is, the rapidity with which its velocity changes. This rate of change is called acceleration, and the electron mass is then defined as the ratio of the applied force to the resulting acceleration. The mass of the electron is found to be about 9.11×10^{-28} grams. Not only the electron but all matter appears to have positive mass, which is equivalent to saying that a force applied to any abject results in acceleration in the same direction as the force.

How does the other aspect, the charge of the electron, arise? All electrons have an electric charge, and the amount of charge, like the mass, is identical for all electrons. No one has ever succeeded in isolating an amount of charge smaller than that of the electron. The sign of the charge of the electron is conventionally defined as negative; the electron thus represents the fundamental unit of a negative charge.

TEXT 9
ELECTRONS AND ELECTRONIC CHARGES

An atom of ordinary hydrogen is composed of one positively charged proton as a nucleus and one negatively charged electron. The proton is about 1,840 times more massive than the electron. Heavier atoms are built up of protons, neutrons, and electrons. When a body is negatively charged, it has excess electrons; if positively charged, there is a deficiency of electrons.

In metallic conductors many of the electrons are free to travel about among the atoms like molecules of a gas.

When electric charges are static, they do not progress in any definite direction. Excess electrostatic charges reside on the outer surface of a conductor, and their density is greatest in regions of greatest curvature.

TEXT 10
POLARITY

All matter is basically composed of two types of electricity: positive particles and negative particles. The negative particles are relatively light in weight and in constant motion. These orbiting particles exhibit equal and opposite electrical characteristics to the heavier particles within the nucleus.

When an atom has the same number of electrons as it has protons, it exalts no outward electrical properties. This is because the positive and negative charges are exactly balanced. Such an atom is electrically stable and is said to be neutral.

When an atom takes on an excess of electrons, it exhibits outward characteristics similar to the electron. It takes an overall negative property. This condition is called a negative change, and such changed atom is not electrically stable. A charged atom is called an ion, and if the charge is negative, it is called a negative ion.

An atom which has less than its normal quota of electrons, displays a positive polarity similar to that of the proton due to the fact that it has more positive protons than it has negative electrons. This type of atom is said to assume a positive electrical charge. Such an atom is known as a positive ion while it is in this electrically unstable condition.

These charges of atoms are the simplest examples of static electricity. We stated that atoms are influenced to accept or give up electrons.

As the name dynamic electricity indicates, this is electricity in motion. The heart of the matter is electron movement.

In electrical system, electrical pressure is needed. To maintain this pressure, a device that will move electrons in a way similar to that in which the pump moves water is necessary. The most familiar is the storage battery.

TEXT 11
ENERGY CONVERSION

Since energy can neither be created nor destroyed, any process of producing voltage must be a conversion from one form of energy to another. There are several names for the machines that convert mechanical energy into electrical energy. The dynamo is the source of huge amounts of power; the magneto supplies minute power outputs; and in between there are alternators and generators. All of these work at the same principle, the principle demonstrated by Faraday when he discovered that relative motion between a magnetic field and a conductor in that field would induce a current in the conductor. It makes no real difference whether the conductor is stationary and the field moving or the field is stationary and the conductor moving. The important factor is the relative motion in a manner that will cause flux to cut across the conductor.

Vocabulary

A

ability	способность
above mentioned	вышеупомянутый
accompany	сопровождать
achievement	достижение
add	прибавлять, вкладывать
adjust	регулировать; устанавливать
advantage	преимущество
air-cooled transformer	трансформатор с воздушным охлаждением
air-gap	воздушный зазор
all over the world	по всему миру
alternating current	переменный ток
alternating force	переменно действующая сила
alternator	генератор переменного тока
although	хотя
amber	янтарь
ammeter	амперметр
amount to	доходить до
appliance	прибор
application	применение
armature	якорь
arrange	располагаться
as a matter of fact	действительно, на самом деле
as for	что касается
as soon as	как только
as well as	так же как
as well	также
asbestos	асбест
at least	по крайней мере
at rest	в покое
at right angles	под прямым углом
at will	по желанию
attract	притягивать

B

bare conductor	неизолированный проводник; оголенный провод

bare wire	оголенный провод
battery	батарея
be alike	быть подобным
be bolted	прикрепляться болтами
be certain	обязательно, несомненно
be composed of	состоять из
be detected	обнаруживаться
be determined	определяться
be dislodged	смещаться
be divided	подразделяться
be driven	приводиться в движение
be exposed	подвергаться действию
be expressed	выражаться
be familiar	быть знакомым
be manifested	проявляться
be related to	относиться
be released	освобождаться
be transmitted	передаваться
because of	из-за, вследствие
bedplate	станина; основание; опорная плита
behaviour	поведение; режим (работы)
bell circuit	цепь включения звонка
brush gear	щеточное устройство
brush	щетка
burn	сжигать
by means of	посредством, при помощи

C

cable fault	повреждение кабеля
calibrate	градуировать
capacity	мощность; способность; емкость
carry out	проводить, осуществлять
carry	нести; проводить; проходить
cell	элемент
change	изменять, преобразовывать
charge	заряд; заряжать
chemical	химический
closed circuit	замкнутая цепь
coal	уголь
coil	катушка
come into contact	соприкасаться

commutating pole	вспомогательный полюс
commutator	коммутатор
comprise	включать (в себя)
concept	понятие; концепция
conduct	проводить
conduct electric current	проводить
conductance	проводимость
conductivity	проводимость
conductor	проводник
confuse	путать, перепутать
connect	соединять, связывать
consequently	следовательно; поэтому
consider	рассматривать; считать
considerable	значительный
consist of	состоять из
constant	постоянный
construct	строить, создавать
contain	содержать
continual	непрерывный
continuously	непрерывно; постоянно
contribute	делать вклад
contribution	вклад
control	управлять, контролировать
convert	преобразовывать, превращать
copper	медь
cord	шнур
core	сердечник
core-type transformer	стержневой трансформатор
crane	подъемный кран
create	создавать
current transformer	трансформатор тока
current	ток
cut	сокращать; резать; рассекать

D

d. c. = direct current	постоянный ток
dangerous	опасный
deal with	иметь дело с
decrease	уменьшить, понижать
decreasing	уменьшение
definition	определение

deflect	отклоняться
deflecting torque	отклоняющий момент
deliver	поставлять, доставлять; предоставлять
despite	несмотря на
destroy	разрушать
detect	обнаруживать; замечать
determine	определять
develop	развивать, разрабатывать
development	развитие; разработка
device	прибор, приспособление
direct current	постоянный ток
direction	направление
disarrangement	беспорядок
discharge	разряжать
discovery	открытие
distribution	распределение
do without	обходиться без чего-либо
drift	дрейфовать; медленно течь
drive	привод; приводить в движение
due to	благодаря, вследствие, из-за
dynamo	динамо

E

ease	легкость, простота
efficiency	эффективность; производительность
electric charge	электрический заряд
electric device	электрическое устройство, прибор
electric(al)	электрический
electrify	электрифицировать; электризовать
electrolytic	электролитический
electromagnetic induction	электромагнитная индукция
electrometer	электрометр
electromotive force (=e. m. f.)	электродвижущая сила (ЭДС)
electroplating	гальванопокрытие
electrostatic field	электростатическое поле
electrostatic generator	электростатический генератор
emit	излучать, выделять, испускать
employ	использовать, применять
encounter	сталкиваться, встречаться

engineer	инженер
engineering	техника
enough	достаточно
equipment	оборудование
essential	существенный; основной; необходимый
establish	устанавливать, основывать
ever since	с того времени, с тех пор
exceed	превышать
excite	возбуждать
expensive	дорогой
extensive use	широкое применение
external	внешний
external circuit	внешняя цепь

F

familiar	знакомый
famous	известный
field coil	катушка возбуждения; обмотка возбуждения
field structure	индукторная станина
field	поле; область (науки, техники)
find out	выяснять; понимать
flow	течь
force	заставлять; сила
former	первый из упомянутых
frame	рама; корпус
friction	трение
furnace	печь
fuse	предохранитель

G

generally	вообще, в целом; обычно
generate	производить, вырабатывать, генерировать
generator	генератор
great variety	большое разнообразие
growth	рост, увеличение

H

harness	использовать энергию (воды, ветра, солнца)
heat loss	тепловые потери
heating losses	тепловые потери
hence	следовательно; отсюда
hot wire	провод под напряжением

I

in conjunction with	вместе с
in each case	в каждом случае
in effect	в действительности
in its turn	в свою очередь
in motion	в движении
in no time	моментально, в мгновение ока
in one’s turn	в свою очередь
in parallel	параллельно
in question	обсуждаемый, о котором идет речь
in series	последовательно
in spite of	несмотря на
in the form	в виде
incandescent filament lamp	лампа накаливания
increase	возрастать; увеличивать
increasing	увеличение
influence	влиять
input voltage	входное напряжение
inserted	вставленный
installation	установка
instead of	вместо
instrument transformer	измерительный трансформатор
insulated	изолированный
insulation	изоляция
insulator	изолятор
interposed	вставленный; расположенный
invent	изобретать
invented	изобретенный
inventor	изобретатель
iron	железо
irreplaceable	незаменимый

K

kind	вид, сорт
knowledge	знания

L

laminated core	пластинчатый сердечник; слоистый сердечник
latter	последний из упомянутых
lead	проводник
leaking off	утечка
lightning	молния
like	подобный, похожий, как
lines of force	силовые линии

M

magnetic flux	магнитный поток
magnetism	магнетизм
maintain	поддерживать; обслуживать; сохранять
make reference to	ссылаться на, упоминать
make use of	использовать
matter	вещество, материя
mean	значить, означать
measure	измерять
measurable	измеримый
mechanical energy	механическая энергия
meet requirements	отвечать требованиям
melt	плавить, плавиться
mention	упоминать
mention	упоминать
meter	измеритель; измерительный прибор
minute objects	мельчайшие предметы
more or less	более или менее
motion	движение, перемещение
movement	движение
moving coil instrument	магнитоэлектрический прибор
moving iron instrument	электромагнитный измерительный прибор
moving parts	движущиеся части

N

name after	называть в честь
needle	стрелка
needless to say	нечего и говорить
negative	отрицательный
negligible	незначительный, пренебрежимо малый
negligible quantity	незначительное количество
nevertheless	однако, тем не менее
nuclear	ядерный, атомный
nucleus	ядро, центр

O

observation	наблюдение
obtain	получать
occupy	занимать
occur	происходить, случаться
on a large scale	в большом масштабе
open circuit	разомкнутая цепь
opposite	противоположный
orbit	вращаться
output voltage	выходное напряжение
outside source	внешний источник
owing to	благодаря; вследствие

P

particle	частица
pass	проходить
pass through	проходить через
passage	проход; прохождение
path	путь; контур электрической цепи
peaceful	мирный
perhaps	возможно, может быть
phenomenon	явление
photocell	фотоэлемент
physicist	физик
play a part	играть роль
polarity	полярность

pole	полюс
pole core	магнитный сердечник
pole shoe	полюсный наконечник
poly-phase	полифазный
positive	положительный
possess	обладать
potential	потенциал; электрический потенциал
potential difference	разность потенциалов
power	энергия; держава
power station (plant)	электростанция
practical importance	практическая значимость
pressure	давление
prevent	предотвращать
previously	заранее, предварительно
primary coil	первичная обмотка
primary winding	первичная обмотка
principle	основной
produce	производить, создавать, выпускать
property	свойство
proportionate	пропорциональный
protect	защищать
prove	доказывать
provide	предоставлять, снабжать, обеспечивать
provided	при условии
purpose	цель; назначение
put into operation	вводить в действие

R

range	диапазон
readily	легко, быстро
rectify	исправлять; выпрямлять
reduce	понижать, уменьшать
relation	связь; отношение
relative motion	относительное движение
relatively	относительно
reliable	надежный
remember	помнить, вспоминать
repel	отталкивать
require	требовать

research	исследование
resist	сопротивляться; противостоять
resistance	сопротивление
result in	приводить к; заканчиваться
reverse	изменять на обратное, реверсировать
reversible	реверсивный
revolving armature	вращающийся якорь
ring	кольцо
ring-shaped portion	кольцеобразная часть
rotate	вращаться
rotating	вращающийся
rub	тереть
rubber	резина
rule	правило

S

scale	шкала
scientific	научный
scientist	ученый
secondary coil	вторичная обмотка
secondary winding	вторичная обмотка
semiconductor	полупроводник
series circuit	последовательная цепь
serve	служить, обслуживать
serve mankind	служить человечеству
shaft	вал
shell-type transformer	броневой трансформатор
short circuit	короткое замыкание
shunt	шунт
silver	серебро
single	один
single-phase	однофазный, монофазный
slip ring	контактное кольцо
slot	прорезь, щель, паз
slotted	оснащенный пазами
socket	розетка
solar	солнечный
solenoid	соленоид; соленоидный
solids	твердые вещества
solve a problem	решать задачу, проблему

source	источник
source of supply	источник питания
spark	искра; вспышка
sparkless	безыскровый
staff	жезл; посох; палка
state	заявлять, сообщать
statement	утверждение; формулировка
stationary	неподвижный
steam	пар
steam engine	паровой поршневой двигатель
steam turbine	паровая турбина
steel	сталь
step-down transformer	понижающий трансформатор
step-up transformer	повышающий трансформатор
straight	прямой
subject	предмет; тема
substance	вещество; материя
successfully	успешно
superheating	перегрев
supply	снабжать, подавать, поставлять
surround	окружать
surrounding	окружающий
switchboard	распределительный щит
synchronous alternator	синхронный генератор переменного тока

T

take time	занимать время
tend to	иметь тенденцию, склоняться
tension	напряжение
terminal	зажим, клемма
that is to say	то есть, иными словами
the number of turns	количество витков
the rest of	остаток; остальной
through	через
transfer	перемещать, переносить
transform	преобразовывать
transformation	преобразование, превращение
transmission	передача
travel	путешествовать
try	пытаться, испытывать

turn on	включать
turn one’s attention to	обращать внимание
turn	виток; превращать

U

under consideration	рассматриваемый, обсуждаемый
unidirectional	однонаправленный
unit	единица, элемент
unlike	разноименный

V

valuable	ценный
value	величина
various	различный
voltage	напряжение
voltage transformer (=potential transformer)	трансформатор напряжения
voltmeter	вольтметр

W

waste	потеря, пустая трата
water wheel	водяное колесо
water-cooled transformer	трансформатор с водяным охлаждением
waterfall	водопад
wattmeter	ваттметр
wave	волна
weigh	весить
weight	вес
welding	сварка
whenever	всякий раз, когда; когда
winding	обмотка
wire	проволока, провод

Y

yoke	ярмо

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