

**Практикум по английскому языку**

**На тему «Известные ученые и их достижения»**

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**Пояснительная записка.**

Методические рекомендации по выполнению практических работ по дисциплине «Иностранный язык» предназначены для студентов 1 курсов очной формы обучения и преподавателей средних профессиональных учебных заведений, соответствуют действующей программе, и содержит систему заданий для аудиторных и внеаудиторных практических работ.

Методические рекомендации представляют собой систему упражнений по развитию и совершенствованию навыков аудирования, чтения вслух и про себя, лексико-грамматических навыков и устной монологической и диалогической речи, а также навыков перевода иноязычного текста.

Данные рекомендации включают в себя разнообразные тексты по теме **«**Известные ученые и их достижения» и упражнения после этих текстов.

Практические рекомендации включают задания по аудированию, задания по чтению и устной речи, лексико-грамматические задания.

Задачи курса:

- расширение содержания образовательного минимума;

- развивать гибкость мышления, способность ориентироваться в типах практических заданий;

- сформировать определенные навыки и умения, необходимые для успешного общения на иностранном языке;

- научить анализировать и объективно оценивать результаты собственной учебной деятельности;

-развивать творческий потенциал учащихся;

В результате изучения предлагаемого курса обучающийся должен уметь:

– правильно употреблять изученную грамматику и лексику в устной и письменной речи.

Весь курс является практико-ориентированным.

При отборе материала учитывалась потребность учащихся в разнообразных по тематике и жанрам текстах для чтения и аудирования, способствующих повышению мотивации, а также в заданиях, направленных на совершенствование устной и письменной монологической и диалогической речи.

Особенности содержания курса обусловлены возрастной спецификой развития личности учащегося. Усложнение познавательной деятельности даёт возможность включать иноязычную коммуникацию в другие виды деятельности, интегрировать знания из разных предметных областей и формировать межпредметные учебные умения и навыки.

При формировании и развитии речевых, языковых, социокультурных или межкультурных умений учитывается новый уровень мотивации учащихся, которые проявляют растущую самостоятельность в постановке целей, поиске информации, овладении учебными действиями, осуществлении самостоятельного контроля и оценке деятельности, профильную ориентацию.

ФГОС второго поколения предъявляют особые требования к результатам освоения основных общеобразовательных программ. Данные результаты структурируются в соответствие с основными задачами общего образования, учитывающими индивидуальные, общественные и государственные потребности.

Федеральный компонент государственного среднего общего образования направлен на реализацию качественно новой личностно-ориентированной развивающей модели массовой средней школы и призван обеспечить достижение основных целей:

1. развитие личности школьника, его творческих способностей, интереса к учению; формирование желания и умения учиться;
2. воспитание нравственных и эстетических чувств, эмоционально-ценностного позитивного отношения к себе и окружающему миру;
3. освоение системы знаний, умений и навыков, опыта осуществления разнообразных видов деятельности;
4. сохранение и поддержка индивидуальности ребенка.

В соответствии с Федеральным государственным образовательным стандартом данный практикум по английскому языку обеспечивает формирование личностных, метапредметных и предметных результатов изучения английского языка.

Например:

* формирование целостного мировоззрения, соответствующего современному уровню развития науки и общественной практики, учитывающего социальное, культурное, языковое, духовное многообразие современного мира;
* формирование основ социально-критического мышления;
* формирование мотивации изучения иностранных языков и стремления к самосовершенствованию в образовательной области «Иностранный язык»;
* осознание возможностей самореализации средствами иностранного языка;
* стремление к совершенствованию речевой культуры в целом;
* развитие таких качеств, как воля, целеустремлённость, креативность, инициативность, эмпатия, трудолюбие, дисциплинированность;
* формирование общекультурной и этнической идентичности как составляющих гражданской идентичности личности;
* готовность и способность обучающихся к саморазвитию; сформированность мотивации к обучению, познанию, выбору индивидуальной образовательной траектории; ценностно-смысловые установки обучающихся, отражающие их личностные позиции, социальные компетенции;
* умение самостоятельно ставить новые учебные и познавательные задачи на основе развития познавательных мотивов и интересов;
* умение самостоятельно планировать альтернативные пути достижения целей, осознанно выбирать наиболее эффективные способы решения учебных и познавательных задач;
* умение адекватно оценивать трудность выполнения учебной задачи, и собственные возможности её решения;
* владение основами волевой саморегуляции в учебной и познавательной деятельности; готовность и способность противостоять трудностям и помехам;
* умение устанавливать причинно-следственные связи, строить логическое рассуждение, умозаключение (индуктивное, дедуктивное и по аналогии) и выводы;
* умение организовывать учебное сотрудничество и совместную деятельность с учителем и сверстниками: определять цели, распределять функции и роли участников
* владение устной и письменной речью, монологической контекстной речью;
* формирование и развитие компетентности в области использования информационно-коммуникационных технологий (ИКТ-компетенции);
* развитие умения планировать своё речевое и неречевое поведение;
* развитие коммуникативной компетенции, включая умение взаимодействовать с окружающими, выполняя разные социальные роли;
* развитие исследовательских учебных действий, включая навыки работы с информацией: поиск и выделение нужной информации, обобщение и фиксация информации;
* развитие смыслового чтения, включая умение выделять тему, прогнозировать содержание текста по заголовку/ключевым словам, выделять основную мысль, главные факты, опуская второстепенные, устанавливать логическую последовательность основных фактов;
* осуществление регулятивных действий самонаблюдения, самоконтроля, самооценки в процессе коммуникативной деятельности на иностранном языке.
* Развитие умения начинать, вести/поддерживать и заканчивать различные виды диалогов в стандартных ситуациях общения;
* Развитие умения расспрашивать собеседника и отвечать на его вопросы, высказывая своё мнение, просьбу, отвечать на предложение собеседника согласием/отказом в пределах изученной тематики и усвоенного лексико-грамматического материала;
* Развитие умения описывать события/явления, передавать основное содержание, основную мысль прочитанного/услышанного, выражать своё отношение к прочитанному/услышанному, давать краткую характеристику персонажей.
* Развитие умения воспринимать на слух и полностью понимать речь учителя, одноклассников;
* Развитие умения воспринимать на слух и понимать основное содержание несложных аутентичных аудио- и видеотекстов, относящихся к разным коммуникативным типам речи (сообщение/рассказ/интервью);
* Развитие умения воспринимать на слух и выборочно понимать с опорой на языковую догадку, контекст краткие несложные аутентичные прагматические аудио- и видеотексты, выделяя значимую/нужную/необходимую информацию.
* Развитие умения читать аутентичные тексты разных жанров и стилей преимущественно с пониманием основного содержания;
* Развитие умения читать несложные аутентичные тексты разных жанров и стилей с полным и точным пониманием и с использованием различных приёмов смысловой переработки текста (языковой догадки, выборочного перевода), а также справочных материалов; уметь оценивать полученную информацию, выражать своё мнение;
* Развитие умения читать аутентичные тексты с выборочным пониманием значимой/нужной/интересующей информации.
* Развитие умения составлять план, тезисы устного или письменного сообщения; кратко излагать результаты проектной деятельности.
* Привить понимание и использование явлений многозначности слов иностранного языка: синонимии, антонимии и лексической сочетаемости;
* Совершенствовать знание признаков изученных грамматических явлений (видовременных форм глаголов, модальных глаголов и их эквивалентов, артиклей, существительных, степеней сравнения прилагательных и наречий, местоимений, числительных, предлогов);
* Развить умение распознавать и употреблять в устной и письменной речи основных норм речевого этикета (реплик-клише, наиболее распространённой оценочной лексики), принятых в странах изучаемого языка;
* Расширить представление о выдающихся ученых и их вкладе в мировую науку);
* Развивать умение пользоваться определённой стратегией чтения/аудирования в зависимости от коммуникативной задачи (читать/слушать текст с разной глубиной понимания);
* Развивать умение действовать по образцу/аналогии при выполнении упражнений и составлении собственных высказываний в пределах тематики основной школы;
* Развивать умение пользоваться справочным материалом (грамматическим и лингвострановедческим справочниками, двуязычным и толковым словарями, мультимедийными средствами).

Предлагаемые задания отличаются разнообразием и степенью трудности, что позволяет использовать упражнения на разных этапах обучения и соответственно разным уровням знаний студентов.

Лексико-грамматический состав упражнений отвечает требованиям федеральных программ по английскому языку для групп СПО.

**СОДЕРЖАНИЕ КУРСА**

**ПРАКТИЧЕСКОЕ ЗАНЯТИЕ № 1.**

**Тема занятия**

**Биография Ломоносова и его достижения.**

**Цели занятия**

* Совершенствование навыков чтения вслух и про себя.
* Развитие навыков диалогической речи.
* Пополнение словарного запаса.
* Обеспечение в ходе урока освоения новой лексики.
* Совершенствование грамматических навыков( порядок слов в вопросительном предложении)

ЗАДАНИЯ К ПРАКТИЧЕСКИМ ЗАНЯТИЯМ, КОТОРЫЕ НУЖНО ВЫПОЛНИТЬ СТУДЕНТАМ

**I. Фонетическая зарядка.**

Произнесите пословицы и найдите им русские соответствия.

A little knowledge is a dangerous thing // Knowledge has bitter roots but sweet fruits//

Knowledge in youth is wisdom in age// He that nothing questions, nothing learns//  It’s never too late to learn // Scientist — way to skill

Ученье — путь к умению.//Кто ничем не интересуется, ничему не научится.//Без муки нет науки//Ученье в юности — мудрость в старости.//Учиться никогда не поздно.//Мало знаний — опасная вещь.

**II. Речевая зарядка.**

Answer the question

You learn a lot of subjects in the college? What subjects belong to what sciences?

*For example*

* What subjects belong to natural sciences? - (geography, botany, biology)
* What subjects belong to physical sciences? - (physics, mathematics, chemistry)
* What subjects belong to social sciences? - (politics, psychology)

3. Read the definitions of different branches of science and match them with the names of sciences:

* It is the science of the stars. It deals with celestial bodies such as our earth, its moon, the sun, the other planets (astronomy).
* It is the study of the way in which language works (linguistics).
* It is the science of mental life which studies human and animal behavior (psychology).
* It is the science of life. It deals with great diversity of life forms (biology).
* It deals with the scientific observation and study of the phenomena of weather and climate (meteorology).

4.Упражнение на сопоставление.

I will pronounce the names of scientists and you will have to decide which sphere he is famous for.

(Студентам раздаются карточки с предложениями).

1. He discovered the law of gravity when an apple fell on his head.
2. This brave scientist discovered penicillin.
3. He tried to prove that our remote granddads and grannies were monkeys.
4. He was the first man to explain correctly our Solar System.
5. He was the father of the Russian science, an outstanding poet, the founder of Russian literature, a historian & a statesman.
6. He was the outstanding Russian chemist. His greatest discovery was the periodic law of chemical elements.
7. He was one of the greatest physiologists of modern times. His greatest discovery was the conditioned reflex.
8. He was a prominent Italian polymath (эрудит), sculptor, artist, cartographer and writer. This man was ultimately talented in many fields: music, art, mathematics, geography, anatomy, literature.
9. Polish-born physicist is famous for her work on radioactivity.
10. He invented the theory of relativity

Ответы

* Isaac Newton -He discovered the law of gravity when an apple fell on his head.
* Alexander Fleming -This brave scientist discovered penicillin.
* Charles Darwin -He tried to prove that our remote granddads and grannies were monkeys.
* Copernicus- he was the first man to explain correctly our Solar System.
* Mikhail Lomonosov -is the father of the Russian science, an outstanding poet, the founder of Russian literature, a historian & a statesman.
* Dmitri Ivanovitch Mendeleyev- is the outstanding Russian chemist. His greatest discovery was the periodic law of chemical elements.
* Ivan Petrovitch Pavlov -was one of the greatest physiologists of modern times. Pavlov’s greatest discovery was the conditioned reflex.
* Leonardo da Vinci -was a prominent Italian polymath, sculptor, artist, cartographer and writer. This man was ultimately talented in many fields: music, art, mathematics, geography, anatomy, literature.
* Marie Curie- Polish-born physicist is famous for her work on radioactivity.
* Albert Einstein- invented the theory of relativity

**III.Работа с текстом «Ломоносов».** И. П. Агабекян « Английский для инженеров» стр.121

1.Знакомство с новой лексикой.

Academy of Sciences, to return, research laboratory, founder, scientist, to reject, matter, commonly accepted общепринятый, to anticipate прогнозировать, motion, wave theory of light, to state the idea изложить идею, to record, freezing of mercury, Venus, to found, to revive возрождать

Флогисто́н — в истории химии — гипотетическая «сверхтонкая материя» — «огненная субстанция», якобы наполняющая все горючие вещества и высвобождающаяся из них при горении.

2. Перекрестное чтение.

(Текст делится на две части. Первая группа студентов задает 5-6 вопросов второй группе по первой части текста и наоборот. На составление вопросов дается 20 минут).

*Примерные вопросы.*

1. What was Lomonosov? A famous Russian writer, chemist, and astronomer.
2. When and where was he born? November 19, 1711, in Denisovka ( now Lomonosov) near Archangelsk
3. Where did he study? At the university of the Imperial Academy of Sciences, in Germany at the Universities of Magburg and Freiberg.
4. What was his profession in St. Petersburg? He taught chemistry.
5. Why is he often called the founder of Russian science? He was innovator in many fields.
6. What did he anticipate? The kinetic theory of gases.
7. What were his discoveries? He regarded heat as a form of motion, he suggested the wave theory of light, he stated the idea of conservation of matter, he recorded the freezing of Mercury, he observed the atmosphere of Venus.
8. When did he found the Moscow State University ? 1755
9. What book did he write? Grammar that reformed the Russian literary language by combining Old Church Slavonic with modern language.
10. When did he publish the history of Russia? 1760
11. What art did he revive? The art of Russian mosaic and also built a mosaic and colured-glass factory/
12. Did people abroad know about his achievements? Most of his achievements were unknown outside Russia.

3.Наsзовите (выпишите 12 достижений ученого)

1. Built a teaching and research laboratory.
2. Anticipated the kinetic theory of gases.
3. He regarded heat as a form of motion
4. he suggested the wave theory of light,
5. he stated the idea of conservation of matter,
6. he recorded the freezing of Mercury,
7. he observed the atmosphere of Venus.
8. he helped to found the Moscow State University
9. He wrote a Grammar that reformed the Russian literary language by combining Old Church Slavonic with modern language
10. He published the first history of Russia
11. he revived the art of Russian mosaic
12. also built a mosaic and colured-glass factory

4.Игра «Пресс-коференция»

Один из учащихся выходит к доске и выполняет роль родственника Ломоносова. Студенты (в роли журналистов задают ему вопросы)

*Примерные вопросы*

1. When and where was he born? *November 19, 1711, in Denisovka ( now Lomonosov) near Archangelsk*
2. Where did he study? *At the university of the Imperial Academy of Sciences, in Germany at the Universities of Magburg and Freiberg.*
3. What was his profession in St. Petersburg? *He taught chemistry.*
4. Why is he often called the founder of Russian science? *He was innovator in many fields*
5. What were his discoveries? *He regarded heat as a form of motion, he suggested the wave theory of light, he stated the idea of conservation of matter, he recorded the freezing of Mercury, he observed the atmosphere of Venus.*
6. Did he write any books? *Grammar that reformed the Russian literary language by combining Old Church Slavonic with modern language. the history of Russia 1760*
7. Was he interested in arts? *The art of Russian mosaic and also built a mosaic and colured-glass factory.*
8. Did people abroad know about his achievements? *Most of his achievements were unknown outside Russia.*

**IV. Повторение грамматического материала.**

**V.Подведение итогов урока и задание на дом.**

Выучить лексику и правило.

Подготовить рассказ об ученом.

Примерный план рассказа

When and where was the scientist born? What was the scientist's childhood like? How and where was the scientist educated? Why is the scientist famous? What did he or she invent and/or discover? With what other scientists did the scientist collaborate or work? What are some of the scientist's famous quotes? When did the scientist die? If he or she is still alive, what is he or she currently doing? What other interesting facts did you discover about your scientist?

**ПРАКТИЧЕСКОЕ ЗАНЯТИЕ № 2 .**

**Тема занятия**

**Александр Белл и другие знаменитые ученые.**

**Цели занятия**

* развитие навыков устной речи
* обеспечение в ходе урока усвоения новой лексики
* совершенствование техники чтения про себя
* совершенствование грамматических навыков

ЗАДАНИЯ К ПРАКТИЧЕСКИМ ЗАНЯТИЯМ, КОТОРЫЕ НУЖНО ВЫПОЛНИТЬ СТУДЕНТАМ

**I.Речевая зарядка.**

Answer the question. Why do people become scientists? (На доске)

* I think it is fun
* They want to have unique knowledge
* They like to create order out of chaos
* They enjoy intellectual challenge
* They want to have freedom to do what they like
* They want to uncover the mysteries of nature
* They feel thrilled when they learn new things
* They like working for the benefit of society

**II. Аудирование.**

Every year hundreds of scientific discoveries are introduced in industry, agriculture, medicine, education & service. New inventions are appearing every day to make our lives easier, longer, warmer, speedier & so on. The development of science has increased man’s knowledge of nature so greatly that now it influences all sides of human life.

All these achievements were absolutely impossible without inventions & discoveries made great scientists: mathematicians, physicists, chemists, biologists, linguists, historians, etc. A lot of discoveries have been made by them in different fields of science & engineering.

1 Аудирование текста и выполнение задания.

*You are going to listen to a part of a radio programme about the lives of these famous inventors. Read questions 1-8 and match each question to the person A-C that is refers to.*

***A. Alexander Graham Bell B. Maria Mitchell C. Jan Szczepanik***

1. Who came from a big family? B

2. Who received a medal from a king? C

3. Whose scientific interests were not grounded in family traditions? C

4. Whose achievements were appreciated outside his/her country? C

5. Whose research was concentrated on one field of science? B

6. Who had planned a different career? A

7. Who worked as a teacher? A

8. Whose birthplace is open to the public? B

**Alexander Graham Bell as a young boy.**

The telephone inventor Alexander Graham Bell liked mathematics, and science, but he was easily bored at school. He was much more interested in experimenting and discovering things on his own. One of his first inventions was a simple machine imitating the human voice. Alexander built it with his brother Melville when they were still children.

As a teenager, Bell wanted to become an actor or a sailor. Instead, he worked, like his father, as a speech therapist, and taught deaf people. Bell’s studies of the human ear and voice vibrations, and years of experiments resulted in 1876 in the first telephone conversation between Bell and his assistant Tomas Watson.

Alexander Bell’s lifelong interest in nature and science also led to a variety of other invention ideas, including experiments with flight and designing aeroplanes.

**Maria Mitchell**

Maria Mitchell was one of the most famous American scientists of the 19th century. Born in 1818, in Massachusetts, Maria was the third child of a family with ten children. Her father was a dedicated astronomer and teacher, and he encouraged Maria’s scientific interests. In 1847, when she was looking at the sky through a telescope from the roof of her parents’ house, she discovered a new comet. A year later she became the first woman admitted to the American Academy of Arts and Sciences, and the first female professor of astronomy in the USA.

After her death, the Maria Mitchell Astronomical Society was created as tribute to her memory. The house where she was born was turned into a museum.

**Jan Szczepanik**

There was an inventor who is sometimes called the “Polish Edison”. His name was Jan Szczepanik, and he was born in a poor uneducated family in a small village in the south of Poland.

During the 54 years of his life, Szczepanik got a few hundred patents and made over fifty inventions, many of which are still used today, especially in colour photography, film production and television. He also worked on a moving wing aircraft, an airship and a submarine.

Szczepanik patented his inventions in Germany and England. The American novelist Mark Twain wrote two articles about his achievements, and the King of Spain gave him an order after a silk bullet-proof vest шелковый бронежилет invented by the `Polish Edison` had saved his life.

2.Чтение и перевод текстов.

**III. Работа с лексикой.**

1.Образуйте от слов , обозначающих науку, слова , обозначающие ученых

science – scientist

chemistry – chemist

physics – physicist

biology – biologist

linguistics – linguist

psychology - psychologist

mathematics – mathematician

history – historian

politics – politician

music – musician

astronomy – astronomer

geography – geographer

2.Составьте предложения с этими словами.

**IV.Повторение грамматического материала.**

**V.Подведение итогов урока и задание на дом.**

Рассказ о знаменитом изобретении.

**ПРАКТИЧЕСКОЕ ЗАНЯТИЕ № 3.**

**Тема**

**Александр Попов и изобретение радио.**

**Цели занятия.**

* Совершенствование навыков чтения вслух и про себя.
* Развитие навыков диалогической речи.
* Развитие умения употреблять лексику по теме урока.
* Пополнение лексического запаса.

ЗАДАНИЯ К ПРАКТИЧЕСКИМ ЗАНЯТИЯМ, КОТОРЫЕ НУЖНО ВЫПОЛНИТЬ СТУДЕНТАМ

**I.Речевая зарядка.**

Tell without what technologies people can’t imagine their life Explain why you cannot imagine your life without these technologies. How do they make your life easier?

Example 1: I can’t imagine mу life without a refrigerator. If I didn't have it I wouldn’t be able to keep food cold and fresh and I would have to do shopping every day.

Example 2: I can’t imagine my life without an automatic washer because it is my assistant in daily work. It does the washing faster. It helps me to relax after a hard day's work and gives me an opportunity to have more free time reading and communicating with my relatives and friends.

Microwave oven, washing machine, calculator, computer, car, TV set, radio, video camera,

Do you listen to the radio? Do you know who invented it?

**II. Работа с текстом «Александр Попов».**

Alexander Stepanovich Popov was a Russian physicist who is widely credited in Russia and European countries as an inventor of the radio. Popov was born in 1859 and came from a religious family; his father was a priest and Alexander studied at a seminary and intended to join the priesthood. He developed an interest in mathewhmatics and physics and then enrolled in St. Petersburg University’s( Faculty of Physics and Mathematics). He graduated in 1882 and worked briefly as a laboratory assistant. Then he was offered a job as a teacher at the university. He refused this offer because the salary was too small and also because he was more interested in research. Instead he joined the Russian Navy Torpedo School in Kronstadt as a teacher and head of the laboratory where he taught the concepts of electricity and magnetism to naval specialists.

During that time, there were many developments in the field of radio technology. The principles of invisible electromagnetic radiation were discovered by Heinrich Hertz in 1888. Popov read his paper along with the works of other physicists such as Édouard Branly who discovered principles of electromagnetic discharge and Oliver Lodge who invented a device known as the coherer. Коге́рер в современном понимании — это резистор, сопротивление которого по командам управления принимает только крайние значения.

Такой элемент в электронике называется ключом. Popov made significant contributions to the field of electromagnetism and improved the coherer by attaching an antenna to it which made it possible to transmit radio waves over short distances. In 1893, he visited the World’s Columbian Exposition held in Chicago, United States where he met and discussed his work with other experts in the field of radio technology.

In 1895, Alexander Popov made the first public demonstration of electromagnetic wave reception and the following year he published a paper and depicted his findings in a detailed diagram. The same year, an Italian named Guglielmo Marconi publicly demonstrated his invention and the following year he received a patent for it. Popov used his apparatus to send the first long distance signal at a distance of six miles that is roughly 10 km. This was three years before Marconi made his famous transatlantic communication so we know that Popov’s claims to the invention are legitimate.

Popov, however, was not solely focused on the invention of the radio; he was also involved in the study of thunderstorms and lightning. By this time, Marconi consolidated his research and applied for a patent, which he was granted. Popov’s claim to the invention was defended by the Russian Physicochemical Society but Marconi is generally credited with the invention of radio technology worldwide. However, there is little doubt that Popov independently devised the apparatus without any help from Marconi’s published material.

The Russian Navy installed the radio devices that Popov had invented which were very useful in communication and sending distress signals. In 1900, a radio station was established at Hogland island to provide two way communication between the Russian navy and the battleship General-Admiral Apraksin, which helped to save the life of the crew when they ran into bad weather. In 1901, Popov was appointed professor at the St. Petersburg Institute of Electrical Engineering and in 1905 he was made a director there. He became ill in 1905 and died in January 1906 due to a brain hemorrhage. His contributions have been widely honored since his death. The “conference room Alexander Stepanovich Popov” was established in the ITU headquarters in Geneva.  ITU (The International Telecommunication Union)

Задание 1 Найти в тексте выражения

1. Изобретатель- an inventor
2. Священник- a priest
3. Намереваться-intend
4. был зачислен-was enrolled
5. принцип-concept
6. невидимая электромагнитная радиация- invisible electromagnetic radiation
7. разряд- discharge
8. делать значительный вклад-to make significant contributions
9. усовершенствовать-improve
10. прикреплять-attach
11. передавать радиоволны на короткие расстояния- transmit radio waves over short distances
12. принятие электромагнитных волн- electromagnetic wave reception
13. отображать-depict
14. претензия-claim
15. законный- legitimate
16. заниматься- to be involved
17. гроза-thunderstorm
18. молния- lightning
19. обобщать-consolidate
20. подал заявку на патент- applied for a patent
21. был предоставлен- was granted
22. независимо- independently
23. придумать-devise
24. сигнал бедствия-distress signal
25. учреждать-establish
26. экипаж- crew
27. был назначен- was appointed
28. кровоизлияние в мозг- a brain hemorrhage
29. чтить-honor
30. штаб- headquarters

Задание 2 Что произошло

1859- Popov was born

1882 - He graduated from St. Petersburg University’s( Faculty of Physics and Mathematics)

1888 - The principles of invisible electromagnetic radiation were discovered by Heinrich Hertz

1895- Alexander Popov made the first public demonstration of electromagnetic wave reception

1900 - A radio station was established at Hogland island to provide two way communication between the Russian navy and the battleship General-Admiral Apraksin, which helped to save the life of the crew when they ran into bad weather.

1901- Popov was appointed professor at the St. Petersburg Institute of Electrical Engineering

1905- He became ill in 1905

1906- Died in January 1906 due to a brain hemorrhage

Задание 3 Придумать 10 вопросов к игре « Пресс конференция»

1. What were his parents? *Came from a religious family; his father was a priest and Alexander studied at a seminary and intended to join the priesthood.*
2. What was his job after the university? *He graduated in 1882 and worked briefly as a laboratory assistant. Then he was offered a job as a teacher at the university. He refused this offer because the salary was too small and also because he was more interested in research.Instead he joined the Russian Navy Torpedo School in Kronstadt as a teacher and head of the laboratory where he taught the concepts of electricity and magnetism to naval specialists.*
3. What do you know about his achievements? *Popov made significant contributions to the field of electromagnetism and improved the coherer by attaching an antenna to it which made it possible to transmit radio waves over short distances.*
4. Did he travel a lot? *In 1893, he visited the World’s Columbian Exposition held in Chicago, United States where he met and discussed his work with other experts in the field of radio technology.*
5. When did he make his first demonstration of radio waves? *In 1895, Alexander Popov made the first public demonstration of electromagnetic wave reception and the following year he published a paper and depicted his findings in a detailed diagram.*
6. What proves that his invention is legitimate? *Popov used his apparatus to send the first long distance signal at a distance of six miles that is roughly 10 km. This was three years before Marconi made his famous transatlantic communication so we know that Popov’s claims to the invention are legitimate.*
7. What did he investigate except radio*? Popov, however, was not solely focused on the invention of the radio; he was also involved in the study of thunderstorms and lightning?*
8. Who helped him to devise radio? *However, there is little doubt that Popov independently devised the apparatus without any help from Marconi’s published material.*
9. How can you prove that radio invented by Popov is useful? *The Russian Navy installed the radio devices that Popov had invented which were very useful in communication and sending distress signals. In 1900, a radio station was established at Hogland island to provide two way communication between the Russian navy and the battleship General-Admiral Apraksin, which helped to save the life of the crew when they ran into bad weather.*
10. What can you tell about his career? *In 1901, Popov was appointed professor at the St. Petersburg Institute of Electrical Engineering and in 1905 he was made a director there.*
11. Why did he die? *He became ill in 1905 and died in January 1906 due to a brain hemorrhage.*
12. Is he honored abroad? *His contributions have been widely honored since his death. The “conference room Alexander Stepanovich Popov” was established in the ITU headquarters in Geneva.  ITU (The International Telecommunication Union)*

**III. Повторение грамматического материала.**

**IV. Подведение итогов урока и задание на дом.**

Выучить лексику.

**ПРАКТИЧЕСКОЕ ЗАНЯТИЕ № 4.**

**Тема**

**Джеймс Ватт.**

**Цели занятия.**

* Совершенствование навыков чтения вслух и про себя.
* Развитие навыков диалогической речи.
* Пополнение словарного запаса.
* Совершенствование грамматических навыков.

ЗАДАНИЯ К ПРАКТИЧЕСКИМ ЗАНЯТИЯМ, КОТОРЫЕ НУЖНО ВЫПОЛНИТЬ СТУДЕНТАМ

**I.Речевая зарядка.**

What famous scientists do you know/remember?

Can you name their inventions?

**II. Работа с текстом «James Watt».** (И. П. Агабекян « Английский для инженеров» стр.119)

**Текст**

James Watt, a famous inventor and mechanical engineer, was born on January 19, 1736, in Scotland. He worked as a mathematical-instrument maker from the age of 19 and soon became interested in improving the steam engine, which was used at that time to pump out water from mines.

Watt is known for his improvements of the steam engine. He determined the properties of steam, especially the relation of its density to its temperature and pressure, and designed a separate condensing chamber for the steam engine that prevented large losses of steam in the cylinder. For this device and other improvements on steam engine Watt received his first patent in 1769.

Watt continued his research and patented rotary engine for driving various types of machinery; the double-action engine, in which steam is admitted alternately into both ends of the cylinder; and the steam indicator, which records the steam pressure in the engine. He retired from the firm manufacturing steam engines in 1800 and devoted himself entirely to research work.

In 1788 Watt invented the centrifugal or flyball governor, which automatically regulated the speed of an engine. It uses the feedback principle of a servomechanism, linking output to input, which is the basic concept of automation. The watt, the union of power, was named in his honour.

1.Знакомство с новой лексикой.

Famous, inventor, to improve, to be known, improvement, steam engine, to determine, property, relation, density, pressure, to prevent, loss,device,to receive, research, rotary engine, double-action, to admit, to record, to retire from, to devote, entirely, to invent , feedback principal, to link, basic concept, unit, to be named in one’s honour

2.Конкурс на лучшего чтеца и переводчика.

3. Перекрестное чтение.

(Текст делится на две части. Первая группа студентов задает 5 вопросов второй группе по первой части текста и наоборот. На составление вопросов дается 10 минут).

*Примерные вопросы.*

What was James Watt? A famous inventor and mechanical engineer

When and where was he born? January 19, 1736, Scotland

What was his profession? Mathematical instrument maker

What was the steam engine used for? To pump out water from mines

For what device did he receive his first patent? [ˈpeɪtənt] steam engine

What else did he patent? Rotary engine

When did he retire from the firm manufacturing steam engines? 1800

What did he devote himself to? Research work

What did he invent in 1788? The centrifugal or fly ball governor центробежный или шаровой регулятор

What unit power was named in his honour? Watt

4.Назовите (выпишите 6 достижений ученого)

1. Improved the steam engine
2. Determined the properties of steam
3. Designed a separate condensing chamber конденсационная камера
4. Patented rotary engine for driving various types of machinery
5. Patented the double-action engine
6. Invented the centrifugal or flyball governor центробежный или шаровой регулятор

5.Игра "Пресс-конференция". .

*Примерные вопросы*

1. When and where were you born?
2. Did you have any other professions except the present one?
3. What was the steam engine used for? To pump out water from mines
4. For what device did you receive your first patent? [ˈpeɪtənt]
5. What else did you patent?
6. In what companies did you work?
7. What do you devote your free time to?
8. What are your most famous inventions?
9. Переведите с русского языка на английский.

Джеймс Уотт, известный изобретатель и инженер-механик, родился 19 января 1736 года в Шотландии. Он работал математиком-приборостроителем с 19 лет и вскоре заинтересовался усовершенствованием паровой машины, которая использовалась в то время для откачки воды из шахт. Уатт известен своими усовершенствованиями парового двигателя. Он определил свойства пара, особенно отношение его плотности к температуре и давлению, и сконструировал отдельную

конденсационную камеру для паровой машины, которая предотвращала большие потери пара в цилиндре. На это устройство и другие усовершенствования парового двигателя Уатт получил свой первый патент в 1769 году. Уотт продолжил свои исследования и запатентовал роторный двигатель для привода различных типов машин; двигатель двойного действия, в котором пар поочередно поступает в оба конца цилиндра; и индикатор пара, который регистрирует давление пара в двигателе. В 1800 году он ушел из фирмы по производству паровых двигателей ии полностью посвятил себя исследовательской работе. В 1788 году Уатт изобрел центробежный или флайбольный регулятор, который автоматически регулировал скорость двигателя. Он использует принцип обратной связи сервомеханизма, связывающего выход с входом, что является основной концепцией автоматизации. В его честь был назван Уатт, единица мощности.

1. Выполнение грамматических заданий.  
     
   Составьте пять типов вопросов к следующему предложению.  
   Watt worked as a mathematical- instrument maker from the age of 19.  
     
   Перепишите предложения и переведите их, принимая во внимание различные функции слов, it, that, one.  
   1) It is easy to discuss this question. It is very simple.  
   2) It is necessary to boil water for our experiment. Then it will be pure.  
   3) One should be careful when working with chemical substances.

**III. Подведение итогов урока и задание на дом.**

Выучить записи в тетради.

**ПРАКТИЧЕСКОЕ ЗАНЯТИЕ № 5.**

**Тема занятия**

**Менделеев - создатель периодической таблицы.**

**Цели занятия**

* Пополнение лексического запаса.
* Совершенствование навыков чтения вслух и перевода.
* Развитие навыков монологической речи и диалогической речи.
* Совершенствование грамматических навыков.

ЗАДАНИЯ К ПРАКТИЧЕСКИМ ЗАНЯТИЯМ, КОТОРЫЕ НУЖНО ВЫПОЛНИТЬ СТУДЕНТАМ

**I.Речевая зарядка.**

Рассказ об ученом.

**II .Работа с текстом Менделеев. (**И.П. Агабекян «Английский для инженеров» стр.122-124)

1.Знакомство с новой лексикой.( Запись в словари) стр.124

2.Чтение и перевод текста.

Dmitry Ivanovich Mendeleyev is a famous Russian chemist. He is best known for his development of the periodic table of the properties of the chemical elements. This table displays that elements' properties are changed periodically when they are arranged according to atomic weight.

Mendeleyev was born in 1834 in Tobolsk, Siberia. He studied chemistry at the University of St. Petersburg, and in 1859 he was sent to study at the University of Heidelberg. Mendeleyev returned to St. Petersburg and became Professor of Chemistry at the Technical Insti­tute in 1863. He became Professor of General Chemistry at the University of St. Petersburg in 1866. Mendeleyev was a well-known teacher, and, because there was no good textbook in chemistry at that time, he wrote the two-vol­ume «Principles of Chemistry» which became a classic textbook in chemistry.

In this book Mendeleyev tried to classify the elements according to their chemical properties. In 1869 he pub­lished his first version of his periodic table of elements. In 1871 he published an improved version of the peri­odic table, in which he left gaps for elements that were not known at that time. His table and theories were proved later when three predicted elements: gallium, germanium, and scandium were discovered.

Mendeleyev investigated the chemical theory of solu­tion. He found that the best proportion of alcohol and water in vodka is 40%. He also investigated the thermal expansion of liquids and the nature of petroleum.

In 1893 he became director of the Bureau of Weights and Measures in St. Petersburg and held this position until his death in 1907.

3 Перекрестное чтение.

(Текст делится на две части. Первая группа студентов задает 5-6 вопросов второй группе по первой части текста и наоборот. На составление вопросов дается 20 минут).

4.Назовите (выпишите 7 достижений ученого)

1. development of the periodic table of the properties of the chemical elements
2. he wrote the two-vol­ume «Principles of Chemistry» which became a classic textbook in chemistry.
3. In 1869 he pub­lished his first version of his periodic table of elements.
4. In 1871 he published an improved version of the peri­odic table, in which he left gaps for elements that were not known at that time.
5. Mendeleyev investigated the chemical theory of solu­tion. He found that the best proportion of alcohol and water in vodka is 40%.
6. He also investigated the thermal expansion of liquids and the nature of petroleum.
7. In 1893 he became director of the Bureau of Weights and Measures in St. Petersburg and held this position until his death in 1907.

5.Игра «Пресс-коференция»

*Примерные вопросы*

1. What is he best known for? and where was he born? *He is best known for his development of the periodic table of the properties of the* *chemical elements.*
2. Where did he study? *He studied chemistry at the University of St. Petersburg, and in 1859 he was sent to study at the University of Heidelberg. He studied chemistry at the University of St. Petersburg, and in 1859 he was sent to study at the sent to study at the University of Heidelberg.*
3. What was his profession in St. Petersburg? *Mendeleyev returned to St. Petersburg and became Professor of Chemistry at the Technical Insti­tute in 1863. He became Professor of General Chemistry at the University of St. Petersburg in 1866.He taught chemistry.*
4. What were his achievements? *In 1869 he pub­lished his first version of his periodic table of elements. In 1871 he published an improved version of the peri­odic table, in which he left gaps for elements that were not known at that time. His table and theories were proved later when three predicted elements: gallium, germanium, and scandium were discovered. He also investigated the thermal expansion of liquids and the nature of petroleum.*
5. Did he write any books? *he wrote the two-vol­ume «Principles of Chemistry» which became a classic textbook in chemistry. In this book Mendeleyev tried to classify the elements according to their chemical properties.*

**III.Повторение грамматического материала.**

**IV Подведение итогов урока, рефлексия и задание на дом.**

Выучить слова и выражения. Подготовить рассказ или презентацию 10 слайдов об ученом (15-20 предложений).

# ПРАКТИЧЕСКОЕ ЗАНЯТИЕ № 6.

**Тема занятия**

**История развития вычислительной техники.**

**Цели занятия**

* Пополнение словарного запаса.
* Совершенствование грамматических навыков.
* Развитие навыков чтения про себя.
* Совершенствование навыков перевода.

ЗАДАНИЯ К ПРАКТИЧЕСКИМ ЗАНЯТИЯМ, КОТОРЫЕ НУЖНО ВЫПОЛНИТЬ СТУДЕНТАМ

**I.Речевая зарядка.**

Презентация или сообщение об ученом .

**II.Работа с лексикой.**

Match the words and word-combinations from the columns.

1.versatility интегральная микросхема (чип)

2.capacitor выполнять, осуществлять

3.binary circuit последовательность

4.computation счеты

5.dump многогранность, многосторонность

6.accuracy конденсатор

7.abacus точность, правильность

8.carry out бинарная (двоичная) цепь

9.succession вычисление, расчет

10.integrated circuit дамп, разгрузка

Translate the given sentences.

1. The first use of the word "computer" was recorded in 1613, referring to a person who carried out calculations.
2. Examples of early mechanical calculating devices included abacuses, slide-rules and the Antikythera mechanism.
3. Many scientific computing needs were met by increasingly sophisticated analog computers, which used a direct mechanical or electrical model of the problem as a basis for computation.
4. Stibitz invented and built a relay-based calculator. He dubbed the "Model K" which was the first to use binary circuits to perform an arithmetic operation.
5. Computers using vacuum tubes as their electronic elements were in use throughout the 1950s.
6. In 1801, Joseph Marie Jacquard made an improvement in the textile loom by introducing a series of punched paper cards which allowed his loom to weave intricate patterns automatically.
7. Jacquard's loom was an important step in the development of computers because the use of punched cards to define woven patterns can be viewed as an early, limited form of programmability.
8. These computers were not programmable and generally lacked the versatility and accuracy of modern digital computers.

**III. Работа с текстом.**

1. Read the text to yourself and find the paragraphs, informing about

* the first mention of the word "computer" and its meaning;
* the first inventions based on the principles of mechanics (the invention of Geron);
* the stages of development of a modern computer.

The first use of the word "computer" was recorded in 1613, referring to a person who carried out calculations, or computations, and the word continued to be used in that sense until the middle of the 20th century. From the end of the 19th century the word began to take on its more familiar meaning, describing a machine that carries out computations.

The history of a modern computer began with two separate technologies-automated calculation and programmability — but no single device can be identified as the earliest computer, partly because of the inconsistent application of that term. Examples of early mechanical calculating devices include the abacus, the slide rule and the Antikythera mechanism (which dates from about 150—100 B.C.). Hero of Alexandria (he lived about 150 B.C.) built a mechanical theater which performed a play lasting 10 minutes and was operated by a complex system of ropes and drums that might be considered to be as means of deciding which parts of the mechanism performed the actions and the time. This is the essence of programmability.

The "castle clock", an astronomical clock invented by **Al-Jazari** in 1206, is considered to be the earliest programmable analog computer. It displayed the zodiac, the solar and lunar orbits, a moon- shaped pointer travelling across a gateway causing automatic doors to open every hour, and five robotic musicians who played music when struck by levers operated by a camshaft attached to the water wheel. The length of days and nights could be re-programmed to compensate for the changing lengths of days and nights throughout the year.

In 1801, **Joseph Marie Jacquard** made an improvement in the textile loom by introducing a series of punched paper cards which allowed his loom to weave intricate patterns automatically. As the result, Jacquard's loom was an important step in the development of computers because the use of punched cards to define woven patterns can be viewed as an early form of programmability.

It was the fusion of automatic calculation with programmability that produced the first recognizable computers. In 1837, **Charles Babbage** was the first to conceptualize and design a fully program­mable mechanical computer, his analytical engine.

In the late 1880s **Herman Hollerith** invented the recording of data on a machine readable medium. Prior uses of the machine readable media had been used for control, but not for data. After some initial trials with paper tape, he settled on punched cards. To process these punched cards he invented a tabulator, and key punch machines. These three inventions were the foundation of the modern information processing industry.

During the first half of the 20th century, many scientific computing needs were met by increasingly sophisticated analog computers, which used a direct mechanical or electrical model of the problem as the basis for computation. However, these computers were not programmable and generally lacked the versatility and accuracy of modern digital computers.

**George Stibitz** is internationally recognized as the father of the modern digital computer. While working at Bell Labs in November of 1937, Stibitz invented and built a relay-based calculator. He dubbed the "Model K" (for "kitchen table", on which he had assembled it), which was the first to use binary circuits to perform an arithmetic operation. Later models added greater sophistications including complex arithmetic and programmability.

A succession of more powerful and flexible computing devices were constructed in the 1930s and 1940s, gradually adding the key features that are seen in modern computers. The use of digital electronics (largely invented by **Claude Shannon** in 1937) and more flexible programmability were vitally important steps, but defining one point along this road as "the first digital electronic computer" is difficult (Shannon 1940). Notable achievements include:

- **Konrad Zuse's** electromechanical "Z machines". The Z3 (1941) was the first working machine featuring binary arithmetic, including floating point arithmetic and a measure of programmability.

- The non-programmable **Atanasoff**-Berry Computer (1941) which used vacuum tubes based on the computation, binary numbers, and regenerative capacitor memory.

- The secret British Colossus computers (1943) which had limited programmability but demonstrated that the device using thousands of tubes could be reasonably reliable and electronically reprogrammable. It was used for breaking German wartime codes.

- **Harvard Mark** I (1944), a large-scale electromechanical computer with limited programmability.

- The US Army's Ballistics Research Laboratory ENIAC (1946), which used decimal arithmetic and is sometimes called the first general purpose electronic computer (since Konrad Zuse's Z3 of 1941 used electromagnets instead of electronics).

A number of projects to develop computers based on the stored-program architecture commenced around this time, the first of these being completed in Great Britain. The first to be demonstrated was SSEM or Manchester Small-Scale Experimental Machine (or "Baby"), while EDSAC, completed a year after SSEM, was the first practical implementation of the stored program design.

Computers using vacuum tubes as their electronic elements were in use throughout the 1950s, but by the 1960s they had been largely replaced by transistor-based machines, which were smaller, faster, cheaper to produce, required less power, and were more reliable. The first transistorized computer was demonstrated at the University of Manchester in 1953. In the 1970s, integrated circuit technology and the subsequent creation of microprocessors, such as Intel 4004, further decreased size and cost and further increased speed and reliability of computers.

By the 1980s, computers became sufficiently small and cheap to replace simple mechanical controls in domestic appliances such as washing machines. The 1980s also witnessed home computers and ubiquitous personal computers. With the evolution of the Internet, personal computers are becoming as common as telephones or television in the household.

Modern smartphones are fully-programmable computers in their own right, and as of 2009, may well be the most common form of such computers in existence.

On June, 2008, the number of personal computers in use worldwide hit one billion, while another billion is expected to be reached by 2014. Mature markets like the United States, Western Europe and Japan accounted for 58 percent of the worldwide installed PCs. The emerging markets are expected to double their installed PCs by 2013 and to take 70 percent of the second billion PCs.

**Выполнение заданий по тексту.**

1.Answer the questions.

1. When was the word "computer" used for the first time? What did it mean?
2. The history of modern computers began with two separate technologies. What are they?
3. What were the first mechanical calculating devices?
4. A succession of more powerful and flexible computing devices were constructed in the 1930s and 1940s. Name them.
5. When and where was the first transistorised computer demonstrated?

2.Complete the sentences, using the text. Translate into Russian. Retell briefly.

1. The first use of the word "computer" was recorded in 1613, referring to ....
2. The history of modern computers began with ....
3. Examples of early mechanical calculating devices include ... .
4. In 1801, Joseph Marie Jacquard made an improvement in the textile loom by ....
5. In 1837, Charles Babbage was the first to conceptualize and design a....
6. During the first half of the 20th century, many scientific computing needs were met by ....
7. George Stibitz is internationally recognized as the father of... .
8. A succession of more powerful and flexible computing devices were constructed in the 1930s and 1940s, gradually ... .
9. The use of digital electronics and more flexible programmability were vitally important steps but...
10. Notable achievements include: ... .

11. A number of projects to develop computers based on the stored- program architecture commenced

around …

12. Computers using vacuum tubes as their electronic elements were in use

13. By the 1980s, computers had become sufficiently small and cheap to ... .

14. On June 2008, the number of personal computers in use worldwide hit... .

15. The emerging markets are expected to double their installed PCs by 2013 and... .

3. Translate the following sentences into English. Use the information from the text.

1. Счеты и логарифмическая линейка были первыми механическими устройствами для вычислений.
2. Первое программное механическое устройство был разработан в 1837 году.
3. Джордж Стибитс - создатель современного цифрового компьютера.
4. В период с 1930-х по 1940-е годы был разработан целый ряд более мощных на тот момент вычислительных устройств.
5. Компьютеры, работающие на радиоэлектронных лампах в качестве электронных элементов, использовались на протяжении всех 50-х годов.
6. Первый транзисторный компьютер был продемонстрирован в Манчестере в 1953 году.
7. К июню 2008 года количество используемых персональных компьютеров в мире достигло

1 миллиарда.

1. Большое количество процессоров встроено в другие устройства, например, в бытовую технику, медицинское оборудование, сотовые телефоны.
2. Лишь малая часть всех компьютеров - это настольные и мобильные персональные компьютеры.

**III. Повторение грамматики.**

**IV. Подведение итогов урока и задание на дом.**

Подготовить сообщение на одну из тем:

* первые механические вычислительные устройства
* преимущества компьютеров, построенных на базе транзисторов

# ПРАКТИЧЕСКОЕ ЗАНЯТИЕ № 7.

**Тема занятия**

**Биография и достижения Ньютона.**

**Цели занятия**

* Пополнение словарного запаса.
* Совершенствование грамматических навыков.
* Развитие навыков чтения про себя.
* Совершенствование навыков перевода.

ЗАДАНИЯ К ПРАКТИЧЕСКИМ ЗАНЯТИЯМ, КОТОРЫЕ НУЖНО ВЫПОЛНИТЬ СТУДЕНТАМ

**I.Речевая зарядка.**

**Повторение темы предыдущего урока.**

**II.Работа с текстом.** И. П. Аганбегян Английский язык стр.220

The great English scientist Isaac Newton was born in the village of Woolthorpe, not far from the university town Cambridge on December 25, 1642. Little Isaac was left to the care of his mother, grandmother and uncle who sent him to school. In his early years young Isaac made various things. He made a clock that worked by water. He also made a sun-dial. When Isaac grew older, he took a considerable interest in mathematics. His ability as mathematician and physicist was very important. His first physical experiment was carried out when he was sixteen years old.  
  
On June 5, 1661 Newton entered the University of Cambridge where he studied mathematics. Soon he became famous for his contribution to mathematics by the time he was twenty-one. When Newton was twenty-two years old he began studying the theory of gravitation. In 1665, while he was on a visit in his native village, he saw an apple fall from a tree and began wondering what force made the apple fall.  
  
At Cambridge Newton read with great interest the writings of Galileo, he knew the geometry of Descartes, he worked out the methods of calculus. So when he began to think «of gravity extending to the orbit of the moon» he immediately put this idea to the test of calculation. Newton performed many experiments with light and found that white light was made up of rays of different colours. He invented a reflecting telescope, that was very small in diameter but magnified objects to forty di ameters. Newton developed a mathematical method which is known as the Binomial Theorem and also differential and integral calculus.  
  
In 1669 Newton was appointed professor and began lectures on mathematics and optics at Cambridge and continued his work on the problem of gravitation. In 1673 Newton, gathered together all his earlier calculations and succeeded in completing his whole theory. He examined the attraction of one mass by another. He showed that a massive sphere here attracts another as if the whole mass were in the centre. This was of great importance it enabled Newton to treat the problems of the sun, the moon and earth like problems of geometry.

He at last justified the method of treatment which he had first adopted for the problem of the Earth and Moon. The proof of his universe square law was not complete. He had demonstrated that the gravitation of the earth extends as far as the moon and keeps it in its orbit. He demonstrated that this pull is in accordance with the same law as that by which a stone falls to the ground, namely gravity. Newton's great work «Elements of Natural Philosophy» was published only in the middle of 1687.

Newton’s law of universe squares joined in one simple mathematical statement the behavior of the planets as well as 42 of bodies on this earth. It was the first synthesis of physical knowledge. As such his contribution to science is unique. Isaac Newton died in 1727 at the age of 85. He was buried with honours as a national hero. It was the first time that national honours of this kind had been accorded in England to a man of science.

Задание 1. Какие изобретения и открытия не являются изобретениями и открытиями Ньютона.

1. A reflecting telescope
2. Differential and integral calcusus
3. Invented the theory of relativity
4. Developed the law of universe squares
5. Binomial theorem
6. Published the work “Elements of natural philosophy”
7. Discovered conditioned reflex
8. Explained the solar system
9. Demonstrated the law of gravitation
10. Made a sun-dial
11. Made clock that worked by water
12. Performed experiments with light

Задание 2. Напишите краткую биографию Ньютона, заполнив пропуски и ответив на вопросы.

Was born (when, where)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Who brought him up\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

His interests and abilities in childhood\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Education(1661)\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Inventions\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Career (1669, 1673,1678\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Death\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Задание3.Найти в тексте и выписать выражения.

1. был оставлен на попечение
2. солнечный диск
3. проявил значительный интерес к математике
4. способности
5. был проведен
6. вклад в математику
7. теория гравитации
8. распространяющейся на орбиту луны
9. немедленно
10. выполнил много экспериментов
11. лучи
12. увеличивать
13. был назначен профессором
14. лекции по математике
15. помогал
16. оправдал
17. доказательство

The great English scientist Isaac Newton was born in the village of Woolthorpe, not far from the university town Cambridge on December 25, 1642. Little Isaac was left to the care of his mother, grandmother and uncle who sent him to school.

In his early years young Isaac made various things. He made a clock that worked by water. He also made a sun-dial. When Isaac grew older, he took a considerable interest in mathematics. His ability as mathematician and physicist was very important. His first physical experiment was carried out when he was sixteen years old.  
  
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Задание 4.Перевести текст по абзацам с русского на английский язык.

Великий английский ученый Исаак Ньютон родился 25 декабря в деревне Вулторп, недалеко от университетского городка Кембридж. Маленький Исаак был оставлен на попечение своей матери, бабушки и дяди, которые отправили его в школу. В свои ранние годы молодой Исаак делал различные вещи. Он сделал часы, которые работали на воде. Он также сделал солнечные часы. Когда Исаак стал старше, он проявил значительный интерес к математике.

Его способности как математика и физика были очень важны. Его первый физический эксперимент был проведен, когда ему было шестнадцать лет.

5 июня 1661 года Ньютон поступил в Кембриджский университет, где изучал математику. Вскоре он стал известен за свой вклад в математику к тому времени, когда ему исполнился двадцать один год. Когда Ньютону было двадцать два года, он начал изучать теорию гравитации. В 1665 году, когда он был в гостях в своей родной деревне, он увидел яблоко, упавшее с дерева, и начал задаваться вопросом, какая сила заставила яблоко упасть.

В Кембридже Ньютон с большим интересом читал труды Галилея, знал геометрию Декарта, разрабатывал методы исчисления. Поэтому, когда он стал думать «о гравитации, распространяющейся на орбиту Луны", он немедленно поставил эту идею на проверку вычисления. Ньютон провел много экспериментов со светом и обнаружил, что белый свет состоит из лучей разных цветов. Он изобрел отражательный телескоп, который был очень мал в диаметре, но увеличивал объекты до сорока Диаметров. Ньютон разработал математический метод, который известен как Биномиальная Теорема, а также дифференциальное и интегральное исчисление.

В 1669 году Ньютон был назначен профессором и начал читать лекции по математике и оптике в Кембридже и продолжил свою работу над проблемой гравитации. В 1673 году Ньютон собрал вместе все свои ранние расчеты и успешно завершил всю свою теорию. Он изучал притяжение одной массы к другой. Он показал, что массивная сфера здесь притягивает другую, как будто вся масса находится в центре. Это было очень важно именно Эна-  
Блед Ньютон рассматривал проблемы Солнца, Луны и земли как проблемы геометрии.

Наконец он оправдал метод лечения, который он впервые применил к проблеме Земли и Луны. Доказательство его универсального квадратного закона было далеко не полным. Он продемонстрировал Эду, что гравитация Земли распространяется до Луны и удерживает ее на своей орбите. Он доказал, что это притяжение подчиняется тому же закону, по которому камень падает на землю, а именно гравитации. Большая работа Ньютона "элементы натурфилософии" была опубликована только в середине 1687 года.

Закон Ньютона о квадратах Вселенной объединил в одном простом математическом утверждении поведение планет, а также 42 тел на этой земле. Это был первый синтез физического знания. Поэтому его вклад в науку уникален. Исаак Ньютон умер в 1727 году в возрасте 85 лет. Он был похоронен с почестями как национальный герой. Это был первый случай, когда национальные почести такого рода были присуждены в Англии человеку науки.

**V Подведение итогов урока и задание на дом.**

Выучить лексику.

**ПРАКТИЧЕСКОЕ ЗАНЯТИЕ № 8.**

**Тема занятия**

**Обед Ньютона.**

**Цели занятия**

* Пополнение лексического запаса.
* Совершенствование навыков чтения вслух и перевода.
* Развитие навыков монологической и диалогической речи.
* Развитие навыков чтения про себя.

ЗАДАНИЯ К ПРАКТИЧЕСКИМ ЗАНЯТИЯМ, КОТОРЫЕ НУЖНО ВЫПОЛНИТЬ СТУДЕНТАМ

**II Речевая зарядка.**

Ответы на вопросы о Ньютоне

Was Isaac Newton a bright child?

When did Newton begin to study theory of gravitation?

What did Newton find about white light?

How did Newton demonstrate his discovery?

What did Newton/s law of universe square join?

How was he buried?

**III Работа с текстом.** Учебник Английский язык, И. П. Агабекян стр.271

Sir Isaac Newton was often so deeply interested in difficult problems that he became quite absent-minded. One day a gentleman came to see him, but was told that Sir Isaac was busy in his study and that nobody was allowed to disturb him.

As it was dinner-time, the visitor sat down in the dining-room to wait for the scientist. The servant came in and placed on the table a boiled chicken under a cover. An hour passed, but Newton did not appear. The gentleman, feeling hungry, ate the chicken, and covering up the skeleton, asked the servant to prepare another one for his master.

Before the second chicken was ready, however, the scientist entered the room apologizing for his delay. Then he added, «As I feel rather tired and hungry, I hope you will excuse me a little longer, while I take my dinner, and then I will be at your service». With these words he lifted the cover, and without emotion turned round to the gentleman and said, «See what a strange people we scientists are! I quite forgot that I had dined already».

At this moment the servant brought in the other chicken. The visitor explained how matters stood. After a hearty laugh, the hungry scientist sat down to dine.

1.Write out the underlined words and expressions.

2.Find the English equivalents to the following expressions

1. сложные проблемы
2. ему сказали что
3. был занят в своем кабинете
4. никому не позволялось
5. было обеденное время
6. ждать ученого
7. поставил на стол
8. прошел час
9. ньютон не появился
10. приготовить другого
11. извиняясь за то, что задержался
12. я надеюсь, что вы меня извините
13. я буду к Вашим услугам
14. повернулся к джентльмену
15. внес
16. объяснил, как обстоят дела
17. голодный ученый

Answers

1. difficult problems
2. was told that
3. was busy in his study
4. nobody was allowed
5. it was dinner-time
6. to wait for the scientist
7. placed on the table
8. an hour passed
9. Newton did not appear
10. to prepare another
11. apologizing for his delay.
12. I hope you will excuse me
13. I will be at your service
14. turned round to the gentleman
15. brought in
16. explained how matters stood
17. hungry scientist

3. Find from the text suitable adjectives for the following words

1. deeply interested
2. difficult problems
3. absent-minded
4. dinner time,
5. a boiled chicken
6. strange people
7. hearty laugh
8. hungry scientist

Answers

1. deeply interested
2. difficult problems
3. absent-minded
4. dinner time,
5. a boiled chicken
6. strange people
7. hearty laugh
8. hungry scientist

4. Make up sentences with these word combinations.

5. Say if these statements are true or false.

1. A gentleman was told that the scientist had gone away.
2. The visitor was ready to wait for the scientist.
3. The servant brought a boiled chicken for the visitor.
4. In an hour the visitor ate the chicken.
5. The gentleman ordered to bring another chicken for the master.
6. The second chicken was prepared for the visitor also.
7. The scientist entered the room being very hungry.
8. He saw the skeleton on the plate and thought that he had dined already.
9. The servant brought in another chicken and Newton suggested the visitor to have dinner.

6.Role-playing game. Stage the story (Класс делится на 3 группы)

Участники сценки:

Автор

Слуга

Посетитель

Ньютон

Или : пересказать текст от лица слуги; посетителя; Ньютона.

**IV Повторение грамматического материала.**

**V Подведение итогов урока и задание на дом.**

Выучить текст и лексику.

**ПРАКТИЧЕСКОЕ ЗАНЯТИЕ № 9.**

**Тема занятия**

**Чарльз Дарвин и его знаменитая работа «Происхождение видов».**

**Цели занятия**

* Пополнение лексического запаса.
* Совершенствование навыков чтения вслух и перевода.
* Совершенствование грамматических навыков.
* Развитие навыков монологической и диалогической речи.

ЗАДАНИЯ К ПРАКТИЧЕСКИМ ЗАНЯТИЯМ, КОТОРЫЕ НУЖНО ВЫПОЛНИТЬ СТУДЕНТАМ

**I.Речевая зарядка.**

Повторение лексики предыдущего урока.

**II Работа с текстом.** Учебник Английский язык, И. П. Агабекян стр 266

A hundred years ago people believed that plants and animals had always been as they are now. They thought that all the different sorts of living things, including men and women, were put in this world by some mysterious power a few thousand years ago.

It was Charles Darwin, born at Shrewsbury on the 12th of February, 1809, who showed that this was just a legend. As a boy Darwin loved to walk in the countryside, collecting insects, flowers and minerals. He liked to watch his elder brother making chemical experiments. These hobbies interested him much more than Greek and Latin, which were his main subjects at school.

His father, a doctor, sent Charles to Edinburgh University to study medicine. But Charles did not like this. He spent a lot of time with a zoologist friend, watching birds and other animals, and collecting insects in the country-side.

Then his father sent him to Cambridge to be trained as a parson. But Darwin didn't want to be a doctor or a parson. He wanted to be a biologist.

In 1831 he set sail in the Beagle for South America to make maps of the coastline there. Darwin went in the ship to see the animals and plants of other lands. On his voyage round the world he looked carefully at thousands of living things in the sea and on land and came to very important conclusions. Later he wrote his famous work 'The Origin of Species'.

1 Write out the underlined words and word combinations.

2 Read and translate the text.

3 Fill in the gaps with proper articles.

1\_\_\_hundred years ago 2\_\_\_people believed that 3\_\_ plants and 4\_\_\_animals had always been as they are now. It was Charles Darwin, who showed that this was just 5\_\_\_legend. As 6\_\_\_boy Darwin loved to walk in 7\_\_\_countryside, collecting insects, flowers and 8\_\_\_minerals. These hobbies interested him much more than 9\_\_\_Greek and 10\_\_\_Latin, which were his main subjects at 11\_\_\_school. His father, 12\_\_\_doctor, sent Charles to 13\_\_\_Edinburgh University to study 14\_\_\_medicine. Then his father sent him to Cambridge to be trained as 15\_\_\_parson. But Darwin wanted to be 16\_\_\_biologist. In 1831 he set 17\_\_\_sail in 18\_\_\_Beagle for 19\_\_\_South America to make maps of 20\_\_\_coastline there. Darwin went in 21\_\_\_ship to see 22\_\_\_animals and plants of 23\_\_\_other lands. Later he wrote his famous work '24\_\_\_ Origin of Species'.

Answers

1. a
2. \_
3. \_
4. \_
5. a
6. a
7. the
8. \_
9. \_
10. \_
11. \_
12. a
13. \_
14. \_
15. a
16. a
17. \_
18. the
19. \_
20. the
21. the
22. the
23. \_
24. the

**A** hundred years ago people believed that plants and animals had always been as they are now. It was Charles Darwin, who showed that this was just a legend. As a boy Darwin loved to walk in the countryside, collecting insects, flowers and minerals. These hobbies interested him much more than Greek and Latin, which were his main subjects at school.

His father, a doctor, sent Charles to Edinburgh University to study medicine. Then his father sent him to Cambridge to be trained as a parson. But Darwin wanted to be a biologist. In 1831 he set sail in the Beagle for South America to make maps of the coastline there. Darwin went in the ship to see the animals and plants of other lands. Later he wrote his famous work 'The Origin of Species'.

4.Decide which of the words and expressions on the left collocate with the words and expressions on the right

1. different sorts
2. were put in this world
3. a few thousand
4. this was
5. as a boy
6. making
7. his main subjects
8. collecting insects
9. to be trained
10. set sail
11. to make maps
12. to see the animals and plants
13. voyage
14. came to
15. years ago
16. chemical experiments
17. Darwin loved to walk
18. just a legend
19. at school
20. by some mysterious power
21. as a parson
22. round the world
23. of living things
24. of the coastline
25. of other lands
26. for South America
27. very important conclusions
28. in the country-side

Answers

1. different sorts of living things,
2. were put in this world by some mysterious power
3. a few thousand years ago
4. this was just a legend
5. As a boy Darwin loved to walk
6. making chemical experiments
7. his main subjects at school
8. collecting insects in the country-side
9. to be trained as a parson
10. set sail for South America
11. to make maps of the coastline
12. to see the animals and plants of other lands
13. voyage round the world
14. came to very important conclusions

5 Make up sentences with these expressions

6.Make up 10 questions to the text.

*Примерные вопросы.*

1. What did people think about all the different sorts of living things, including men and women?  
2. When was Charles Darwin born?  
3. What did Charles Darwin like doing in his childhood?  
4. What did his father do?  
5. What profession did Charles’s father want for his younger son?  
6. What Charles wanted to be?  
7. Where did he set sail in 1831?  
8. What did he do in his voyage round the world?  
9. What was the result of his trip?  
10. What is the title of his famous work?

7.In pairs answer these questions.

**III Повторение грамматического материала.**

**IV Подведение итогов урока и задание на дом.**

Выучить лексику и подготовить доклад о Дарвине.

**ПРАКТИЧЕСКОЕ ЗАНЯТИЕ № 10.**

**Тема занятия**

**Джордж и Роберт Стивенсон.**

**Цели занятия**

* Пополнение лексического запаса.
* Совершенствование навыков чтения вслух и перевода.
* Совершенствование грамматических навыков.
* Развитие навыков монологической и диалогической речи.

ЗАДАНИЯ К ПРАКТИЧЕСКИМ ЗАНЯТИЯМ, КОТОРЫЕ НУЖНО ВЫПОЛНИТЬ СТУДЕНТАМ

**I.Речевая зарядка.**

1. What did people think about all the different sorts of living things, including men and women?  
2. When was Charles Darwin born?  
3. What did Charles Darwin like doing in his childhood?  
4. What did his father do?  
5. What profession did Charles’s father want for his younger son?  
6. What Charles wanted to be?  
7. Where did he set sail in 1831?  
8. What did he do in his voyage round the world?  
9. What was the result of his trip?  
10. What is the title of his famous work?

**II Работа с текстами.** Учебник Английский язык для инженеров, И. П. Агабекян стр 117-118

**Text 1. George Stephenson**  
  
George Stephenson was a British inventor and engineer. He is famous for building the first practical railway locomotive.  
  
Stephenson was born in 1781 in Wylam, near Newcastle upon Tyne, Northumberland. During his youth he worked as a fireman and later as an engineer in the coal mines of Newcastle. He invented one of the first miner's safety lamps independently of the British inventor Humphry Davy. Stephenson's early locomotives were used to carry loads in coal mines, and in 1823 he established a factory at Newcastle for their manufacture. In 1829 he designed a locomotive known as the Rocket, which could carry both loads and passengers at a greater speed than any locomotive constructed at that time. The success of the Rocket was the beginning of the construction of locomotives and the laying of railway lines.

**Text 2.Robert Stephenson**  
Robert Stephenson, the son of George Stephenson was a British civil engineer. He is mostly well-known known for the construction of several notable bridges.  
  
He was born in 1803 in Willington Quay, near Newcastle upon Tyne, and educated in Newcastle and at the University of Edinburgh. In 1829 he assisted his father in constructing a locomotive known as the Rocket, and four years later he was appointed construction engineer of the Birmingham and London Railway, completed in 1838. Stephenson built several famous bridges, including the Victoria Bridge in Northumberland, the Britannia Bridge in Wales, two bridges across the Nile in Damietta in Egypt and the Victoria Bridge in Montreal, Canada. Stephenson was a Member of Parliament from 1847 until his death in 1859.

Задание 1. Перекрестное чтение.

*Примерные вопросы по тексту1.*

1. When and where was he born? *Stephenson was born in 1781 in Wylam, near Newcastle upon Tyne, Northumberland.*
2. What was his occupation? *During his youth he worked as a fireman and later as an engineer in the coal mines of Newcastle.*
3. What were his inventions? *He invented one of the first miner's safety lamps independently of the British inventor Humphry Davy.*
4. What do you know about his locomotive? *Stephenson's early locomotives were used to carry loads in coal mines, and in 1823 he established a factory at Newcastle for their manufacture.*
5. Did he ever improve his achievements? In 1829 he designed a locomotive known as the Rocket, which could carry both loads and passengers at a greater speed than any locomotive constructed at that time.
6. Did he construct anything in his life? *The success of the Rocket was the beginning of the construction of locomotives and the laying of railway lines.*  
     
   *Примерные вопросы тексту 2.*
7. What was Robert Stevenson? *Robert Stephenson, the son of George Stephenson was a British civil engineer.*
8. What is he famous for? *He is mostly well-known known for the construction of several notable bridges.*
9. When and where was he born? *He was born in 1803 in Willington Quay, near Newcastle upon Tyne.*
10. Where did he study? *He was educated in Newcastle and at the University of Edinburgh.*
11. Tell a few words about his career? *In 1829 he assisted his father in constructing a locomotive known as the Rocket, and four years later he was appointed construction engineer of the Birmingham and London Railway, completed in 1838.*
12. What bridges did he built? *Stephenson built several famous bridges, including the Victoria Bridge in Northumberland, the Britannia Bridge in Wales, two bridges across the Nile in Damietta in Egypt and the Victoria Bridge in Montreal, Canada.*
13. Did he take part in politics? *Stephenson was a Member of Parliament from 1847 until his death in 1859.*

Задание2. Fill in the gaps with the missing words in the following sentences, the first letter of each word has been given to help you.

**George Stephenson**  
  
George Stephenson was a B1……. inventor and engineer. He is famous for building the first p2……. railway locomotive. he worked as a f3…… and later as an engineer in the c4…… mines of Newcastle.. His early l5…….. were used to carry l6….. in coal mines He e7…….. a factory at Newcastle for their m8……... He d9,,……. a locomotive known as the R10…….. It could carry both loads and p11…….. at a greater s12……. than any locomotive c13…….. at that time.

Answers

1. british
2. passenger
3. fireman
4. coal
5. locomotives
6. loads
7. established
8. manufacture
9. designed
10. rocket
11. passengers
12. speed
13. constructed

Задание 3.Find in the text, translate and analyse.

Grammar forms with ending ed

Grammar forms with ending –s

Grammar forms with ending –ing

Задание 4.Put the words in the following sentences in order, the first word in each sentence is in italics.

And/ a/ Stephenson/ British/ engineer/ **George**/ was/ inventor

Practical/ for/ building/ **He** /first/ railway/ locomotive/ famous/ is/ the

a /worked/ youth/ **During/** and/ an/ his/ he/ as /fireman/ engineer

safety/ first /of /one/ invented/ lamps/ **He/** the/ miner's

in/ to/ were **/Stephenson's/** early/ carry/ loads/ coal/ used/ locomotives/ mines

construction /beginning/ the/ **The/** was /of /of /success/ of/ Rocket/ the/ the/ locomotives.

Answers

George Stephenson was a British inventor and engineer.

He is famous for building the first practical railway locomotive.  
  
During his youth he worked as a fireman and an engineer.

He invented one of the first miner's safety lamps.

Stephenson's early locomotives were used to carry loads in coal mines.

The success of the Rocket was the beginning of the construction of locomotives.

Задание 5 Translate the following sentences from Russian into English.

Джордж Стивенсон был Британским изобретателем и инженером. Он знаменит благодаря строительству первого Локомотива.

Он родился в 1781 году около города Ньюкасл. За свою жизнь он сменил несколк профессий. Сначала он работал пожарным, а позднее - инженером в угольных шахтах Ньюкасла

Он изобрел одну из первых безопасных ламп для шахтеров. Его первые локомотивы использовались для перевозки грузов в угольных шахтах. В 1823 году он учредил завод для их производства. В 1829 году он сконструировал локомотив Ракета. Этот локомотив мог перевозить как грузы, так и людей с быстрой скоростью. Успех локомотива Ракета положил начало строительству локомотивов и прокладки железнодорожных линий.

Роберт Стивенсон родился в 1803 году около города Ньюкасл. Он учился в Единбургском Университете. Он помогал своему отцу Джорджу Стивесону строить локомотив. Через 4 года после строительства локомотива Ракета он был назначен инженером-конструктором в Бирмингеме и на Лондонской железной дороге.

Роберт Стивенсон также известен за строительство нескольких известных мостов.

Среди них мост Виктория, мост Британия, 2 моста через Нил в Египте, а также мост в Монреале в Канаде. С 1847 года до самой смерти он был членом парламента.

Задание 6 Make up a dialogue between Robert Stephenson and George Stevenson concerning the construction of the Locomotive Rocket.

**III .Подведение итогов урока и задание на дом.**

Выучить записи в тетради.

**ПРАКТИЧЕСКОЕ ЗАНЯТИЕ № 11**

**Тема занятия**

**Джеймс Прескотт Джоуль**

**Цели занятия**

* Совершенствование навыков чтения вслух и перевода.
* Совершенствование грамматических навыков.
* Развитие навыков монологической и диалогической речи.
* Работа с лексикой.

ЗАДАНИЯ К ПРАКТИЧЕСКИМ ЗАНЯТИЯМ, КОТОРЫЕ НУЖНО ВЫПОЛНИТЬ СТУДЕНТАМ

**I.Речевая зарядка.**

When and where was George Stephenson he born?

What was his occupation?

What were his inventions?

What do you know about his locomotive?

What was Robert Stevenson?

What is he famous for?

When and where was he born?

Where did he study?

Tell a few words about his career?

What bridges did he built?

Did he take part in politics?

**II Работа с текстом.** Учебник Английский язык для инженеров, И. П. Агабекян стр 120

James Prescott Joule, famous British physicist, was born in 1818 in

# Salford, England.

# Joule was one of the most outstanding physicists of his time. He is best

# known for his research in electricity and thermodynamics. In the course

# of his investigations of the heat emitted in an electrical circuit, he

# formulated the law, now known as Joule's law of electric heating. This

# law states that the amount of heat produced each second in a conductor

# by electric current is proportional to the resistance of the conductor

# and to the square of the current. Joule experimentally verified the law

# of conservation of energy in his study of the conversion of mechanical

# energy into heat energy.

# Joule determined the numerical relation between heat and mechanical

# energy, or the mechanical equivalent of heat, using many independent

# methods. The unit of energy, called the joule, is named after him. It is

# equal to 1 watt-second. Together with the physicist William Thomson

# (Baron Kelvin), Joule found that the temperature of a gas falls when it

# expands without doing any work. This phenomenon, which became known as

# the Joule-Thomson effect, lies in the operation of modern refrigeration

# and air-conditioning systems.

Задание 1. Read the text to yourself and put the following questions in the right order?

1. What is joule equal to?
2. When and where was he born?
3. What did he find together with the physicist William Thomson?
4. What law did he formulate?
5. What phenomenon lies in the operation of modern refrigeration and air-conditioning systems?
6. What is he best known for?
7. What does the law state?
8. What kind of methods did he use?
9. Is joule the unit of energy?

Задание 2. Find the answers to the questions.

Задание3.Read the text aloud and translate it.

Задание 4. Match the verbs in the box with the expressions to form a word combination.

|  |
| --- |
| was born //is best known//formulated//verified//determined// is named// found//became known// lies |

1. the numerical relation
2. the law
3. in 1818
4. that
5. after him
6. in the operation of modern refrigeration
7. as the Joule-Thomson effect
8. for his research
9. the law

Задание5.Make up sentences with these word combinations.

Задание 6. Which of these words and expressions would you use in a report about James Prescott Joule

famous //theatre//was born//one of the most outstanding// is best known for//take a shower// research// to do homework//investigations// opinions//electrical circuit//formulated// to worry//electric heating//law// an-email//states// the amount of heat//photographs//electric current// resistance of the conductor//science fiction films//square// verified// the law of conservation of energy //determined// heat//mistakes// mechanical energy//independent methods//computer//the unit of energy//equal to //falls//expands //headache//modern refrigeration//air-conditioning systems

Задание7.Make a report about James Prescott Joule and his achievements.

**III Повторение грамматического материала.**

**IV Подведение итогов урока и задание на дом.**

Подготовить доклад о Джоуле.

**ТЕКСТЫ ДЛЯ ДОПОЛНИТЕЛЬНОГО ЧТЕНИЯ.**

**1.Albert Einstein**

Born in Ulm, Germany, in 1879, Einstein was a precocious child. As a teenager, he wrote a paper on magnetic fields. (Einstein never actually failed math, contrary to popular lore.) He married twice, the second time to his first cousin, Elsa Löwenthal. The marriage lasted until her death in 1936.

As a scientist, Einstein’s watershed year was 1905, when he was working as a clerk in the Swiss Patent Office, having failed to attain an academic position after earning his doctorate. That year he published his four most important papers. One of them described the relationship between matter and energy, neatly summarized *E = mc*2.

Other papers that year were on Brownian motion, suggesting the existence of molecules and atoms, and the photoelectric effect, showing that light is made of particles later called photons. His fourth paper, about special relativity, explained that space and time are interwoven, a shocking idea now considered a foundational principle of astronomy.

Einstein expanded on relativity in 1916 with his theory of gravitation: general relativity. It holds that anything with mass distorts the fabric of space and time, just as a bowling ball placed on a bed causes the mattress to sag. During a solar eclipse in 1919, astronomers showed that the sun’s mass did indeed bend the path of starlight. (The temporary darkness around the sun enabled astronomers to chronicle the bending.) The validation made Einstein a superstar.

Two years later, Einstein won the Nobel Prize in Physics, not for general relativity, but for his discovery of the photoelectric effect. By this time, the 42-year-old physicist had made most of his major contributions to science.

In 1933, Einstein accepted a professorship at the Institute for Advanced Study in Princeton, N.J., where for years he tried (unsuccessfully) to unify the laws of physics. He became a U.S. citizen in 1940, and his fame grew as a public intellectual, civil rights supporter and pacifist.

Many consider Einstein’s theory of general relativity to be his crowning achievement. The theory predicted both black holes and gravitational waves — and just last year, physicists measured the waves created by the collision of two black holes over a billion light-years away. During their epic journey across the cosmos, the ripples played with space and time like a fun-house mirror contorting faces.

General relativity also is the bedrock of gravitational lensing, which uses the gravity of stars and galaxies as a giant magnifying glass to zoom in on farther cosmic objects. Astronomers may soon take advantage of such physics to see geographic details of worlds light-years away.

Einstein, who died of heart failure in 1955, would have applauded such bold, imaginative thinking. His greatest insights came not from careful experimental analysis, but simply considering what would happen under certain circumstances, and letting his mind play with the possibilities. “I am enough of an artist to draw freely upon my imagination,” he said in a *Saturday Evening Post* interview. “Knowledge is limited. Imagination encircles the world.”

**2.Marie Curie.**

Despite her French name, Marie Curie’s story didn’t start in France. Her road to Paris and success was a hard one, as equally worthy of admiration as her scientific accomplishments.

Born Maria Salomea Sklodowska in 1867 in Warsaw, Poland, she faced some daunting hurdles, both because of her gender and her family’s poverty, which stemmed from the political turmoil at the time. Her parents, deeply patriotic Poles, lost most of their money supporting their homeland in its struggle for independence from Russian, Austrian and Prussian regimes. Her father, a math and physics professor, and her mother, headmistress of a respected boarding school in Russian-occupied Warsaw, instilled in their five kids a love of learning. They also imbued them with an appreciation of Polish culture, which the Russian government discouraged.

When Curie and her three sisters finished regular schooling, they couldn’t carry on with higher education like their brother. The local university didn’t let women enroll, and their family didn’t have the money to send them abroad. Their only options were to marry or become governesses. Curie and her sister Bronislawa found another way.

The pair took up with a secret organization called Flying University, or sometimes Floating University. Fittingly, given the English abbreviation, the point of FU was to stick it to the Russian government and provide a pro-Polish education, in Polish — expressly forbidden in Russian-controlled Poland.

Eventually, the sisters hatched a plan that would help them both get the higher education they so desperately wanted. Curie would work as a governess and support Bronislawa’s medical school studies. Then, Bronislawa would return the favor once she was established. Curie endured years of misery as a governess, but the plan worked. In 1891, she packed her bags and headed to Paris and her bright future.

At the University of Paris, Curie was inspired by French physicist Henri Becquerel. In 1896, he discovered that uranium emitted something that looked an awful lot like — but not quite the same as — X-rays, which had been discovered only the year before. Intrigued, Curie decided to explore uranium and its mysterious rays as a Ph.D. thesis topic.

Eventually, she realized whatever was producing these rays was happening at an atomic level, an important first step to discovering that atoms weren’t the smallest form of matter. It was a defining moment for what Curie would eventually call radioactivity.

Around the same time, Curie met and married her French husband, Pierre, an accomplished physicist who abandoned his own work and joined his wife’s research. The two started examining minerals containing uranium and pitchblende, a uranium-rich ore, and realized the latter was four times more radioactive than pure uranium. They reasoned some other element must be in the mix, sending those radioactive levels through the roof. And they were right: After processing literally tons of pitchblende, they discovered a new element and named it polonium, after Marie’s native Poland.

They published a paper in July 1898, revealing the find. And just five months later, they announced their discovery of yet another element, radium, found in trace amounts in uranium ore.

In 1903, Curie, her husband and Becquerel won the Nobel Prize in Physics for their work on radioactivity, making Curie the first woman to win a Nobel.

Tragedy struck just three years later. Pierre, who had recently accepted a professorship at the University of Paris, died suddenly after a carriage accident. Curie was devastated by his death.

Yet she continued her research, filling Pierre’s position and becoming the first woman professor at the university. In 1911 Curie won her second Nobel Prize, this time in chemistry, for her work with polonium and radium. She remains the only person to win Nobel prizes in two different sciences.

Curie racked up several other accomplishments, from founding the Radium Institute in Paris where she directed her own lab (whose researchers won their own Nobels), to heading up France’s first military radiology center during World War I and thus becoming the first medical physicist.

She died in 1934 from a type of anemia that very likely stemmed from her exposure to such extreme radiation during her career. In fact, her original notes and papers are still so radioactive that they’re kept in lead-lined boxes, and you need protective gear to view them.

**3.Isaac Newton.**

Isaac Newton was born on Christmas Day, 1642. A sickly infant, his mere survival was an achievement. Just 23 years later, with his alma mater Cambridge University and much of England closed due to plague, Newton discovered the laws that now bear his name. (He had to invent a new kind of math along the way: calculus.)

Halley persuaded Newton to publish his calculations, and the results were the *Philosophiæ Naturalis Principia Mathematica*, or just the *Principia*, in 1687. Not only did it describe for the first time how the planets moved through space and how projectiles on Earth traveled through the air; the *Principia* showed that the same fundamental force, gravity, governs both. Newton united the heavens and the Earth with his laws. Thanks to him, scientists believed they had a chance of unlocking the universe’s secrets.

Newton’s academic devotion was absolute. His sometime assistant Humphrey Newton (no relation) wrote, “I never knew him to take any recreation.” He would only really leave his room to give lectures — even to empty rooms. “Ofttimes, he did in a manner, for want of hearers, read to the walls,” Humphrey wrote in 1727. Newton never went halfway on anything.

It would take too long to list his other scientific achievements, but the greatest hits might include his groundbreaking work on light and color; his development and refinement of reflecting telescopes (which now bear his name); and other fundamental work in math and heat. He also dabbled in biblical prophecies (predicting the world’s end in A.D. 2060), practiced alchemy and spent years trying, and failing, to produce the fabled philosopher’s stone. Alas, even Newton’s genius couldn’t create the impossible.

In 1692, this rare failure, along with the unraveling of one of his few close friendships — and possibly mercury poisoning from his alchemical experiments — resulted in what we’d now call a prolonged nervous breakdown. Newton’s science-producing days were over, for reasons known only to him, though he would remain influential in the field.

After languishing on a professor’s salary at Cambridge University for decades, in 1696 Newton received a cushy royal appointment to be Warden of the Mint in London. It was meant as an easy job with a nice paycheck: It “has not too much bus’nesse to require more attendance than you may spare,” his friend Charles Montague wrote after landing him the job. But Newton, focused as ever, threw himself into it.

He also focused his attention on counterfeiters, searching them out as zealously as he sought answers from the heavens. Newton established information networks among London’s shadiest spots, even going undercover to do so. Counterfeiting was considered high treason, punishable by death, and Newton relished witnessing his targets’ executions.

Newton was known by his peers as an unpleasant person. He had few close friends and never married. Astronomer Royal John Flamsteed called him “insidious, ambitious, and excessively covetous of praise, and impatient of contradiction.” The man could nurse grudges for years, even after his foes had died.

He famously feuded with German scientist Gottfried Leibnitz, mainly over who invented calculus first, creating a schism in European mathematics that lasted over a century. Newton also made it his life’s work to torment English scientist Robert Hooke, destroying the legacy of a man once considered London’s Leonardo da Vinci.

How fitting that the unit of force is named after stubborn, persistent, amazing Newton, himself a force of nature.

**4.Charles Darwin.**

Charles Darwin would not have been anyone’s first guess for a revolutionary scientist.

As a young man, his main interests were collecting beetles and studying geology in the countryside, occasionally skipping out on his classes at the University of Edinburgh Medical School to do so. It was a chance invitation in 1831 to join a journey around the world that would make Darwin, who had once studied to become a country parson, the father of evolutionary biology.

Aboard the HMS *Beagle*, between bouts of seasickness, Darwin spent his five-year trip studying and documenting geological formations and myriad habitats throughout much of the Southern Hemisphere, as well as the flora and fauna they contained.

Darwin’s observations pushed him to a disturbing realization — the Victorian-era theories of animal origins were all wrong. Most people in Darwin’s time still adhered to creationism, the idea that a divine being was responsible for the diversity of life we find on Earth.

Darwin’s observations implied a completely different process. He noticed small differences between members of the same species that seemed to depend upon where they lived. The finches of the Galapagos are the best-known example: From island to island, finches of the same species possessed differently shaped beaks, each adapted to the unique sources of food available on each island.

This suggested not only that species could change — already a divisive concept back then — but also that the changes were driven purely by environmental factors, instead of divine intervention. Today, we call this natural selection.

When Darwin returned, he was hesitant to publish his nascent ideas and open them up to criticism, as he felt that his theory of evolution was still insubstantial. Instead, he threw himself into studying the samples from his voyage and writing an account of his travels. Through his industrious efforts, Darwin built a reputation as a capable scientist, publishing works on geology as well as studies of coral reefs and barnacles still considered definitive today.

Darwin also married his first cousin, Emma Wedgwood, during this time. They had 10 children, and by all accounts Darwin was an engaged and loving father, encouraging his children’s interests and taking time to play with them. This was a level of attention uncommon among fathers at that time — to say nothing of eminent scientists.

Through it all, the theory of evolution was never far from his mind, and the various areas of research he pursued only strengthened his convictions. Darwin slowly amassed overwhelming evidence in favor of evolution in the 20 years after his voyage.

All of his observations and musings eventually coalesced into the tour de force that was *On the Origin of Species*, published in 1859 when Darwin was 50 years old. The 500-page book sold out immediately, and Darwin would go on to produce six editions, each time adding to and refining his arguments.

In non-technical language, the book laid out a simple argument for how the wide array of Earth’s species came to be. It was based on two ideas: that species can change gradually over time, and that all species face difficulties brought on by their surroundings. From these basic observations, it stands to reason that those species best adapted to their environments will survive and those that fall short will die out.

Though Darwin’s theory was logically sound and backed up by reams of evidence, his ideas faced sharp criticisms from adherents of creationism and the religious establishment around the world — just as he had feared.

Although it wouldn’t become widely accepted until the 1930s, Darwin’s theory of natural selection and his ideas on evolution have survived largely intact.

**5.Nikola Tesla.**

We owe much of our modern electrified life to the lab experiments of the Serbian-American engineer, born in 1856 in what’s now Croatia. His designs advanced alternating current at the start of the electric age and allowed utilities to send current over vast distances, powering American homes across the country. He developed the Tesla coil — a high-voltage transformer — and techniques to transmit power wirelessly. Cellphone makers (and others) are just now utilizing the potential of this idea.

Tesla is perhaps best known for his eccentric genius. He once proposed a system of towers that he believed could pull energy from the environment and transmit signals and electricity around the world, wirelessly. But his theories were unsound, and the project was never completed. He also claimed he had invented a “death ray.”

In recent years, Tesla’s mystique has begun to eclipse his inventions. San Diego Comic-Con attendees dress in Tesla costumes. The world’s most famous electric car bears his name. The American Physical Society even has a Tesla comic book (where, as in real life, he faces off against the dastardly Thomas Edison).

While his work was truly genius, much of his wizardly reputation was of his own making. Tesla claimed to have accidentally caused an earthquake in New York City using a small steam-powered

electric generator he’d invented. And Tesla didn’t actually discover alternating current, as everyone thinks. It was around for decades. But his ceaseless theories, inventions and patents made Tesla a household name, rare for scientists a century ago. And even today, his legacy still turns the lights on.

**6.Galileo Galilei.**

Around Dec. 1, 1609, Italian mathematician Galileo Galilei pointed a telescope at the moon and created modern astronomy. His subsequent observations turned up four satellites — massive moons — orbiting Jupiter, and showed that the Milky Way’s murky light shines from many dim stars. Galileo also found sunspots upon the surface of our star and discovered the phases of Venus, which confirmed that the planet circles the sun inside Earth’s own orbit.

“I give infinite thanks to God, who has been pleased to make me the first observer of marvelous things,” he wrote.

The 45-year-old Galileo didn’t invent the telescope, and he wasn’t the first to point one at the sky. But his conclusions changed history. Galileo knew he’d found proof for the theories of Polish astronomer Nicolaus Copernicus (1473-1543), who had launched the Scientific Revolution with his sun-centered solar system model.

Galileo’s work wasn’t all staring at the sky, either: His studies of falling bodies showed that objects dropped at the same time will hit the ground at the same time, barring air resistance — gravity doesn’t depend on their size. And his law of inertia allowed for Earth itself to rotate.

But all this heavenly motion contradicted Roman Catholic doctrine, which was based on Aristotle’s incorrect views of the cosmos. The church declared the sun-centered model heretical, and an inquisition in 1616 ordered Galileo to stop promoting these views. The real blow from religious officials came in 1633, after Galileo published a comparison of the Copernican (sun-centered) and Ptolemaic (Earth-centered) systems that made the latter’s believers look foolish. They placed him under house arrest until his death in 1642, the same year Isaac Newton was born.

The English mathematician would build on Galileo’s law of inertia as he compiled a set of laws so complete that engineers still use them centuries later to navigate spacecraft across the solar system — including NASA’s Galileo mission to Jupiter.

**7.Ada Lovelace.**

Ada Lovelace earned her place in history as the first computer programmer — a full century before today’s computers emerged.

She couldn’t have done it without British mathematician, inventor and engineer Charles Babbage. Their collaboration started in the early 1830s, when Lovelace was just 17 and still known by her maiden name of Byron. (She was the only legitimate child of poet Lord Byron.) Babbage had drawn up plans for an elaborate machine he called the Difference Engine — essentially, a giant mechanical calculator. In the middle of his work on it, the teenage Lovelace met Babbage at a party.

There, he showed off an incomplete prototype of his machine. According to a family friend who was there: “While other visitors gazed at the working of this beautiful instrument with the sort of expression. . . that some savages are said to have shown on first seeing a looking-glass or hearing a gun. . . Miss Byron, young as she was, understood its working, and saw the great beauty of the invention.”

It was mathematical obsession at first sight. The two struck up a working relationship and eventual close friendship that would last until Lovelace’s death in 1852, when she was only 36. Babbage abandoned his Difference Engine to brainstorm a new Analytical Engine — in theory, capable of more complex number crunching — but it was Lovelace who saw that engine’s true potential.

The Analytical Engine was more than a calculator — its intricate mechanisms and the fact that the user fed it commands via a punch card meant the engine could perform nearly any mathematical task ordered. Lovelace even wrote instructions for solving a complex math problem, should the machine ever see the light of day. Many historians would later deem those instructions the first computer program, and Lovelace the first programmer. While she led a raucous life of gambling and scandal, it’s her work in “poetical science,” as she called it, that defines her legacy.

In the words of Babbage himself, Lovelace was an “enchantress who has thrown her magical spell around the most abstract of Sciences and has grasped it with a force which few masculine intellects. . . could have exerted over it.”

**8.Pythagoras.**

Memories of middle or high school geometry invariably include an instructor drawing right triangles on a blackboard to explain the Pythagorean theorem. The lesson was that the square of the hypotenuse, or longest side, is equal to the sum of the squares of the other sides. Simply put: *a*2*+ b*2*= c*2. A proof followed, adding a level of certainty rare in other high school classes, like social studies and English.

Pythagoras, a sixth-century B.C. Greek philosopher and mathematician, is credited with inventing his namesake theorem and various proofs. But forget about the certainty.

Babylonian and Egyptian mathematicians used the equation centuries before Pythagoras, says Karen Eva Carr, a retired historian at Portland State University, though many scholars leave open the possibility he developed the first proof. Moreover, Pythagoras’ students often attributed their own mathematical discoveries to their master, making it impossible to untangle who invented what.

Even so, we know enough to suspect Pythagoras was one of the great mathematicians of antiquity. His influence was widespread and lasting. Theoretical physicist James Overduin sees an unbroken chain from Pythagoras to Albert Einstein, whose work on curving space and time Overduin calls “physics as geometry.”

Even today, the sea of numerical formulas typically on physicists’ blackboards suggests the Pythagorean maxim “All is number,” an implication that everything can be explained, organized and, in many cases, predicted through mathematics. The Pythagorean theorem proof doesn’t just work

sometimes, most of the time or when the stars align — it works all the time. Pythagoras’ legacy includes the scientific hallmarks of pattern, order, replication and certainty.

**9.Carl Linnaeus.**

It started in Sweden: a functional, user-friendly innovation that took over the world, bringing order to chaos. No, not an Ikea closet organizer. We’re talking about the binomial nomenclature system, which has given us clarity and a common language, devised by Carl Linnaeus.

Linnaeus, born in southern Sweden in 1707, was an “intensely practical” man, according to Sandra Knapp, a botanist and taxonomist at the Natural History Museum in London. He lived at a time when formal scientific training was scant and there was no system for referring to living things. Plants and animals had common names, which varied from one location and language to the next, and scientific “phrase names,” cumbersome Latin descriptions that could run several paragraphs.

The 18th century was also a time when European explorers were fanning out across the globe, finding ever more plants and animals new to science.

“There got to be more and more things that needed to be described, and the names were becoming more and more complex,” says Knapp.

Linnaeus, a botanist with a talent for noticing details, first used what he called “trivial names” in the margins of his 1753 book *Species Plantarum*. He intended the simple Latin two-word construction for each plant as a kind of shorthand, an easy way to remember what it was.

“It reflected the adjective-noun structure in languages all over the world,” Knapp says of the trivial names, which today we know as genus and species. The names moved quickly from the margins of a single book to the center of botany, and then all of biology. Linnaeus started a revolution, but it was an unintentional one.

Today we regard Linnaeus as the father of taxonomy, which is used to sort the entire living world into evolutionary hierarchies, or family trees. But the systematic Swede was mostly interested in naming things rather than ordering them, an emphasis that arrived the next century with Charles Darwin.

As evolution became better understood and, more recently, genetic analysis changed how we classify and organize living things, many of Linnaeus’ other ideas have been supplanted. But his naming system, so simple and adaptable, remains.

“It doesn’t matter to the tree in the forest if it has a name,” Knapp says. “But by giving it a name, *we* can discuss it. Linnaeus gave us a system so we could talk about the natural world.”

**10.Rosalind Franklin.**

In 1962, Francis Crick, James Watson and Maurice Wilkins shared the Nobel Prize for describing DNA’s double-helix structure — arguably the greatest discovery of the 20th century. But no one mentioned Rosalind Franklin — arguably the greatest snub of the 20th century.

The British-born Franklin was a firebrand, a perfectionist who worked in isolation. “She was prickly, did not make friends easily, but when she did she was outgoing and loyal,” Jenifer Glynn wrote in *My Sister Rosalind Franklin.*

Franklin was also a brilliant chemist and a master of X-ray crystallography, an imaging technique that reveals the molecular structure of matter based on the pattern of scattered X-ray beams. Her early research into the microstructures of carbon and graphite are still cited, but her work with DNA was the most significant — and it may have won three men a Nobel.

While at King’s College London in the early 1950s, Franklin was close to proving the double-helix theory after capturing “photograph #51,” considered the finest image of a DNA molecule at the time. But then both Watson and Crick got a peek at Franklin’s work: Her colleague, Wilkins, showed Watson photograph #51, and Max Perutz, a member of King’s Medical Research Council, handed Crick unpublished data from a report Franklin submitted to the council. In 1953, Watson and Crick published their iconic paper in *Nature*, loosely citing Franklin, whose “supporting” study also appeared in that issue.

Franklin left King’s in 1953 in a long-planned move to join J.D. Bernal’s lab at Birkbeck College, where she discovered the structure of the tobacco mosaic virus. But in 1956, in the prime of her career, she developed ovarian cancer — perhaps due to her extensive X-ray work. Franklin continued working in the lab until her death in 1958 at age 37.

“As a scientist, Miss Franklin was distinguished by extreme clarity and perfection in everything she undertook,” Bernal wrote in her obituary, published in *Nature*. Though it’s her achievements that close colleagues admired, most remember Franklin for how she was forgotten.

**11.Our Personal Favorites**

**Isaac Asimov** *(1920–1992)* Asimov was my gateway into science fiction, then science, then everything else. He penned some of the genre’s most iconic works — fleshing out the laws of robotics, the messiness of a galactic empire, the pitfalls of predicting the future — in simple, effortless prose. A trained biochemist, the Russian-born New Yorker wrote prolifically, producing over 400 books, not all science-related: Of the 10 Dewey Decimal categories, he has books in nine.

**Richard Feynman** *(1918–1988)* Feynman played a part in most of the highlights of 20th-century physics. In 1941, he joined the Manhattan Project. After the war, his Feynman diagrams — for which he shared the ’65 Nobel Prize in Physics — became the standard way to show how subatomic particles interact. As part of the 1986 space shuttle Challenger disaster investigation, he explained the problems to the public in easily understandable terms, his trademark. Feynman was also famously irreverent, and his books pack lessons I live by.

**Robert FitzRoy** *(1805–1865)* FitzRoy suffered for science, and for that I respect him. As captain of the HMS Beagle, he sailed Charles Darwin around the world, only to later oppose his shipmate’s theory of evolution while waving a Bible overhead. FitzRoy founded the U.K.’s Met Office in 1854, and he was a pioneer of prediction; he coined the term weather forecast. But after losing his fortunes, suffering from depression and poor health, and facing fierce criticism of his forecasting system, he slit his throat in 1865.

**Jean-Baptiste Lamarck** *(1744–1829)* Lamarck may be remembered as a failure today, but to me, he represents an important step forward for evolutionary thinking. Before he suggested that species could change over time in the early 19th century, no one took the concept of evolution seriously. Though eventually proven wrong, Lamarck’s work brought the concept of evolution into the light and would help shape the theories of a young Charles Darwin. Science isn’t all about dazzling successes; it’s also a story of failures surmounted and incremental advances.

**Lucretius** *(99 B.C.–55 B.C.)* My path to the first-century B.C. Roman thinker Titus Lucretius Carus started with Ralph Waldo Emerson and Michele de Montaigne, who cited him in their essays. Lucretius’ only known work, On the Nature of Things, is remarkable for its foreshadowing of Darwinism, humans as higher primates, the study of atoms and the scientific method — all contemplated in a geocentric world ruled by eccentric gods.

**Katharine McCormick** *(1875–1967)* McCormick planned to attend medical school after earning her biology degree from MIT in 1904. Instead, she married rich. After her husband’s death in 1947, she used her inheritance to provide crucial funding for research on the hormonal birth control pill. She also fought to make her alma mater more accessible to women, leading to an all-female dormitory, allowing more women to enroll. As a feminist interested in science, I’d love to be friends with this badass advocate for women’s rights.

**John Muir** *(1838–1914)* In 1863, Muir abandoned his eclectic combination of courses at the University of Wisconsin to wander instead the “University of the Wilderness” — a school he never stopped attending. A champion of the national parks (enough right there to make him a hero to me!), Muir fought vigorously for conservation and warned, “When we try to pick out anything by itself, we find it hitched to everything else in the Universe.” It’s a reminder we need today, more than ever.

**Rolf O. Peterson** *(1944–)* Peterson helms the world’s longest-running study of the predator-prey relationship in the wild, between wolves and moose on Isle Royale in the middle of Lake Superior. He’s devoted more than four decades to the 58-year wildlife ecology project, a dedication and passion indicative, to me, of what science is all about. As the wolf population has nearly disappeared and moose numbers have climbed, patience and emotional investment like his are crucial in the quest to learn how nature works.

**Marie Tharp** *(1920–2006)* I love maps. So did geologist and cartographer Tharp. In the mid-20th century, before women were permitted aboard research vessels, Tharp explored the oceans from her desk at Columbia University. With the seafloor — then thought to be nearly flat — her canvas, and raw data her inks, she revealed a landscape of mountain ranges and deep trenches. Her keen eye also spotted the first hints of plate tectonics at work beneath the waves. Initially dismissed, Tharp’s observations would become crucial to proving continental drift.

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