ЗЕЛЕНИНА Л.Е.
АНГЛИЙСКИЙ ЯЗЫК В ФИЗИКЕ
(ДЛЯ ВТОРОГО КУРСА)

Екатеринбург 2020

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образования

АНГЛИЙСКИЙ ЯЗЫК В ФИЗИКЕ (ДЛЯ ВТОРОГО КУРСА)

Учебно-методическое пособие

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Учебно-методическое пособие представляет собой первую часть из двух частей учебно-методического комплекса «Английский язык в физике для 2 курса» и предназначено для обучения студентов на уровне, необходимом для общения в профессиональной сфере, а также для поиска и анализа зарубежных источников информации. Программа курса включает широкое использование современного аутентичного материала – статей, интернет-ресурсов.

Данное учебно-методическое пособие предназначено для студентов 2 курса бакалавриата, а также может быть использовано при самостоятельном изучении английского языка. Печатается по решению кафедры профессионально-ориентированного языкового образования от 26 сентября 2019, протокол № 2.

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СОДЕРЖАНИЕ

ПРЕДИСЛОВИЕ

Пособие «Английский язык в физике для второго курса» предназначено для организации работы на занятиях и самостоятельной работы студентов второго курса и представляет собой учебно-методический комплекс для годичного курса обучения при 2-4 аудиторных часах в неделю. Пособие рассчитано на 48 часов аудиторной работы и примерно такое же количество часов самостоятельной работы. Пособие соответствуют ФГОС ВПО и отвечает требованиям типовых учебных и рабочих программ дисциплины «Иностранный язык».

Студентам необходимо овладеть иностранным языком на уровне В2. По окончанию второго курса студенты должны уметь рассказать о своей профессии, специфике выбранной специальности, основных достижениях в области физики, уметь читать профессиональную литературу на иностранном языке, уметь отвечать на вопросы на профессиональную тематику, представлять тему своего исследования в области физики. Перечисленная тематика для обсуждения расширяется в последующих упражнениях, которым предшествует список профессионального вокабуляра, диалог или текст, задающий тематику общения. Учебно-методическое пособие составлено в соответствие с требованиями «учебной программы по иностранным языкам», которая определяет первоначальную цель обучения как формирование коммуникативной и профессиональной компетенций.

Пособие содержит материал по разговорным темам, диалоги, подкасты, лексические упражнения, тезаурус лексических единиц, содержит дополнительные аутентичные тексты, что повышает мотивацию к изучению иностранного языка. Объем материала представлен в полном объеме для достижения главной цели: формирования коммуникативной компетенции в профессиональной сфере. Данная цель определяет структуру и содержание пособия.

Тема пособия – история знаменитых открытий и вклад выдающихся ученых в научный прогресс человечества. Курс сочетает изучение английского языка с учебным материалом естественно-научных дисциплин. Коммуникативная направлен-

ность пособия делает его особенно актуальным, так как в современном мире именно владение коммуникативными навыками позволит активно общаться с иностранными коллегами, легко вступать в международные научные сообщества и становиться полноценными участниками международных проектов.

Основная задача пособия – обеспечить целесообразное и эффективное обучение на среднем этапе вузовского образования с последующим эффективным развитием знаний в профессиональной сфере и совершенствованием умений и навыков.

В пособии содержится общеупотребительная профессиональная лексика. Учебное пособие поделено на методические разделы, изучают биографии известных физиков, открытия известных физиков, разделы физики.

Грамматический курс включает теоретический материал по темам, предусмотренным учебной программой, а также практическую часть – систему тренировочных упражнений и контрольную часть – проверка овладения грамматическими явлениями. Основной структурной единицей является методический комплекс, в основе которого лежит тематически завершенный блок (Unit). Каждый Unit соответствует определенному методическому разделу. Усвоение материала содержащегося в разделе является условием аттестации за определенный блок.

Тематика текстов учебника и задания творческого и дискуссионного характера направлены на создание дополнительной мотивации для занятия иностранным языкам. Эмоционально-смысловой метод реализуется в ролевых играх.

В каждом уроке содержатся упражнения, на закрепление изученного вокабуляра, упражнения для закрепления изученного языкового материала и написания эссе на заданную тематику.

Освоив материал курса, вы сможете вести дискуссии, проводить презентации, составлять доклады и отчеты, писать письма, статьи, эссе, сочинения. В ходе выполнения заданий учащиеся приобретают умения письменно фиксировать ключевые слова в качестве опоры устного высказывания, находить в тексте нужную информацию. Учащиеся формируют монологическую и диалогическую речь, учатся обмениваться фактической информацией, выражать свою оценку происходящего, задавать вопро-

сы и отвечать на них, выяснять точку зрения собеседника и находить совместное решение.

Каждый урок представляет собой реализацию следующих разделов:

1. Введение нового лексического материала. Сопоставление лексики русского и английского языков. Объяснение контекста употребления лексики. Урок содержит упражнения на расширение и закрепление активной лексики – как общего так и специального плана, и на проверку понимания прочитанного.

2. Работа с текстом. В данном разделе представлены профессиональные тексты, диалоги и упражнения к ним. Упражнения на понимание прочитанного, обсуждение изученной информации, высказывание собственной точки зрения по заявленной проблематике.

3. Грамматический. Изучение общеупотребительных грамматических конструкций для развития навыков устной и письменной речи.

4. Обучение монологическому и диалогическому общению проводится на базе речевых структур и выполнения языковых и речевых упражнений. Практика речевой деятельности реализуется в определенных речевых ситуациях.

5. Написания эссе или статьи по изученному разделу.

Таким образом, данное пособие учитывает новые методические подходы в теории и практике обучения иностранным языкам в нашей стране и за рубежом. Пособие рассчитано на студентов второго курса, направление – физика.

UNIT 1. PHYSICS AS A SCIENCE

1. Read and translate the text

Even since humankind first looked at the stars moving about the sky, they have wondered how and why they do that. People have always wondered why things behave the way they do. For thousands of years have been asking questions like why things fall to the ground, not away from it. Why are some types of stone hard and others soft? Why does the Sun come up in the east and go down in the west? These are all questions that physics can answer.

In the beginning, people answered questions like these in philosophical or religious ways. In early descriptions of the world, philosophers such as Aristotle reported what they believed to be true. Others, however, such as astronomers from India, Egypt and China, or the Greek thinker, Archimedes, were able to use calculations to predict the movements of the Sun and the Moon or to describe and build machines.

The works of Eastern scholars reached Europe in the 12^{th} and 13^{th} centuries. There were studies of planetary motion by Indian astronomers, the theories of light from Buddhist and Persian thinkers and especially the work of the Persian philosopher Nasir al-Din al-Tusi on the planetary system. Eventually, these ideas pushed Europe into a scientific revolution. Galileo laid the foundations for this with his work on dynamics, that is, how things move. Nicolas Copernicus and then Johannes Kepler described the solar system with the Sun at its center. Later, buildings on their work, Isaac Newton set out his Laws of Motion and modern physics was born.

The next great area of investigation was electricity and in the 19th century Michael Faraday first demonstrated an electromagnetic motor. Later, it was improved by James Clerc Maxwell, whose equations were also used to describe light. In proving Maxwell's equations, Heinrich Hertz discovered radio waves and Wilhelm von Rontgen, X-rays. Maxwell's work was also the starting point for Einstein's Theory of Relativity. At the same time, other scientists were working on thermodynamics, that is, the study of changes of heat in matter. Physicists such as Robert Boyle, James Prescott Joule and many others set out the theories that allow us today to make use of engine and other mechanical devices. Rontgen's discovery of X-rays and the work of Pierre and Marie Curie on radioactivity led to the development of the science of nuclear physics.

In the first half of the 20th century, developments in phycics were concerned with the structure of atoms. The parts of the atom were identified – its nucleus, protons and electrons. Eventualy in the 1940s, scientists in the USA were able to split a nucleus and the result was the world's first nuclear explosion. Also at that time, scientists such as Max Planck were looking at the relationship between matter and wave motion. The field of quantum mechanics, which explains not only how atomic particles move, but how the universe does, came into being. Without physics to describe the way things behave, we would have none of the technology and machninery we take for granted today.

Vocabulary

humankind – человечество

to use calculations – использовать вычисления

to predict the movements – предсказать движения

to reach – достигать

planetary motion – движение планет

to push into a scientific revolution – подтолкнули к научной революции

set out – устанавливать

laws of motion – законы движения

investigation – исследование

to improve – улучшать, совершенствовать

engine – мотор

mechanical devices – механические устройства
to lead to the development – приводить к развитию
nuclear physics – ядерная физика
to split a nucleus – ращеплять ядро
a wave – волна
come into being – возникать, появляться
take for granted – считать доказанным

2. Answer the questions

1) What does physics study?
2) How old is the science of Physics?
3) Can you name any famous physisists?
4) What physical phenomenon do you know?
5) Why are you interested in physics?
6) What branch of physics is the most interesting for you?
7) Are you planning to be a physisist or a teacher of physics?

3. Read the text and choose the best title for each paragraph. There is one title which you do not need to use

Paragraph 1……
Paragraph 2……
Paragraph 3……
Paragraph 4……
Paragraph 5 ……...

A. Early ideas about Physics.
B. Mechanical devices.
C. Ideas that created the modern world.
D. What we can learn from physics.
E. Atomic physics.
F. The origins of modern physics.

4. Write nouns, adjectives and verbs connected with the word physics

nouns	adjectives	verbs
proton	interesting	to make expirements

science	exact	to predict
rainbow	difficult	to demostrate

GRAMMAR CORNER: PAST CONTINIOUS

УТВЕРЖДЕНИЕ	ОТРИЦАНИЕ	ВОПРОС	КРАТКИЙ ОТВЕТ
I was reading	I was not reading	Was I reading?	Yes, I was. No, I wasn't.
You were cooking	You were not cooking	Were you cooking?	Yes, you were. No, you were not.
He was dancing	He was not dancing	Was he dancing?	Yes, he was. No, he was not.
She was singing	She was not singing	Was she singing?	Yes, she was. No, she was not
It was sleeping	It was not sleeping	Was it sleeping?	Yes, it was. No, it was not.
We were studying	We were not studying	Were we studying?	Yes, we were. No, we were not.
They were investidating	They were not investigating	Were they investigating?	Yes, they were. No. they were not

Words signals: at ... o'clock yesterday, from 5 till 6 yesterday, the whole evening

Using two tenses

When father came home the children were watching cartoons
When mother entered my room I was reading
Was reading (действие в процессе) past continous
Entered (однократное действие) past simple

5. Open the brackets with the past continuous

1) They (play) tennis at 10.30 yesterday. 2) I (go) to the cinema at 4 o'clock yesterday. 3) we (not play) the piano at 4 o'clock yesterday. 4) he (do) his homework the whole evening yesterday. 5) she (cook) from 2 till 3 o'clock. 6) what he (do) the whole evening yesterday? 7) I (watch TV) from 5 till 7 yesterday. 8) At 8 o'clock yesterday evening I (have) dinner with some friends. 9) We (work) at

8 o'clock last night. 10) The sun (shine) and I (walk) along the High Street. 11) While the children (swim) in the lake, the parents (watch) them. 12) While Ellen (read), Tim (watch) television. 13) It (rain) while I (wait) for the bus. 14) He (listen) carefully while they (explain) the plan to him. 15) We (not/make) much noise when she told us to be quite. 16) Cathy (wash) the dishes when she dropped a glass. 17) We (not/do) anything wrong when the teacher send us both out of the classroom. 18) She (type) a letter when her boss arrived. 19) We (not/do) anything at ten, we were really tired. 20) Mary (ride) her bike

6. Put the phrases into interrogative and negative form

1) James was having lunch.
2) She was shouting all the time.
3) Beth and Maggie were running.
4) I was painting the bathroom.
5) We were holding our bags.
6) She was sleeping at that time.
7) She was picking apples when I saw her.
8) Tom was swimming during his holidays.
9) The sun was shining.
10) They were showing their holiday photos.

7. Use the correct form of the given verbs (past simple/past continuous)

1) I (instant message) with my dad about how my exam was like when the teacher (call) me. 2) Mary (post) her project to her teacher yesterday. 3) Joe (read) postings about the next history lesson's topic on the internet at two o'clock yesterday. 4) My sister (see) your posting from your blog on google while she (surf) the net. 5) you (do) a Boolean search for you homework? It really helps you find your query. 6) The school (not upload) the profiles at eight o'clock last night according to the logs. 7) Tim (direct message) to his tutor when I (come) home. 8) He (use) Boolean operators on the wiki page last week. 9) I (download) the pictures of the trip at nine o'clock last night. 10) Why you (not create) an account on our internet? You can't log it now. 11) Sam (watch) videos on YouTube

while we (do) our math homework. 12) While Sandra (write) on her Tumbler page, I (sent) a text message.

8. Open the brackets using past simple or past continuous

1) When I (to come) home, my little sister (to sleep). 2) When Nick (to come) home, his brother (to play) with his toys. 3) When mother (to come) home, I (to do) my homework. 4) When father (to come) home, Peter (to sleep). 5) When mother (to come) home, the children (to play) on the carpet. 6) When I (to get) up, my mother and father (to drink) tea. 7) When I (to come) to my friend's place, he (to watch) TV. 8) When I (to see) my friends, they (to play football). 9) When I (to open) the door, the cat (to sit) on the table. 10) When Kate (to open) the door, the children (to dance) round the fur tree. 11) When Tom (to cross) the street, he (to fall). 12) When I (to go) to the university, I (to meet) my friend. 13) When we (to go) to the cinema, we (to meet) grandmother. 14) When grandmother (to go) home, she (to see) many children in the yard. 15) When Henry (to walk) about in the forest, he (to find) a bear cub. 16) When we (to walk) about in the forest, we (to see) a hare. 17) When I (to wash) the floor, I (to find) my old toy under the sofa. 18) When granny (to read) a book on the sofa, she (to fall) asleep. 19) When I (to play) in the yard, I suddenly (to see) my old friend. 20) When Nick (to run) about) in the yard, he (to fall).

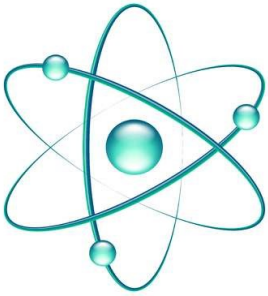
9. Answer the questions using past continuous

1) What were you doing 10 minutes ago?
2) What were you doing at 7 o'clock this morning?
3) Were you playing computer game at 10 o'clock last night?
4) What were you thinking about a few minutes ago?
5) What was our teacher saying a few minutes ago?
6) What were you doing yesterday afternoon at three o'clock?
7) Was it raining two hours ago?
8) What were we talking about one minute ago?
9) Who were you talking to a few minutes ago?
10) What were you doing at six o'clock this morning?

10. Read the text and translate

THE ATOM

The ancient Greeks coined the term atomos, meaning the smallest possible separation of matter. In ancient times, both the Greeks and Indians has philosophied about the existence of the atom but, it was first hypothesised scientifically by the British chemist John Dalton (1766-1844) in the early years of the 19th century, when he suggested it was the smallest particle that could exist. Since then, smaller subatomic particle have been discovered and the part they play as the basic building blocks of the universe is clear. We now know how that atoms are made up of differing numbers of electrons, neutrons and protons, and these too are made up of seven smaller particles.



Dalton's theory about atoms was not immediately accepted by chemists, though one reason for this was Dalton's well-known carelessness in experimental procedures. However, we know now that Dalton was correct in almost everything he said in his theory of the atom. He described an atom, even though he had never seen one, as a particle that cannot change its nature. It could, he observed, combine with the atoms of other chemical elements to create a compound. Almost a century later the first subatomic particles were discovered. By the 1930s, physicisrs were working with new ideas which allowed them to investigate the parts of the atom in great detail. In turn, these developments helped them to develop quantum mechanics – the basis of both modern chemistry and physics.

In Chemistry, the atom is the smallest part of an element that can still be recognized. An example will explain best of all. Each

element is identified by the number of prortons it has. An atom of carbon has six protons. Those six protons without the neutrons and electrons, or the electron without the other subatomuc particles; they are not carbon. A carbon atom can be combined with two atoms of oxygen to give the compound carbon dioxide, or CO2. It is this difference in the number of subatomic particles that makes one atom different from another.

Subatomic particles also have another purpose. If there is the same number of electrons and protons in the atom, them the atom will be electronically neutral. A difference between the two means the atom has an electrical charge, in other words, it produces electricity. This electricity means the electrons can become attracted to each other. In this way, atoms can bond together to form molecules, and when enough molecules are joined together we have matter that we can see.

The most recent theories of the origins of the universe say that all the atoms in the universe were formed in the first few minutes of the universe coming into existence. The most common element is the simplest, hydrogen, which has the atomic number 1. Seventy-five per cent of all atoms are hydrogen atoms. The next most simple is the next most common, helium, atomic number 2 making twenty-four per cent of all atoms. All the other atoms add up to just one per cent of everything that exists in the universe.

Vocabulary
ancient – древние
to mean – значить
separation – разделение
matter – материя
existence – существование
particle – частица
to discover – открывать, обнаруживать
to made up составлять
immediately –сразу же
accept – принимать
reason – причина
to recognise – осознавать

11. Choose the correct answer

1) Dalton believed the atom to be
a) An element
b) Made of smaller particles
c) The smallest possible particle
d) His own idea

2) Dalton's theories were
a) Generally accepted
b) Not tested very carefully
c) Accepted at once
d) Not correct

3) The number of protons in an element
a) Is the same as the number of electrons
b) Is always six
c) Never chahges
d) Characterises the element

4) Electrons help
a) Protons to form elements
b) Atoms to be neutral
c) Molecules to become atoms
d) Atoms to form molecules

5) Hydrogen is
a) The simplest atom there is
b) Present in all atoms
c) The oldest atom
d) As common as helium

12. Match these words with their definitions

1.	subatomic	A.	Part of an atom which has no charge
2.	electron	B.	Two or more atoms
3.	neutron	C.	Smaller than an atom
4.	molecule	D.	Part of an atom that has

		a negative charge
5.	proton	E. A theory developed by physisists to explain the atom
6.	quatum mechanics	F. Part of an atom which has a positive charge
7.	carbon	G. Pulled together
8.	attracted	H. A chemical element
9.	helium	I. A chemical element that is ligther than air
10.	universe	J. The whole cosmos

13. Write 4-5 words in each letter, connected with your summer holidays, work in groups

A	B	C	D	E
F	G	H	I	J
K	L	M	N	O
P	Q	R	S	T
U	V	W	Y	Z

14. Discuss the questions

1) Traditionally the folowing sustances are used as fuels: oil, petrol, gas, coal, wood. Today, nuclear power is getting more and more popular, supplying about 16 per cent of electricity worldwide.

2) Petrol or gas which one is better?

3) What fuel do people use to make power?

4) Where does petrol come from?

15. Listen and translate the dialogue

Man: Have you heard about these cars? They don't use petrol, they run on hydrogen.

Woman: I have heard something about them. It's just an experiment, really, isn't it? The idea will never work.

Man: Well, actually, it's almost ready to go on the merket. A few people are driving that type of car already.

Woman: Oh, it's just another trick to sell new cars.

Man: It's more than that. It's a new type of engine. Instead of burning petrol and producing all all those exhaust fumes. It burns hydrogen and guess what comes out of the back of the car?

Woman: No idea.

Man: Water. The only waste product is water. This could be the answer to all our pollution problems.

Woman: I bet it's really expensive. It's just another way to get your money off you.

Man: It's expensive now, because it's new. But there no way hydrogen will be as expensive as petrol. It's the most common element in the world – in the universe. We'll never run out of it. On the other hand, there'll be no petrol in fifty years.

Woman: Wait a minute, though. Isn't hydrogen dangerous? I mean doesn't it burn easily and explode sometimes?

Man: Yes, but so does petrol. Hydrogen fuel isn't liquid like petrol. One day we'll be filling up our cars with pellets of hygrogen, it's safer that way. You'll have thirty kilos in the tank not thirty litres.

Woman: Sounds crazy. I'll keep on using my bike I think.

16. Find the correct word

1) Most/some/plenty of people are already using hydrogen-powered cars.

2) The waste from these cars is pollution/water/fumes.

3) It's expensive because it is new/uses hydrogen/is not common.

4) Hydrogen is more/less/just as dangerous as petrol.

5) Hydrogen will be used in gas/solid/liquid form.

17. Translate the sentences into Russian

1) A lot of questions which used to be asked, such as why does the Sun come up in the east or why does it go down in the west, have been answered by physics.

2) The idea that the Sun was the centre of the universe pushed Europe into a scientific revolution.

3) Isaak Newton, building on Copernicus' and Kepler's work, set out his Laws of Motion and modern physics was born.

4) Thermodynamics is the study of changes of heat in matter.

5) James Mackswell equations were used to describe light.

6) The discovery of X-rays and the work of Marie Curie on radioactivity led to nuclear physics.

7) Successful experiments in the 1940s resulted in the splitting of a nucleus and led to the world's first nuclear explosion.

18. Translate the sentences into English

1) Физика дала ответы на многие вопросы, например, почему солнце встает на востоке, а заходит на западе.

2) Идея о том, что солнце является центром вселенной подтолкнуло Европу к научной революции.

3) Исаак Ньютон, опираясь на работы Коперника и Кеплера, вывел законы движения и таким образом, положил начало современной физике.

4) Термодинамика – это наука, изучающая изменение теплоты в материальных объектах.

5) Уравнения Максвелла использовались для описания света.

6) Открытие рентгеновских лучей и работы Кюри по радиоактивности привели к созданию ядерной физики.

7) Успешные эксперименты 1940-годов по расщеплению атомного ядра привели к первому в мире ядерному взрыву.

8) Термин «атом» греческого происхождения и означает мельчайшую частицу химического элемента.

9) Первая научная гипотеза атомного строения материи была выдвинута британским ученым Джоном Долтоном.

10) На сегодняшний день известно, что атомы состоят из еще более мелких частиц: электронов, нейтронов и протонов.

11) Один атом отличается от другого количеством элементарных частиц.

12) Электрический заряд заставляет электроны притягиваться друг к другу, благодаря чему, атомы соединяясь, образуют молекулы.

19. Write an article for the student's conference with the title: «Interesting facts about the atom»

Use the plan

1) History of discovery
2) Parts of the atom
3) What the parts do
4) How many atoms

Use the headings in your article. Write four paragraphs. Use some of these words and phrases:

- At first
- Smallest particles
- A number of
- Electrically charged
- Bond
- Molecule

UNIT 2. FAMOUS PHYSICISTS

1. Read the text and translate

ISSAK NEWTON

Isaak Newton was born on Christmas Day 1642, according to the calendar which was used in England at that time, or, according to the modern calendar, 4th January, 1643. His father was a wealthy farmer in the north of England, and the owner of a large estate which included the family home, called Woolsthore. Unfortunately, his father died several months before Newton was born, so he never knew him. When he was two, his mother married again and moved to another village, leaving him behind to be brought up by his grandmother.

When his stepfather died some years later, Newton's mother returned to Woolsthore, together with the three children from her second marriage. Even though Newton's family was wealthy, his mother did not want him to go to school. Instead, she wanted him to learn to be a farmer and to take care of the family's estate. Newton did not like farming and was not very good at it. Eventually, he was allowed to return to school and then to attend university, although he had to work to earn money to cover at least some of his expenses.

Despite the fact that Newton was studying Law at Cambridge, where the ideas of Aristotle were greatly respected, he became more interested in modern philosophers like Rene Decartes, Thomas Hobbes and Robert Boyle and also explored the ideas of Nicolas Copernicus, Galileo and Johannes Keppler. At some point, he became interested in mathematics, including the work of Euclid and Decartes, which eventually resulted in Newton's invention of calculus. In the field of optics, he made important discoveries about light and colour theory, as well as building the first reflecting telescope. He was also involved in alchemy, religion and, of course, physics, where his discovery of the laws of planetary motion and gravity were great advances and also served as the basis for later work, such as Albert Einstein's. He was also interested in politics, serving as a Member of Parliament and in other govermental positions.

Throughout his life, Newton was a fragile, sensitive person, who did not take well to critisism. In fact, he often delayed publishing his work because he was afraid of being criticised, which led to many problems later on. He suffered two nervous breakdowns and finally stopped doing research. However, he remained active by working for the government as Warden, and later Master, of the Royal Mint, where his efforts produced important results. He was made a knight by Queen Anne in 1705.

Newton died on 20th march, 1727. The epitaph for his tomb, which is in London's Westminster Abbey, was written by the poet, Alexander Pope: *Nature and nature's laws lay hid in night; God said Let Newton be and all was light.*

Vocabulary
according to – согласно
wealthy – обеспеченный
estate – поместье
to bring up – воспитывать
to allow – позволять
to cover expenses – покрывать расходы
despite the fact – несмотря на факт
at some point – в определенный момент
reflecting – отражающий
to be involved – быть вовлеченным
take critisism – принимать критику
to lead to problems – приводить к проблемам
to suffer – страдать
nervous breakdown – нервный срыв
knight – рыцарь

2. Answer the questions

1) When was Isaak Newton was born?
2) Who was his father?
3) Who brought him up, when his mother married again?
4) What profession did his mother choose for him?
5) Is it a good idea for scientists to tell others about their research results? Why/Why not?

6) Can you explain why we see colours?

7) Do you know the famous story of how Newton discovered gravity?

3. Choose the correct answer

1) As a young child, Newton

A) lived on a small farm

B) lived at Woolsthore with his grandmother

C) lived with his parents

D) lived with his mother and her new husband

2) Newton's mother

A) Took him with her when she remarried

B) wanted him to go to school

C) thought he should be a farmer

D) covered all costs of his education

3) Newton was originally studying to be

A) a physicist

B) a pholosopher

C) a mathematician

D) a lawyer

4) Newton was not particularly influenced by

A) the ideas of Aristotle

B) the ideas of Descartes

C) the ideas of Copernicus

D) the ideas of Euclid

5) Newton had problems in his later life because

A) he was so famous

B) he was afraid of criticism

C) he published his work

D) he stopped doing research

4. Write nouns, adjectives and verbs, connected with the word SCIENTIST

nouns	adjectives	verbs
laboratory	hardworking	to investigate
microscope	famous	to publish
experiment	outstanding	to demonstrate

5. The underlined words are all in the wrong sentences. Put the words into the coreect sentences

1) My uncle worried so much about his work that he had a mint.

2) Our class visited the estate and we saw how the money is made.

3) That crystal vase is very calculus and will easily break.

4) The bracnh of mathematics that is concerned with limits and with the differentiation and integration of functions is called a delay.

5) The telescope had a huge old castle and beautiful gardens.

6) A nervous breakdown has a large convex lens so that you can see things which are far away.

7) There was a fragile so we were late.

GRAMMAR CORNER: FUTURE CONTINUOUS

УТВЕРЖДЕНИЕ	ОТРИЦАНИЕ	ВОПРОС	КРАТКИЙ ОТВЕТ
I will be working	I won't be working	Will I be working?	Yes, I will. No, I will not
You will be reading	You won't be reading	Will you be reading?	Yes, you will. No, you won't.
She will be solving task	She won't be solving task	Will she be solving tasks?	Yes, she will. No, she won't.
He will be driving a car	He won't be driving a car	Will he be driving a car?	Yes, he will. No, she won't.
It will be sleeping	It won't be slleping	Will it be sleeping?	Yes, it will. No, it won't.

We will be visiting our parents	We won't be visiting our parents	Will we be visiting our parents?	Yes, we will. No, we won't.
They will be passing exams	They won't be passing exams	Will they be passing exams?	Yes, they will. No, they won't.

Words signals: at this time tomorrow, from 2 till 4, the whole evening the next week

6. Use these words to write sentences with Future Continuous . Use will be, won't be or won't

1) I (not travel) next week. 2) (you work) tonight? 3) Sam (study) at 2 o'clock. 4) (She study)? 5) They (not drive) tomorrow. 6) (you sleep)? 7) We (watch) TV tonight. 8) Mr. Smith (to fly) to Italy soon. 9) The Sun (set) at seven o;clock. 10) (We eating) soon? 11) Where (you stay)? 12) I (do my homework) tonight. 13) How (get to work)? 14) (She play)? 15) I (get) a haircut this afternoon.

7. Put the verbs into future continuous

THIS TIME NEXT WEEK

1) I (play) Clash of Clans with my friend Bill.
2) We (collect) trophies, gold and elixirs.
3) While we are playing, we (drink) lots of coca cola for energy.
4) At the same time, the wizard (cast) spells on goblin village.
5) I _____also (build) a new community and then with Bill – we (attack) goblin vilages.
6) We may take a break – and then we (eat) deliciuos spring rolls and wonton soup from the Golden Foenix.
7) Later we (train) soldiers and we (upgrade) our walls and storage areas.
8) One thing we (not do) – is our homework and we (not study) for our math test.
9) The Clans (face) off against one another – in one epic battle after another.

10) I hope we (receive) many stars and that we (advance) the next level.

11) This time next week I believe that I _____still (play) Clash of Clans and that I will be a champion with 3200 points.

12) So, don't phone us next week, we (battle) giants and gobblins there.

8. Put the verbs into the future continuous

A WONDERFUL PLAN

Alison and Nate, a brother and sister, live together in an appartament. They attend university in the same city, so they live together to share expenses. Their parents live in a different city, but they (visit) their children tomorrow. They (arrive) at the airport at 10 o'clock.

Nate and his elder sister talk about all the arrangements they made for their parents visit.

- «Okay, so we (go) to the concert tomorrow, right?» Nate asks.

- «That's right» Alison replies. We (see) the orchestra at 7:00 p.m.»

- «_____we (go) to the museum tomorrow, then?» her brother asks.

- «Yes, I reserved tickets for the special exhibition on mummies». Alison says. «_____you (come) with us or _____you (meet) your study group?»

- «No, I _____definetely (go) with you to the museum». Nate answers. «I love museums! All right right, so we (pick) Mom and Dad up in about an hour.

- «Yes, I (leave) soon» Alison says.

Nate is confused. «What do you mean? We _____both (go), right?

- «Of course not» Alison laughs. «Look at this place! I was very busy making all the reservations and getting all the tickets. We did not clean at all ».

- «Oh, no. you are right». Nate looks at the messy living room and remembers all the dirty dishes in the kitchen. «What will we do?»

- «Don't worry, my dear brother», Alison says, smiling. «You know, I always have a plan».

- «Is a cleaning service coming?» Nate asks. «_____Mom and Dad _____(stay) in a hotel?»

- «No, silly» Alison replies. «No one (come) to help us clean».

- «Then what is your wonderful plan?» What _____we _____(do) to get the appatment clean? Mom and Dad (arrive) soon». Now Nate is getting really nervous.

- «Not to worry» Alison reassures his brother. «I (drive) to the airport to pick them up, and then we (go) to a new art gallery that just opened. We (take) a guided tour for an hour».

- «How does an art gallery tour get the house clean?» Nate wonders.

- «That does not clean the house! Remember that you (stay) here , little brother». Alison says, giving him a hug before she walks to the door. «This way you will have lots of time!» I (go out) to have fun with Mom and Dad because I am a wonderful daughter, and you (stay) here to clean the whole appartment because you are a wonderful son!».

9. Put the verbs into Future Simple or Future Continious

1) I (send) you a postcard from Spain.
2) She (stay) at Sunrise Hotel if you need her.
3) Miss Richards (attend) a lecture from 2 till 5 p.m. today.
4) We (wash) those dirty dishes when we come home from work.
5) I know that Jerry (stand) on the platform and (wave) his hand when our train arrives.
6) Your dress (be) ready in half an hour.
7) The New Year (start) at midnight.
8) He (not return) to that island amynore.
9) Sandra (enjoy) her vacation in a ski-resort at this time next year.
10) I (not work) in the library tomorrow evening.
11) We (fly) to India this summer.
12) We (go) to USA at this time next Sunday.

13) I can give you a lift to the office in a couple of minutes, I (drive) that way anyway. – if you are late I (drive) you to school.

14) Don't call me at 7 a.m., I (take) a shower after work.

15) Our granny (to read) 3 fairy-tales to us in the evening. – Our granny (to read) a fairy-tale when mum and dad come home.

10. Read a part of a radio programme about great scientists

Although Isaak Newton is famous for his work in physics and mathematics, he also spent a lot of his time working on alchemy. Nevertheless, nowadays we remember him for many scientific discoveries. So, what were they? Well, where to begin?

At the beginning of the 1670s he was involved in the branch of physics that studies the physical properties of light kniown as optics and to this end was studying the refracton of light. He found that a prism, which is an optical device with a triangular shape and made of glass and which is used to change the direction of light, could decompose white light into a spectrum of colors. If you are not sure what a spectrum is, it's a whole range of something. He said, if you then used a lens, you know like the glass in a pair of glasses, together with a second prism, you could then recompose the multi-coloured spectrum into white light.

But that wasn't all. Indeed, he also looked at coloured light and found that separation of a coloured beam proved it didn't change its properties. However the beam was shone, its colour remained the same. This gave him an explanation for why we see colours. Basically, he claimed that an object didn't make its colour but its interaction with coloured light caused us to see colours.

Newton also made a lot of headway in the area of light composition. He suggested that light is made up of particles connected to waves. Modern day science agrees with the idea of a wave-particle relationship although not with the whole theory.

Perhaps not suprisingly, Newton may have also been the first to give an exact account of how a rainbow is formed when he illustrated light passing through the water droplets.

However, for many of us, Newton entered history as the discoverer of gravity. We all know the famous story of an apple supposedly dropping on his head leading him to his realisation of gravity. Well, don't think things were so simple. He knew gravity existed, the question was how far-reaching was its influence. Was it responsible for keeping the Moon in orbit, for example? His calculations said yes and he name the force universal gravitation.

11. Fill the gaps

1) Optics is the branch of physics that studies the physical ……of light known as optics.

2) Newton claimed that a prism could ……..white light into a spectrum of colors.

3) A second prism and lens could recompose the multi-coloured spectrum into ……..light.

4) Newton said ……..with coloured light caused us to see colours.

5) Newton believed light is made up of particles connected to …….

6) Newton's calculations said gravity kept the Moon in ……..

12. Read and translate a part of a radio programme about great scientists.

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13. Translate into Russian

1) Albert Einstein is known as one of the greatest physisists of all time.

2) While still at Luitpold Gymnasium, Einstein wrote his first scientific work *The Investigation of The State of Ather in Magnetic Fields.*

3) Einstein was qualified to teach Physics and Mathematics but could not get a teaching position then.

4) While working at the Patent Office, he began to do research in the field of physics and made some outstanding discoveries.

5) Einstein Theory of Relativity caused an upheaval in the scientific world as it completely overturned the long-standing Law of Universal Gravitation.

6) The Noble Prize for Physics was given to Einstein in 1921 for his work on the photoelectric effect. He proved that when matter was exposed to.

7) Einstein never worked on the atomic bomb because he had always be against war and weapon of mass destruction.

14. Translate into English

1) Мать Ньютона хотела, чтобы он был фермером, но он был не способен к этому.

2) Изучая право в Кембридже, Ньютон заинтересовался современной философией.

3) Интерес Ньютона к математике в конечном итоге привел его к созданию математического анализа.

4) Работая в области оптики, Исаак Ньютон сделал важные открытия в области света и цвета и создал первый зеркальный телескоп.

5) Законы движения планет и закон всемирного тяготения, открытые Ньютоном, имели исключительное значение. Позднее они были использованы Эйнштейном в его научной работе.

6) Интересно отметить, что Ньютон также занимался политикой. Он даже был членом Парламента.

7) Известно, что Ньютон был нетерпим к критике. Впоследствии это привело к ряду конфликтов, и, в конце концов, он перестал заниматься наукой.

8) Майкл Фарадей был из бедной семьи. Он вынужден был заниматься самообразованием, т. к. не имел возможности получить хорошее школьное образование.

9) Майкл вынужден был много работать, чтобы обеспечить себя. Он даже подумывал оставить занятия наукой.

10) Когда Фарадей работал помощником Деви, он построил униполярный электродвигатель.

11) Фарадей никогда не был силен в математике и поэтому сотрудничал с Максвеллом.

12) Фарадею удалось создать устройство для перемещения магнита через витки провода и таким образом получить электрический ток.

13) Закон индукции Фарадея является основой электромагнетизма и современных технологий.

14) Фарадей открыл как способ производства электричества, так и способ его использования.

15. Fill in the following sentences with an appropriateverbs

AUTUMN VERBS

1) The weather _____chilly.
2) People _____sweaters.
3) Leaves _____color.
4) Leaves _____to the ground.
5) People _____leaves into piles.
6) Scarecrows _____the crops.
7) Crops _____in the fields.
8) Farmers _____their crops at the market.

9) People _____apples from trees.
10) Squirells _____nuts.
11) Geese _____south for the winter.
12) Frost _____the ground in the morning.

13) Children _____trick-or-treating.
14) Pumpkins _____orange in the fields.
15) Families _____Thanksgiving.

16. Fill in the blanks below with words from the box.

FALL

harvest	red	pumpkins
sweaters	orange	corn
chilly	yellow	September
sets	scarecrpows	country
migrating	autumn	foliage
change	season	ground
November	back	coats
farmers	October	crows
before	grapes	

Fall

Fall, which is also called _____, is the _____when the leaves _____color and fall to the _____. In North America, it is also the season when kids head _____to school.

The wesather

Fall begins with warm weather in _____, but as the season continues into _____and _____, the sun _____earlier and earlier everyday and the weather becomes _____. And so, people put away their shorts and t-shirts and take out their _____and _____.

The harvest

In fall, _____are busy working in their fields. They have to _____their crops before the cold of winter comes. _____now big and orange, are ready for making pies. _____quickly ripens on the cob. Wine makers pick their plump, juicy, purple _____from the vine. _____stand guard in the fields to keep the _____from stealing the crops _____the farmers can gather them.

The Country

If you are fortunate, you can visit the _____in the fall and see the spectacular _____on the trees as the leaves change to _____, _____, brown, and _____. Overhead, birds are _____, heading south to their winter homes.

17. Read and translate

Before the scientific revolution the world was viewed very differently. To understand why, we need to first look at the reasons for the thinking in the past and then explain how modern scientists changed those beliefs.

Ancient thouht was guided by philosophy and religion. Rather than analysing an idea based on what could be seen, descriptions of the world were according to what a philosopher believed. Nevertheless, there were thinkers using mathematics and observations for scientific reasons and sometimes the right answer was found to a questions even if it was for the wrong reason.

Modern thought began with a scientific revolution influenced by the works from Eastern scholars in the early middle ages. Works like Galileo's on dynamics, and Newton's laws of motion all built on them, bringing in modern physics. The 19th century saw investigation

into electricity and thermodynamics. Through the use of equations and investigation, theories were discovered allowing many advances in technology. Later examples included the development of X-rays and nuclear power. Physics progressed, quantum mechanics gave explanations for how particles move and the whys of the universe. Due to science developing, finding proof became the key to new ideas based on what could be seen. Of course, knowing what mistakes had gone before also helped modern scientists.

Finally, we can understand that theories of physics both before and after the scientific revolution had a need for observation and proof. However, the difference lay in how easily theories were accepted, with modern thinkers requiring more analysis and proof. And also aiming to change the world.

18. Write a newspaper article about famous physicist

Give biographical information and an explanation of his many achievements.

Use this plan:

Title (think of an eye-catching title)

Paragraph 1

Explain who are you writing and why.

Paragraph 2

Give an overview of Newton's life.

Paragraph 3 and 4

Give examples of his theories and how he arrived at the conclusions.

Paragraph 5.

Sum up by briefly restating his life and achievements and say what kind of impression this scientist made on you.

UNIT 3. PHYSICAL PHENOMENA

1. Read and translate the text

THE GENERAL THEORY OF RELATIVITY

Isaak Newton's discovery of the Laws of Universal Gravitation would seem to have definitely answered the question of planetary movement. And yet, it became apparent to scientists that a number of phenomena which they observed did not agree with those they expected to see based on Newton's predictions.

One of the differences was the orbit of the planet Mercury, which did not quite match the orbit predicted by Newton's theory. Another problem resulted from James Clerk Maxwell's theory of electromagnetism (about 1870), which indicated that space was filled with matter that moved and was not empty and motionless, as Newton had believed. Finally, there was a problem with Newton's claim that light travelled at a constant speed, whether the observer was moving toward or away from it or not.

These questions captured the interest of a brilliant young physics student, Albert Einstein.

Einstein's first attempt to solve the problem was his 1905 paper on *The Special Theory of Relativity,* a concept which has been

noted by Galileo in 1632. In this work, Einstein found that time and space are relative, not constant. This means that time and space are different depending on where observer is. This was proved by an experiment involving two clocks: one was put on an airplane which travelled around the world and the other remained at the starting point on the ground. When the first one returned, it was running slower than the one which had been left behind, exactly as Einstein had predicted.

Einstein continued to expand on this theory, and in 1916 presented a paper on a new theory, *The General Theory of Relativity,* which took into account the effect of gravitation on space and time. It involved the notion of space time, a multi-dimentional phenomenon which is constantly moving and bending as it meets obstacles in its path. Everything in the universe is part of this space time and is carried along with it. Futhermore, gravity is not a force which moves things, but rather it is an element which illustrates curved space and time.

Einstein's theory was based on geometrical calculations and principles and had to be proved by scientific testing in the natural world, which many scientists were eager to do. In 1919, during a solar eclipse, a British team working in two different locations measured the light of several stars. They found that the light from these stars was actually bent, just as Einstein's equations to other natural phenomena, all with positive results.

Vocabulary
definetely – определенно
apparent – очевидный
prediction – предсказание
to indicate – указывать
to fill – наполнять
to move – двигаться
empty – пустой
motionless – без движения
to claim – заявлять
constant speed – постоянная скорость
to capture the interest – провоцировать интерес
involving – включающий

to remain – оставаться
starting point – исходная точка
to expand – расширять
to take into account – брать врасчет
to bend – изгибаться
to meet obstacles – встречать препятствия
curved – изогнутая
to be eager to do – иметь желание сделать

2. Answer the questions

1) Who first attempted to solve the problem?
2) Were time and space relative or constant?
3) Which clock were running slower?
4) What is gravity?
5) How was Einstein's theory proved?

3. True or false

1) The orbit of the planet Mercury led scientists to question Newton's Law of Universal Gravitation.
2) Maxwell agreed with Newton that space was empty and motionless.
3) Einstein was the first scientist to talk about the notion of relativity.
4) According to Einstein, gravity is not a force which moves matter.
5) Einstein's theories were never proved by scientific testing.

4. Find a synonym in the box for the words or phrases in the sentences.

an eclipse	apparent	notion
multi-dimentional	eager	bend
obstacles		curved

1) In scince fiction films, space travel is often talked about as being *more than one dimension* since it involves both time and space _____

2) When there is *the phenomenon of the Sun being covered by the Moon,* it is observed by millions of people. _____

3) The scientist was very *keen* to test her theory. _____

4) The heliocentric theory was a(n) *idea* that many people did not want to accept.

5) Unfortunately, he met many *difficulties* in his reserch. _____

6) Light can *turn.*_____

7) It was *obvious* to scientists that more research was needed.

8) The line was rounded.

5. Find the words, connected with the word physical phenomena

Nouns	Adjectives	Verbs

6. Discuss the questions

1) Why do scientists want to test and prove theories?

2) Do you think there are general laws which can explain the physical universe? Why/Why not?

3) Are scientists influenced by the work of earlier scientists?

4) Discovery is just a different way of looking at something. Do you agree or disagree with this statement?

7. Read about five famous scientists talking about research involving relativity.

Speaker 1: I had been working in theoretical physics for years when Einstein announced his discovery of the special law of relativity in 1905. Many of my concepts did not fit models of classical physics and led to the birht of a new field of inquiry, quantum physics. But to

get back to the point. I immediately recognized the implications of Einstein's theory and spent a lot of time and effort promoting it among my colleagues in the scientific world.

Speaker 2: I discovered a set of mathematical equations to express the basis laws of electricity and magnetism. From there, I eventually found that light is actually an electromagnetic disturbance. My theory was not perfect, but it was a success in that a lot of other researchers became interested in aspects of it and it led to great advances in the field of physics. For example, one of those researchers discovered the laws of special and general relativity.

Speaker 3: I did not come up with the theory, you understand – I was not that brilliant. I have to admit. No, I just proved it. You see, I had read about the his ideas and thought there might be some truth to them – he never bothered testing them himself, you see. So, when the opportunity presented itself, I jumped at the chance and became famous for it.

Speaker 4: During the many hours I sat in my office during my boring job, I thought about physics problems and tried to solve them mathematically – just as one might do any other puzzle in order to pass the time. I did not have a laboratory to test my theories – I left that tasks to others. But my thinking turned out to be right after all – I did discover two theories of relativity, so you could say my time was not wasted.

Speaker 5: I believed that we should use mathematics instead of logic to solve physical problems – and I ran into a lot of critisism for it in those days, let me tell you. I also tried to measure the speed of light – not very successfully. I am afraid, but was the first to come up with the concept that there were no absolutes in the cases of motion and rest, which was a basic principle of relativity.

8. *Match each statement with the speaker. There is one statement which you don't need to use.*

A He discovered one of the first principles of relativity.

B His work led to the discovery of the Theory of Relativity.

C He discovered the two theories of relativity.

D He disagrred with the Theory of Relativity.

E He supported the Theory of Relativity.

F He tested the Theory of Relativity.

GRAMMAR CORNER: PAST PASSIVE VOICE
WAS, WERE + 3 FORM

УТВЕРЖДЕНИЕ	ОТРИЦАНИЕ	ВОПРОС	КРАТКИЕ ОТВЕТЫ
The book was written in 2017	The book was not written in 2017	Was the book written in 2017?	Yes, it was. No, it wasn't.
The documents were received yesterday	The documents were not received yesterday	Were the documents received yesterday?	Yes, they were. No, they were not.

9. Complete the sentences with past passive voice form

1) The house …… (paint) last year. 2) We ……. (not/invite) for Kelly's birthday party. 3) Three rooms……. (damage) by a fire. 4) I (bear) ……in Italy. 5) My stolen car …… …….(find) by the police. 6) Many people ……..(injure) in the accident. 7) I ……(now/wake up) by my alarm clock yesterday. 8) This shirt …….(iron). 9) The bridge …….(damage). 10) Those hiuses ……..(build) in 1922. 11) This bike ……(buy) by my grandparents. 12) The book …….(not/read). 13) A lot of photos ……(take) during our holidays. 14) Five hundred people …….(employ) in that company.

10. Make passive sentences

1) This song …….(sing) everywhere in 1970.

2) Flowers ……..(plant) in this area. 3) Strawberry ……(grow) in this town. 4) Telephone …….(invent) in England. 5) My car ……(produce) in 2008. 6) The forest ……..(burn down) in 1986. 7) This school ……..(build) a decade ago. 8) Your computer …….(infect) by a virus. 9) His television ……(fix)

last weekend. 10) The apples ……(harvest) before Friday. 11) My clothes ……..wash last night.

11. Rewrite the sentences to make past passive voice

1) Columbus discovered America. 2) Tom cleaned the windows. 3) They built this bridge in 1733. 4) Someone took my umbrella. 5) They made dinner for us. 6) Sam wrote three emails. 7) They didn't play football. 8) They invented the bicycle. 9) They did not a new TV set. 10) He repaired my car. 11) He gave her a bunch of flowers. 12) They made this film in 1945. 13) He broke three windows. 14) I did not sell my computer. 15) Someone stole my car 16) They sold nice and cheap clothes in this shop. 17) Melinda made this project last term. 18) Students read history books.

12. Translate sentences into English, using Past Passive Voice

1) Это открытие было сделано в 17 веке. 2) Доклад был опубликован в сборнике. 3) Эксперимент был проведен профессором. 4) Формула была выведена. 5) Теоремы были доказаны студентом. 6) Конференция по физика была проведена в Москве на прошлой неделе. 7) Значимость этого открытия была описана в научном журнале. 8) Выступление лектора впечатлило аудиторию. 9) Мой друг был назначен заведующим лаборатории. 10) Контрольная работа была выполнена на отлично. 11) Экзамен был сдан на прошлой неделе. 12) В начале года было проведено тестирование студентов. 13) Мой брат был зачислен в университет.14) Лучшие студенты были отобраны для выступления на конференции. 15) Выбор стать учителем был сделан еще в школе. 16) Результаты тестов были получены вчера. 17) Семинар был проведен опытными специалистами. 18) Строение клетки было изучено на уроке.

13. Read and translate the text

THE BIG BANG THEORY

The Big Band theory is the theory that our universe began from an expansion event. According to the theory, our universe was previously very hot and dense. The Big Bang caused a rapid expansion of this dense matter. This expansion turned the not, dense

universe into the spread out, cool place that we are now familiar with.

The Big Bang was not actually an explosion, as the name seems to suggest. Instead, the Big Bang was simply a very rapid expansion of particles through space. It is worth nothing that while widely accepted, the Big Bang theory is still a work-in-progress. What existed before the Big Bang and what exactly caused the Big Bang have not been fully agreed upon. Scientists estimate that the Big Bang occurred about 13 billion years ago. The universe has not stopped expanding since the Big Bang.

In 1929, Edwin Hubble observed that far off galaxies were increasing in distance from our own. Since the universe is always expanding, it is always in a constant state of change.

14. Answer the questions

1) What is the Big Bang Theory is short?
2) Who discovered the big bang theory?
3) How was the Universe created?
4) Where did the singularity come from?

15. Translate the sentences into Russian

1) As had been suggested by Newton, experiments proved the idea of light being made up of tiny particles.
2) In 1900, Max Plank assumed that hot bodies radiated energy in packets called quanta.
3) Quantization helped to explain other mysteries of physics.
4) In 1907, Einstein used Planck's hypothesis of quantization to explain why the temperature of a soild changed by

difeerent ammounts if you put the same amount of heat into the material but changed the starting temperature.

5) The theory of photoelectric effect explains how protons can knock an electron out of the atom.

6) It has been found that the electrons in atoms can absorb and radiate a certain amount of energy only when moved from one stable orbit to another. In a stable orbit, electrons do not radiate energy.

7) Light is considered to be both particle and a wave at the same time.

8) Quantuum mechanics explains why atoms are stable and why they absorb or release energy only in certain ways.

9) Scientists have used quantuum mechanics to explain a number of phenomena that could not be explained before.

10) Since the early 1800s, the science of spectroscopy had shown that difeerent elements emit and absorb specific colors of lifht called «spectral lines».

11) The principles of quantization, wave-particle duality and the uncertainty principle ushered in a new era for quantum mechanics.

12) Many equations on quantum field theory stopped making physical sense because they produced results of infinity.

16. Translate the sentecnces into English

1) Ньютон утверждал, что свет распространяется с постоянной скоростью независимо от того, движется наблюдатель к источнику света или от него.

2) Альберт Эйнштейн попытался решить проблему света в своей работе «Специальная теория относительности».

3) Эйнштейн установил, что время и пространство не постоянны, а относительны.

4) Теория Эйнштейна была экспериментально доказана с помощью двух часов. Часы, которые находились в летящем самолете, шли медленнее, чем те, которые оставались на земле.

5) Во время солнечного затмения было обнаружено, что свет, исходящий от звезд, отклоняется. Это открытие принесло всемирную славу Эйнштейну.

6) Эйнштейн предположил, что гравитация – это не сила, а свидетельство искривления пространства-времени.

7) Многие ученые применяли уравнение Эйнштейна для описания других явлений и получали положительный эффект.

8) Альберт Эйнштейн является одним из самых великих физиков в мире.

9) Свою первую научную работу «Исследование состояния эфира в магнитных полях» Эйштейн написал, будучи учеником Луитпольдской гимназии.

10) Эйнштейн получил квалификацию, позволяющую ему преподавать физику и математику, но не смог найти работу учителя.

11) Работая в патентном бюро, он начал заниматься научной работой в области физики и сделал ряд выдающихся открытий.

12) Теория относительности Эйнштейна потрясла научный мир, так как полностью опровергла существующий издавна закон всемирного тяготения.

13) Нобелевская премия в области физики в 1921 году была присуждена Эйнштейну за работу в области фотоэллектрического эффекта. Он доказал, что, когда материя подвергается воздействию электромагнитного излучения, наблюдается появление электронов.

14) Эйнштейн никогда не работал над созданием атомной бомбы, так как всегда был против войны и оружия массового поражения.

17. Imagine that you live in 17th, 18th and 19th century, you are a famous scientist and write a letter about your discovery

Model answer

Dear Marcel,

My dear friend I am writing to tell you about some wonderul news I had today. You see, after all these years of study and research, my theory of general relativity has been proved true by researchers in Britain.

As yoi know I did this work in 1905, but it has taken fourteen years for it to be proved. This is because up until now the conditions

to check my theory have not existed. Basically the sun's light is too bright to measure. But today there was an eclipse which enabled scientists to measure the way light bent; they concluded the sun's light bent just as I said.

I have to say though, I am a bit worried about public attention – there's already been a reporter at my door. I hope I will just be left to get on with my work.

Do take care, Marcel, and write soon.

Yours, Albert

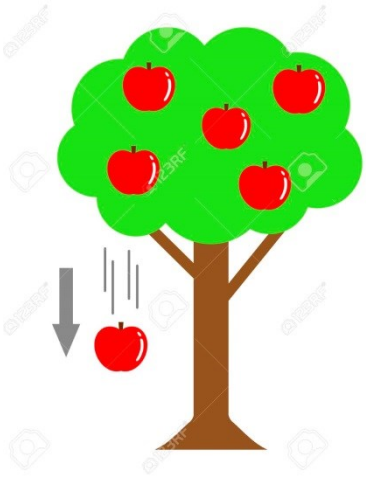
UNIT 4. PHYSICAL DISCOVERIES

1. Read and translate the text

THE LAW OF UNIVERSAL GRAVITATION

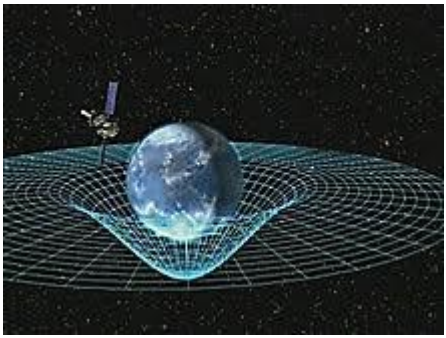
In ancient times, people believed that the Earth was the center of the solar system and tried to understand and explain the movement of the Sun, the Moon, the stars and the planets around the Earth. As scientific knowledge and technology improved over time, this idea (called the geocentric theory, from the ancient Greek words meaning Earth-centured) lost favour and new theories about the solar system were put forward.

Tycho Brahe (1546-601) and Galieo (1564-1642) made accurate measurements of the heavens, which were the basis for later theories. Nicolas Copernicus (1473-1543) believed that the Earth was not the center of the solar system but just another planet revolving around the Sun, which itself never moved. This type of theory was called heliocentric. Johannes Kepler (1571-1630), an assistant to Brahe, used Brahe's measurements to support Copernicus' heliothentric theory. This led to his discovery of three laws relating to planetary movement, including the fact that the planets move in elliptical orbits around the Sun.



It was left to Isaak Newton to expand on these theories by testing and proving Kepler's laws. By observing things around him. Newton realised several things. One was that objects can be in one place without moving. This is called inertia. Then, if the object moved, it moved toward another object. The phenomenon causing this pull of one object towards another was the force of gravity. Newton found that the mass of the two objects and the distance between them determined the strenght of the force of gravity and developed an equation which expressed this relationship.

Continuing to test and expand his fundings, Newton hypothesised that this relationship existed not only between objects on the Earth but also objects in space. This led in 1687 to Newton's Mathematical principles of natural phylosophy, usually called Principia in which he wrote about his historic discovery a law, it meant that the relationship he had discovered were true everywhere and in all cases.



Newton's discovery had a huge impact on scientific thinking for centuries afterwards. In fact, his fundings were not impoved upon untill 1905, when Albert Einstein introduced his special theory of relativity.

Vocabulary
in ancient times – в древние времена
to put forward – выдвигать
accurate – точные
measurements – измерения
heavens – небо, небеса
to revolve – вращаться

to expand – расширять
to prove – доказывать
inertia – инерция
to pull – двигать, толкать
strenght – сила, прочность
equation – уравнение
relationssship – взаимосвязь
a huge impact – большое влияние
funding – финансирование, субсидирование

2. Read the text abd choose the correct title for each paragraph. There is one title which you do not need to use

PARAGRAPH 1 ……
PARAGRAFH 2 ……
PARAGRAPH 3 ……
PARAGRAPH 4 ……
PARAGRAPH 5 ……
A Newton's discovery
B Early thepories of heliocentrism
C The strengh of Newton's Law
D Geocentrism
E Newton's observations
F Einstein's theories

3. Find nouns, adjectives and verbs, connected with the word discovery

discovery

nouns	adjectives	verbs
success	important	to make
phenomenon	valuable	to find
findings	scientific	to represent

4. You will hear five students talking about famous scientists. Match each statement with the speaker. There is one statement which you don't need to use.

Speaker 1: Well, he was actually the first who wrote about his observations. He believed that things did not happen by accident but

that something caused them to happen. He also believed that the stars and the planets were all moving towards their proper place in the heavens, although he did not say what that was.

Speaker 2: He was a firm believer in the ancient theory that the Earth was the center of the solar system. It sounds strange to us, but in those times people did not have the knowledge or technology we have now. Despite his limited resources, he made measurements of the heavens which were used for astronomical and navigational purposes for hundreds of years.

Speaker 3: One night, he saw a bright new star in one of the constellations. He began to measure its movements and realized it was a new astral phenomenon, which he called a «nova» a term we still use today. He came up with a new model of the solar system, a kind of hybrid. Where the Sun orbited the Earth but all the other planets orbited the Sun.

Speaker 4: He was the first to say that the Sun – and not the Earth – was the centre of the solar system. Well, actually, he believed that although the Sun itself was not the actual centre of the universe, it was close to the centre. The important thing is that he believed that the Earth orbited the Sun, and not the other way round.

Speaker 5: Although people had been measuring the movements stars for centuries, he was the first to apply mathematical principles to the thousands of different astral measuments which had been recorded by others. This led to the discovery of three laws of planetary motion, which attracted the interest of later researchers and led to great advances in the field.

5. *Answer the questions*

1) Why do the scientists want to test and prove theories?

2) Do you think there are general laws which can explain the physical universe? Why/Why not?

3) Does all research lead to important discoveries? Explain your answer.

4) What role does the work of earlier researchers play in scientific discoveries?

6. Find a synonym in the box for the words or phrases in the sentences.

an eclipse	apparent	notion
multi-dimentional	bend	
obstacles	eager	curved

1) In science fiction films, space travel is often talked about as being *more than one dimension* since it involves both time and space.

2) When ther is *the phenomenon of the Sun being covered by the Moon,* it is observed by millions of people.

3) The scientist was very *keen* to test his theory.

4) The heliocentric theory was a(n) *idea* that many people did not want to accept.

5) Unfortunately, he met many *dificulties* in his research.

6) Light can *turn.*

7) It was *obvious* to scientists that more research was needded.

8) The line was *rounded.*

GRAMMAR CORNER: PRESENT PASSIVE VOICE

УТВЕРЖДЕНИЕ	**ОТРИЦАНИЕ**	**ВОПРОС**	**КРАТКИЙ ОТВЕТ**
I am read an article	I am not read an article	Am I read an article?	Yes, I am. No, I am not.
You are cooked dinner	You are not cooked dinner	Are you cooked dinner?	Yes, you are. No, you are not .
He is given money by his parents	He is not given money by his parents	Is he given money by his parents?	Yes, he is. No, he is not.
She is helped with her homework.	She is not helped with her homework	Is she helped with her homework?	Yes, she is. No, she is not.
It is taken by my grandmother	It is not taken by my	Is it taken by my	Yes, it is. No, it is not.

	grandmother	grandmother?	
We are sent to the sea	We are not sent to the sea	Are we sent to the sea?	Yes, we are. No. we are not.
The docunents are printed now	The documents are not printed now	Are the documents printed now?	Yes, they are No, they are not.

7. Fill in the gaps using the Present Simple Passive Voice form of the verbs in brackets

1) The news reporter and a camera operator _____(to send) to investigate a news story. 2) People _____(to interview) by a reporter and the interviews _____(to film) by a camera operator. 3) The film _____(to take back) to the TV studio, and the best parts of the film _____(to choose) by the news editor. 4) Finally, the news report _____(to send) to televisions in people's homes and the news _____(to watch) by all over the country. 5) My motherland is the republic of Belarus. 6) My country _____(to situate) in the centre. 7) It _____to make) up of six regions: Brest, Vitebsk, Gomel, Grodno, Minsk and Mogilev. 8) Belarus _____(to not wash) by any seas or oceans. 9) Belarus _____(to border) by five countries. 10) Most of Belarus _____(to cover) by forests. It is a beatiful country with a lot of lakes. 11) The house _____(to build) from stone. 12) The children _____(not allow) to ride a motor-bike. 13) We _____(to give) text-books at school. 14) The letter _____(to write) in English. 15) The newspapers _____(to bring) in the morning. 16) Dinner _____(to cook) by my mother. 17) The picture _____(to paint) by my friend. 18) The classroom _____(to clean) every day. 19) I _____(to invite) to the concert. 20) Potatoes _____(to grow) in many countries.

8. Make these sentences passive

1) Mike brushes his shoes before school. 2) Claire knits nice jumpers for the kids. 3) Hans tidies his room today. 4) Kelly

doesn't speak English after school 5) Mag drives her car slowly and carefully. 6) Pam reads an advanture book this week. 7) Joseph answers the question correctly. 8) David doesn't know the way to the harbour. 9) I take books at the library. 10) Boys play football. 11) We clean our classroom after the lessons. 12) The postman brings newspapers every day. 13) We keep the dog in the yard. 14) We give milk to our cat every day. 15) We usually pick apples in September. 16) They use disks for storing information. 17) They discover new planets every day. 18) People give present at Christmas. 19) They speak Spanish in Peru. 20) They tidy the classroom every day.

9. Translate into Englsih

1) Слова написаны на доске 2) Эта книга продается во всех магазинах. 3) Ему часто отправляют письма? 4) Когда приносят газеты? 5) Этот парк всегда показывают туристам. 6) В нашей школе не дают завтрак. 7) Эти тексты не учат наизусть. 8) Машины БМВ производятся в Германии. 9) Чай выращивают в Индии. 10) Модемы используются для доступа в Интернет. 11) В Англии играют в крикет. 12) Молоко не продается в этом магазине. 13) Их дом построен не из дерева. 14) Правила не всегда учатся учениками. 15) Яблоки собираются не мной. 16) Мои тетрадки не хранятся на полке. 17) Спортивные программы не смотрятся некоторыми людьми. 18) Родительские собрания проводятся раз в 2 месяца.

10. Answer the questions, using Present Simple Passive

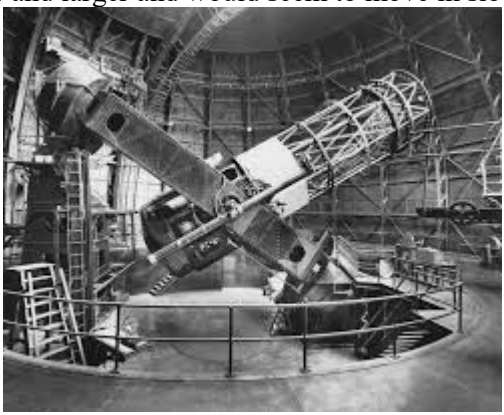
1) Are you always given good marks?
2) Is your groupmate is also given good marks at the exams?
3) Is your homework always done in time?
4) Are you often given money by your parents?
5) Is chess played by two or three people?
6) Are you shown physical experiments at the university?
7) Are professional books read by you?
8) Is scholarship got by you?
9) Are you shown presentations at your physics lessons?

10) Are sport programms watched by you?

11. Read and translate the text

LANDMARKS OF SCIENCE

In the summer of 1905, a young man was sitting at home after a day's work. While rocking his one-year-old baby, he thought something over. Suddenly, it came to him! The equation $\mathbf{E=mc^2}$ was borm, an equation which would change our understanding of the universe but would help to create the nuclear bomb. Albert Einstein was aware of recent developments, such as Marie Curie's research into radioacivity, but he had been working on his own. His mould-breaking equation showed how a small peace of mass could produce an unbelievable amount of energy. Einstein then demonstrated in his theory of relativity that not even time, mass or length are constant – they vary according to our perspective of them. For example, if we could see people moving at the speed of light, they would appear much heavier and larger and would seem to move in slow motion.



By the time Einstein had become world-famous, a young ex-lawyer returning from the First World War started work at the 15 Mount Wilson Observatory in California. Using the most high-powered telescope of its time, he began a painstakingly slow observation of nebulae, small patches of light that appeared outside oir galaxy. Edwin Hubble was on the brink of making the greatest astronomical breakthrough of the century. He discovered that these nebulae were in fact galaxies like our own, millions of light years away from us, which proved that the universe was wastly larger than

had previously been thought. Then, Hubble proved that the universe is actually expanding and that the further away galaxies are the faster they move.

12. Read and translate the dialogue

Questions to ask applicant

– Could you spell your name please?
– Cleopatra Jones.
– What kind of experience do you have?
– 3 years at a Law firm?
– What did you study at the university?
– Law.
– Do you have any special skills?
– License to practise Law.
– What are your good points and bad points?
– I am a team player, but I get angry easily.

Questions to ask employers

– What company do you represent?
– High School.
– What kind of job do you offer?
– Teacher.
– How much does the job pay?
– 30000/year.
– Where is it located?
– Suburbs
– Do you offer any benefits?
– Medical/Dental Insurance/ 2 months vacation.
– Is there any chance for a promotion or a raise?
– 3% raise every year.

13. Fill the table, using information from the previuous task

Name of the company		Name of applicant	
Job		Expirience	
Salary		Major	

Location		Skills	
Benefits Incentives		Good points	
Promotions Raises		Bad points	

14. In pairs decide what the benefits and drawbacks of each job are

Job	Benefits	Drawback
Teacher		
Taxi driver		
Farmer		
Police officer		
Scientist		
Grahic designer		
Pilot		
Engineer		

14. Translate the sentences into Russian

1) The belief in ancient times that the Earth was the centre of the solar system led to incorrect theories.

2) The fact that planets move in elliptical orbits around the Sun was explained by Copernicus' heliocentric theory.

3) Johannes Kepler tested and proved Copernicus' heliocentric theory.

4) It was Isaak Newton who, while observing things around him, realised that objects could be in one place without moving.

5) He called this phenomenon inertia.

6) The force of gravity is the attraction of one object towards another.

7) The Law of Universal Gravitation is true everywhere and in all cases, not only on Earth but also in space.

8) The discovery of the Law of Gravitation had a strong influence on scientific thinking for centuries.

9) Light speed is the speed at which light travels trough a vacuum.

10) The lights we call stars are actually light beams that are hundreds to millions of years old.

15. Translate the sentences into English

1) В древности считалось, что земля является центром солнечной системы, что приводило к ошибочным теориям.

2) То, что планеты двигаются по эллиптическим орбитам вокруг солнца, было объяснено гелиоцентрической теорией Коперника.

3) Иоганн Кеплер проверил и подтвердил гелиоцентрическую теорию Коперника.

4) Именно, Исаак Ньютон, наблюдая за предметами, окружающими его, понял, что объекты могут находиться на одном и том же месте без движения, и назвал это явление инерцией.

5) Гравитационная сила – это притяжение одного объекта к другому.

6) Она определяется массой двух объектов и расстоянием между ними.

7) Закон всемирного тяготения справедлив всегда и везде, не только на Земле, но и в космосе.

8) Открытие законов гравитации оказывало огромное влияние на научную мысль в течении столетий.

9) Исаак Ньютон объединил законы планетного движения Кепплера с теорией Галлилея о падающих телах.

10) Ньютон полагал, что пространство и время должны быть абсолютными.

16. Read magazine article about famous scientist

Everething you always wanted to know about Isaak Newton

Most people have probably heard of Isaak Newton as the discoverer of the Law of Universal Gravitation. However, Newton offered a lot more in many areas of science and even played an active role in politics.

Born in 1642, Newton came from a wealthy farming family. After his father's death he was raised by his grandmother until his mother's second husband died. Newton was not interested in farming and against his mother's wishes he studied law at university. He was attracted to modern philosisophy there and from that moved onto mathematics.

Newton explored the theories of many thinkers like Copernicus and Galileo and this led to his invention of calculus. He also made important discoveries in optics, theories about light and colour, and helped to build the first reflecting telescope. Moreover, he explored the fields of alchemy and religion. However, physics was the area where he made his great discoveries about the laws of planetary motion and gravity.

Newton expanded on previous theories by testing and proving them. He found that objects can be stationary in one place (inertia). But if an object moved, it moved towards another object due to the force of gravity. The strength of this force depended on the mass of the objects and the distance between them. Newton put this into equation. As he continued his work, he concluded that the same relationship was true for objects in space.

There is no doubt about Newton's achievements and his importance to scientific thinking. Indeed, it took until Einstein's time for his work to be improved on.

17. Write a magazine article about physical discobery.

UNIT 5. INVENTIONS

1. Read and translate the text

ELECTRCITY AND MAGNETISM

Electromagnetism is everywhere. It is a field that exists throughout space. When particles are electrically charged, the electromagnetic field exerts a force on them. These particles then move and exert a force on the electromagnetic field. By generating these fields when and where we want them and by controlling these forces we have electricity. This gives us the power we use in the modern world. All our TVs, phones, street lights and cars depend on electromagnetism.

So what is electromagnetism? Actually, it is two things, but they are closely connected that it is convinient for us to think of them as one, as two sides of the same coin. There are two types of field: electric and magnetic. Electrically-charged particles result in an electric field, static electricity. When there is a conductor, a material which will allow electric field to pass through it, then we can create an electric current. In our homes, the conductors are the wires that run through our house to the light bulbs or theTV. A magnetic field results from the motion of an electric current and is used to generate the electricity we use.

In the 19th century, James Clerk Maxwell, the Scottish physicist, produced the equations that proved the two forces acted as one. One effect of this was for physisists all over the world to hurry back to their libraries and laboratories to rewrite the theories on the

motion of objects. Maxwell's equations showed that what physisits had believed for centuries was in fact not correct. It was not untill Einstein, in the 20th century, that the theory of motion was put right – at least for now.

How do you know the two things are one? Well, sailors had known for centuries that lightning affected the magnetic compasses on their ships. No one, however, made the connection between lightning and electricity until Benjamin Franklin, the American politician and scientist, flew a kite in a thunderstorm to attract the lightning. In other parts of the world, physisits were experimenting with magnets and electricity. Most passed a current across a magnetic needle and watched it move. The Frenchman, Andre Marie Ampere eventually applied mathematics to electromagnetism. It is from his work that we have our modern understanding of electromagnetism.

One piece of the jigsaw remained. No one had discovered a way of generating electricity. True, there were batteries, Alessandro Volta invented the Voltaic pile in 1800, but it was of limited use. Certainly no battery could provide enough electrical power to operate a machine. For that the world would have to wait for Michael Faraday to find a way of creating an electrical current, when and where it was needed.

Vocabulary
field – область
throughout – через
to exert – вызывать
force – сила
generate – генерировать

to be closely connected – быть тесно связанными
two sides of the same coin – две стороны одной монеты
electrically-charged электрически заряженные
conductor – проводник
to allow – позволять
to pass through – проходить через
electric current – электрический ток
wire – провод
to produce the equation – вывести уравнение
to be put right – быть исправленным
lightning – молния
to affect – влиять
to attract – вызывать
magnetic needle – магнитная игла
one piece of the jigsaw – кусок пазла

2. Discuss these questions with your partner

1) What household appliances use electricity?
2) Where does electricity come from?
3) What does a magnet do?
4) Tell about the advantages of electricity?
5) What did people do before electricity was invented?
6) Can you think of some different ways of generating electricity?
7) What are the advantages and disadvantages of each?

3. Choose the correct word to complete the sentences

1……is something through which electricity can pass.

2 An electrical ……supplies power in our home.

3. The electromagnetic field ……a force on the particles.

4. To ……power you need a way to control electricity.

5. Normally, electricity is carried through homes by ……

6. Is 6 o'clock a ……time for your meeting?

1. a conductor	B a magnetic	C static
2. a bulb	B current	C particle
3. a. put	B exerted	C applied
4. attract	B exert	C generate
5. wires	B charges	C forces
6. comfortable	B fitting	C convinient

4. Read the text and choose the correct answer

1. We can make elecricity by

A exerting a force.
B creating electromaghtic fields.
C charging particles
D moving particles

2. Electrical and magnetic fields

A are opposites
B are two very different things
C are very closely related
D need a conductor

3. Maxwell's equations

A corrected the theory of motion
B caused scientific to rethink
C rewrote older theories
D have completely ensured the theory of motion law.

4. Our modern knowledge of electromagnetism comes from

A Ampere
B lightning
C Benjamin Franklin
D experimets with magnets

5. The electric battery

A could operate a machine
B could create an electric current
C was invented by Faraday
D was invented in 1800

5. Read the extract from a lecture on generating electricity. Then complete the table

What I am going to talk about today is how electricity is generated for use in our homes and factories. There are three main ways that we can make electricity, as well as some newly developing tecnhologies that I believe we will come to rely on in the future. They all have one thing in common. That is, they use fuel to turn a turbine, a large wheel. The three most common means of power generation are firstly, by burning fuel to make steam, which turns the turbine. Another way is to use a nuclear reaction to heat the water to make steam. And a third is to use the force of moving water to turn the turbine – hydroelectricity.

All have advantages and disadvantages. Burning is cheap and the fuel, usually coal, is easily available. However, burning does cause pollution. Nuclear energy is the cheapest way to make electricity, once the costs of building the nuclear power station are taken away. The waste, however, stays radioactive for a very long time, so we have the problem of storage. Hydroelectricity is the cleanest way to generate power – there is no pollution. But, not everywhere has fast-running rivers, and creating an artificial lake is very expensive and often means moving people away from their homes.

Other, newer ways of generating electricity, for example the use of wind power, do not pollute the atmosphere but they also do not yet produce enough electricity for the needs of a modern city. Of course, improvements in technology are happening all the time. What I would like to discuss now is.

Ways of generating electricity	
advantages	Disadvantages
Fuel	
Nuclear power	

Hydroelectricity	
Wind power	

6. Find the words connected with the words invention

nouns	adjectives	verbs
electricity	important	to find
laboratory	useful	to explore
Breakthrough	advanced	to discover

GRAMMAR CORNER: FUTURE PASSIVE VOICE

УТВЕРЖДЕНИЕ	ОТРИЦАНИЕ	ВОПРОС	КРАТКИЕ ОТВЕТЫ
I will be read a book	I will not be read a book	Will I be read a book?	Yes, I will. No, I won't.
You will be met at the railway station	You will not be met at the railway station	Will you be met at the railway station?	Yes, you will. No, you won't.
He will be sent to Moscow on business	He will not be sent to Moscow on business	Will he be sent to Moscow on business?	Yes, he will. No he won't
She will be invited to the party	She will not be invited to the party	Will she be invited to the party?	Yes, she will. No, she won't.
The parcel will be delivered in a week	The parcel will not be delivered in a week.	Will the parcel be delivered in a week?	Yes, it will. No. It won't.
We will be given a day-off tomorrow	We will not be given a day-off tomorrow	Will we be given a day-off tomorrow?	Yes, we will. No, we won't.
They will be explained the rules	They will not be explained the rules	Will they be explained the rules?	Yes, they will. No, they won't.

7. Make passive sentecnces in a Future Passive Voice

1) The exibition (to visit) by many people. 2) The bedroom (to clean) tomorrow. 3) The dishes (to cook) by my grandmother. 4) The thief (to arrest) by the police. 5) This car (to buy) by my brother. 6) These songs (to sing) at the concert. 7) This interesting film (to watch) by us in the evening. 8) The computer (to use) by my collegue. 9) I hope my mobile phone (to find) today. 10) The restaurant (to close) at 12 o'clock. 11) The homework (to do) by the students. 12) New discoveries (to do) in future. 13) I hope a lot of useful medicine (to invent) by scientists. 14) The flat (to sell) soon. 15) This amazing pictire (to finish) by the painter. 16) A lot of interesting books (to write) next century. 17) The text (to translate) by the students. 18) The conference (to hold) in a week. 19) The presentation (to show) at the next lesson. 20) She (to give) a good mark.

8. Rewrite the sentences to make future passive voice

1) He will compose an opera. 2) They will produce some TVs. 3) The railway lines will connect the town with other towns. 4) The physisict will make a lot of discoveries. 5) Scientists will invent new physical formulas. 6) A famous architect will design this theatre. 7) The students will not read this text aloud. 8) The teacher will correct the student's mistakes. 9) The scientists will made many discoveries. 10) The director will sign the letters. 11) The workers will prepare the ship. 12) He will check the room. 13) The buyers will ensure the cargo. 14) The advisor will show the contract. 15) The parents will not correct the compostitions. 16) The director will read the papers. 17) The student will apply the documents. 18) The lawyer will sent the letter. 19) The buyer will return the goods. 20) He will check the results.

9. Translate the sentences into English

1) Научные лаборатории откроют по всему миру. 2) Он переведет статью в научный журнал. 3) Учитель объяснит ученикам закон всемирного тяготения. 4) Учитель покажет ученикам физические опыты. 5) Студенты проведут физический эксперимент. 6) Мой брат защищает курсовую работу завтра. 7) Мои коллеги проведут научную конференцию в следующем месяце. 8) Студент будет зачислен в университет в августе.

9) Выпускники будут сдавать государственные экзамены в июне. 10) Заявление будет подписано директором завтра. 11) После торжественной церемонии будут выданы студенческие и читательские билеты. 12) Завтра будет сдан последний экзамен. 13) Научное исследование будет закончено через месяц. 14) Он будет проконсультирован научным руководителем. 15) Меры предосторожности будут приняты 16) Торжественное открытие будет проводиться в актовом зале. 17) Презентации будут показаны на следующем уроке 18) Результаты исследования скоро будут опубликованы. 19) Результаты экзаменов будут получены завтра. 20) Студенты будут встречены в аэропорту.

11. Translate the sentences into Russian

1) Michael Faraday came from a poor family; because he could not get a good school education, he educated himself.

2) Faraday had to work so hard to support himself that he even thought about giving up science at one point.

3) When Faraday worked as Humphrey Davy's assistant he built a homopolar motor.

4) Because mathematics had always been Faraday's week point, he worked together with Maxwell.

5) Faraday managed to build a device which moved a magnet through the loops of wire, thus creating an electric current.

6) Faraday's Law of Induction is the foundation of electromagnetism and modern tecnhologies.

7) Faraday discovered a way both of making electricity and of making use of it.

8) Research has shown mobile phones are not so dangerous.

9) There are three main ways that we can make electricity.

10) Electrical appliances are used every day.

12. Translate the sentences into English

1) Электромагнитное поле существует повсюду в пространстве.

2) Электромагнитное поле оказывает воздействие на заряженные частицы.

3) Электромагнитное поле используется для получения электричества, от которого зависит работа бытовых приборов.

4) Известно, что Андре Мари Ампер был первым ученым, который применил математику к электромагнетизму.

5) Электрические батареи, изобретенные Алессандро Вольта, использовались ограниченно и не могли вырабатывать достаточно электрической энергии для работы машин.

6) Открытие электромагнетизма позволило ученым создать такие устройства, как телевизоры, телефоны, электродвигатели.

7) Уравнения Максвела показали, что то, во что физики верили веками, оказалось неверным.

8) Возмущение электромагнитного поля, распространяющееся в пространстве, называется электромагнитной волной.

9) Любая электромагнитная волна распространяется в пустом пространстве с одинаковой скоростью – скоростью света.

10) В зависимости от длины волны электромагнитное излучение подразделяется на радиоизлучение, свет, рентгеновское излучение и гамма излучение.

11) До начала 20 века электричество и магнетизм считались явлениями, не связанными друг с другом, и рассматривались с разных разделах физики.

12) Английский физик М. Фарадей экспериментально обнаружил и дал математическое описание явления электромагнитной индукции.

13) Физические свойства электромагнитного поля и электрического взаимодействия – предмет изучения электродинамики.

14) Немецкий физик Герц поставил эксперимент, полностью подтвердивший теоретические выводы Максвелла.

13. Read the text and translate

THE WORLD'S WORST INVENTION

Fast food and speed cameraa are among the most hated inventions of all time. But what really gets you annoyed? Thousands of people voted and the results, published by the BBC, make for a surprising read.

2) Fast Food. Americans are the ultimate fast food eaters, spending an estimated 142 billion $ on it in one year. But it seems our days of carefree consumption of fatty, cholesterol-rich food may be limited, as we gradually wake up to the health risks. In 2002, some obese U.S. teenagers filed a lawsuit against McDonald's, accusing the fast food chain of fattening them up. A judge later threw out the lawsuit.

3) Television. Many of us are probably surprised by this one. But it's actually reality TV that's the main ofender with 3 % of the total vote. Making its debut in 1948 with Candid Camera in America, reality television's popularity has risen in the 21st century, in the USA There are two TV chanels devoted to it. Why it's so popular is anyone's guess.

4) Cigarettes. Cancer-causing chemicals in cigarettes mean that men who smoke are twenty-two times, and women twelve times, more likely to develop lung cancer than those who don't. Smoking is also linked to other cancers and heart attacks. Pregnant smokers are at great risk of giving birth to underweight babies. The World Health Organization says up to 29 % of British men and 19% of woman smoke.

5) The car. Car haters out-voted petrol users. Developed in the late 1880s, the modern car was initially the toy of the wealthy, but falling prices have made it a key part of family life. The motor industry is now booming – over 60 million cars and light trucks are produced globally in a year. But a green fuel is unlikely to take over from petrol soon, so the car continues to add to our growing carbon footprint.

6) Nuclear power. Nuclear accidents are rare but can have devastating effects. Nuclesr power plants cost more to construct and operate than fossil fuel ones, and are supported by large subsidies from the taxpayer Waste storage is also a concern but supporters promote nuclear power's green status as it produces no carbon dioxide directly.

7) Mobile phones. A surprising silver media for the gadget that's revoluonized communication. Mobiles have been available in the UK since 1985 and have been widely used since the late 1990s. Almost three-quatrers of Britons now own one. Despite health scares linking mobile phone use to brain tumours, most studies have found there is no increased risk. May be it's those annoying ring tones that have put mobile phones here.

8) Weapons. Bombs, guns, biological weapons, you name it – innovations that go bang or cause bodily harm were the most widely hated in our survey. Nuclear weapons were the worst offender, getting 11% of the total vote. They have only been used twice in wars – in 1945, the USA dropped the bomb Little Boy on the Japanese city of Hiroshima, followed three days later by Fat Man which fell on Nagasaki.

14. Read the article again. Are the sentences True, False or Not given? Where possible, underline the phrase or word that helped you decide

1. Americans consume the most fast food.
2. Candid Camera is famous for being the most popular U.S. reality show ever.
3. Smoking is more dangerous for woman that men.
4. Cars being less expensive has meant that more people use cars.
5. Alternative fuels will probably replace petrol in the near future.
6. Traditional power plants are less expensive to run.
7. Research has shown mobile phones are not more dangerous as you get older.
8. People felt equally negative about all types of weapon.

15. Work in paires and discuss, what do you think are the five worst inventions of all time? Look at the photos. Were these the same as your ideas? Write down one reason why each is on the worst invention list. How many of your reasons were the same? Which invention should not be on the list.

16. Complete the article with a, an, the, no article

An invenor or the inventor?

a) It is ___well-known fact that _____electric light was invented by Tomas Edison, but is it really true? Edison's light bulb, like many inventions, was _____result of many scientists' work. _____English scientist had made _____simple electric light seventy years yearlier and Edison's further development of _____idea would not have been possible without the work of his colleagues.

Similarly, the Wright Brothers are generally credited with inventing the first successful airplane at _____beginning of _____twentieth century. Yet, literally dozens of _____inventors and scientists before that time might claim to have taken key steps in developing _____sustained flight. For instance, _____Norwegian named Navrestad supposedly flew in a glider in 1825 and, in subsequent years, _____advances were made all over the world. In fact, just before the Wright Brothers' famous flight, _____American named Langley flew over _____Rotomac River, a distance of about 800 metres.

It seems that _____person who not only achieves a particular feat but also records it, protects it and publishes it will be credited with the discovery.

b) Cross out the in ten places where it is unnessesary

Your million-dollar idea

Do you want to join those people who have made a million from a simple idea? Then just follow these five tips.

Remember the saying «the necessity is the mother of the invention». When the people need the things, sooner or later someone will come up with an idea to meet that need. It could be you!

Watch people and notice their habits. How do they do the everyday activities, such as answering the phone, handling the money or the credit cards, eating and drinking? Is there a way that one of the activities could be made easier?

When you have an idea, write it down. Draw a picture. Give it a name. This will help you mind work on the idea further.

Don’t talk to the negative people about your ideas. The motivation isimportant for the creativity and negative people can kill it.

Talk to a friend about your ideas. Some of the most successful ideas emerge through the talking.

17. Listen the conversation and translate

Girl: Do you know how your hairdryer work?

Boy: You switch it on and it blows warm air onto your hair. Easy.

Girl: No, I mean how does it blows the air, and how does it warm it?

Boy: Erm, electricity, I suppose. Go on. Tell me then.

Girl: There is an electric motor inside. When you switch it on, it turns a fan. That what blows the air.

Boy: But that doesn’t get it warm, does it?

Girl: No, I was about to explain. There is a heating element in there, too. When the cirrent passes through it.

Boy: You mean the electricity?

Girl: That’s right, the electric current. It passes through the element and it gets hot. Then, air is blown over the element by the fan and this is how it gets warm. There is a thing called a thermostat in there, too. That stops the element getting too hot. If it does, it switches it off. Simple.

Boy: Very interesting. I think my hair’s dry now.

18. Look at the list below. Which of these things are importatnt to consider when hiring somebody for a job. Choose the five most important and five least important

_____Level of education
_____Color of hair
_____Family background
_____Good references
_____Clothing
_____Prior criminal record
_____Weight
_____Work expirience
_____Speking ability

_____Well-prepared resume
_____Hobbies
_____Religion
_____Transcripts and report cards from school

19. Look at the statements and decide whether «there is some truth to it» or «that's completely wrong» and then explain why

Money is the best measure of success.

Happiness is the best measure of success. Do whatever makes you feel good.

Finding a good partner is the best measure of success. We are animals and the more beautiful, interesting boyfriends or girlfriend we have, the more successful we are.

Success is winning at whatever you decide to do.

Success is conquering oneself. Learning to be in control of your emotions and desires.

Success is getting the respect of other people. Having friends.

Success is being able to get other people to do what you want.

Look at this list and decide which are the most important things to be successful in your career

_____dressing well
_____good education
_____sense of humour
_____understanding your own emotions
_____learning quickly

_____creativity
_____charisma
_____skilled at your job
_____connections
_____hard-working
_____leadership
_____self-control
_____good at finding solutions
_____ability to express yourself

20. Read an article about Michael Faraday

Michael Faraday came from a poor background and this was to have a great effect on his scientific work. As a boy, his education was very limited and there were certainly no great teachers behind him giving him encouragement and support. However, he must have been hungry for an education because he worked during the day as a bookbinder and attended lectures in the evening.

It was after a lecture given by Humphrey Davy that Faraday decided to write to him seeking a place in the scientific community. Davy's reply suggested he give up the idea. Luckily for Faraday, Davy injured his eyes shortly after and decided to employ him as his secretary.

Unfortunately, though, Faraday was not considered a gentelman and was treated like a servant. Althought this made him unhappy, he had the opportunity to carry out experimetns at the Royal institutions of Great Britain. He managed to make advances in an electrical motor, but probably Davy was not happy with this as he removed Faraday from work. In fact, he prevented him working with electricity, but on Davy's death in 1829, Faraday resumed his experiments. His work laid the foundations of electromagnetism and modern tecnhology.

Until his death, Faraday remained a hard-working, modest man who made many important discoveries but refused honours from the Queen. Finally many years later, he was honoured between 1991 and 2001, when his face appeared on the Bank of England's 20 pounds banknote.

21. Choose one important inventions: wheel, writing, electricity, antibiotics, nuclear power, computer, etc. and write about it.

UNIT 6. QUANTUM MECHANICS

1. Read and translate the text, complete with the missing sentences below. There is one sentence which you do not need to use

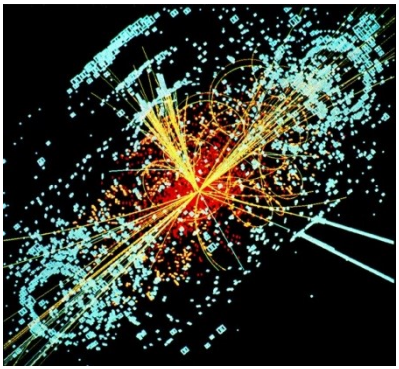
QUANTUM MECHANICS

Quantum mechanics is the branch of physics that explains the behaviour of the tiniest matter such as atoms, molecules and nuclei. (1)……..Thanks to the ideas it put forward, scientists managed to explain all the new experimental evidence of the time that could not be explained by classical physics (also known as Newtonian physics, after Isaak Newton).

(2)……..

A few years later, Isaak Newton suggested that light was made up of tiny particles. Both of these theories were backed up by experiments. But neither theory could adequately explain on its own all of the phenomena associated with light.

Nearly two hundred years later, in 1900, Max Plank assumed that hot things send out energy in packets, and he named these packets quanta. (3)……In 1905, Albert Einstein published a paper based on Plank's work to explain the photoelectric effect, and called the energy packets of light photons. According to this theory, when light shines on a metal surface, the photons in the light can carry enough energy to hit an electron in an atom in the metal and knock the electron out of the atom.



In 1920, while working on the idea that a moving particle had the property of a wave and thus could have a wavelenght (that is, that there was a specific length to the waves of light), Niels Bohr decided to find the wavelength of an electron moving around the nucleus of an atom. He found that an electron could have a stable orbit, which means that the electron in orbit is not radiating energy. He also found that an electron absorbed or radiated a certain distinct amount of energy only when moved to another stable orbit. (4)…….

It appears that quanta were being used by scientists to explain all sorts of phenomena that they could not explain before. However, the scientific community was divided on whether light was a wave or a particle because it behaved as both in different experiments. So they began to think of light as both a particle and a wave. (5)……
This concept is true for both matter (such as electrons) and energy (such as light). We can only conclude that light is somehow both a wave and a particle, or it is something else that we cannot quite understand and which physisists of the future will be able to explain.

In the final analysis, quantum mechanics explained two very important things: why atoms were stable and why atoms absorbed or released energy in certain ways.

A. Quanta were the modern answer to Newton's theories.

B. Electrons could not inhabit the space between orbits.

C. Quantum mehanics is used for understanding the behaviour of systems at atomic length scales and smaller.

D. The foundations of quantum mechanics were laid in the late 1600s, when Christian Huygens proposed that light was made up of waves.

E. Then Albert Einstein began to wonder if light also delivered its energy in packets.

F. This is now known as the wave-particle duality concept.

Vocabulary
tiny matter – крошечная материя
to manage – удаваться

evidence – доказательство
to suggest – предположить
to made up – состоять
to back up – поддерживать
to be associated with light – быть связанным со светом
to assume – предполагать
to send out – выпускать

2. Questions for discussion

1. Who investagated the Quantum mechanics?
2. What does Quantum mechanics study?
3. What physical phenomena are made up of waves?
4. What things are we able to do because of these waves?

3. Complete the sentences below with words from the box

evidence	back up	duality	distinct
tiny	adequately		radiates

1. There was a (n) ……..amount of energy – it was separate from any other.
2. There has to be …….. to prove a theory.
3. Atoms are not just small. They are ……..
4. If energy is given off, we say it ……
5. You will need to ……..your theory with some kind of proof.
6. I think I have argued my point quite …….
7. Some properties being best explained by wave theory and others by particle theory is known as

4. Listen to a teacher and a student discussing the photoelectic effect

Student: Could you help me with the photoelectric effect please? I can't seem to grasp it.

Teacher: Yes, it can be confusing. Well, experiments have shown that when light shines on a metal surface, the surface releases electrons.

Student: Yes. That the easy part.

Teacher: Ok, What could be the reason for that?

Student: I am afraid I don't know.

Teacher: Well, let me ask you this: What is light made up of?

Student: I am not sure, waves, particles?

Teacher: All right, we'll go back to that later, but for now let's say light is made up of waves and those waves have energy. So when a wave of light hits an electron in an atom in the metal, that energy can knock the electron out of its atom. Is that clear?

Student: Yes, but what about particles?

Teacher: The truth is we don't really know for sure one way or the other. Isaa Newton thought of light as a particle. Then in 1805 an experiment was conducted which indicated that light was a wave. However, in the early 20^{th} century, some physisists, including Einstein, began to think again of light as a particle.

Student: particle, wave, particle… no wonder, I am confused.

Teacher: Hold on, there is more. Einstein believed that experiments with the photoelectronic effect could prove whether light consists of particles or waves.

Student: But whether light is made up of waves of particles wouldn't the photoelectric effect still happen? I mean, light would still have energy to knock electrons out, whether that energy came from particles or waves.

Teacher: That's true, but science is about finding out the truth in the world, so it did matter whuich of the two it was. And someone did do the experiment Einstein suggested.

Student: What happened?

Teacher: It was found that all of the results agreed exactly with Einstein's predictions, not with the wave theory. In fact, did you know Einstein won the Nobel Prize for the photoelectric effect, not for his more famous theory of relativity?

Student: Wow! I did not know that. So, light is made up of particles.

Teacher: No, no, no. Some experiments seem to prove that light consists of particles while other experiments prove that it's waves. We can only say that light can be a wave or a particle, depending on how we look at it.

Complete each sentence with one world

1. When light shines on a ……surface, electrons can be released.

2. Isaak Newton and Albert Einstein both believed that light was made of ……

3. The role of science is to find out the ……

4. In experiments with the photoelectric effect the …….agreed with Einstein's predtictions.

5. Einstein didn' t win the Nobel Prize for his …….of Relativity.

6. From different points of view, ……..can be a particle or a wave.

5. Read the essay about Quantum Mechanics and write your own essay about physical phenomena

Quantum physics or mechanics deals with the behaviour of the smallest matter: atoms, molecules and nuclei. It is used to understand the behaviour of systems of atomic length scales or smaller.

At the beginning of the 20th century, Planked coined the term quanta to mean the energy packets he believed hot things emitted. A little later, Einstein did some work based on Plank's ideas which explained the photoelectric effect. He called Plank's energy packets of light photons. He believed when a light shone on a metal surface, the photons in the light carried enough energy to hit the electron out of the atom in the metal.

One very important figure in quantum physics was Niels Bohr. In the 1920s, drawing on the ideas of Plank and Einstein, he made a model of the atom with a nucleus around which the electrons move in stable states without radiating energy. Only when the electron moved to another stable states without radiating energy. Only when

the electron moved to another stable orbit did it absorb or radiate energy. Loss or gain of energy caused a line to appear on a spectrum. This is known as the quantized atom. Added to this, Bohr came up with the idea of complementarity which basically says although an electron may be a wave or a particle at the same time, we cannot think of it in that way. This is considered a groundbreaking concept.

In conclusion, we can see that quantum physics is very important as it has explained stability and energy levels. However, it has not provided an answer to the issue of wave-particle duality.

GRAMMAR CORNER: CONDITIONAL MOOD 1
IF + PAST SIMPLE WOULD + PRESENT SIMPLE

УТВЕРЖДЕНИЕ	ОТРИЦАНИЕ
If I were a rich woman I would live in the country mansion	If I were not a musician I would not be so busy
If you lived near the sea you would swim very often	If you were not my friend I would not help you
If he graduted from the university he would have a diploma	If he didn't stop dancing he would become a professional dancer
If she got this job she would be very happy	If she did not get married she would not be so happy
If it happened I would be upset	If it did not happen we would not ask for help
If we went to the forest we would gather mushrooms	If we did not smoke we would not have problems
If they bought tickets we would go to the theatre	If they did not prepare well they would not pass exams

6. Open the brackets, using the appropriate form of the verb

1) If Molly and Paul (be not) _____misformed about the train times, they (not be)_____late. 2) If Ioannis (stay) _____longer at the party, he (have)_____ a good time.

3) If the government (lose) _____the next election, the Prime Minister (resign) _____from politics. 4) If we (not go) _____to your friend's party, I

never meet _____Ann. 5) If train fares (be)_____cheaper, more people (use) _____them. 6) If Molly get _____that job she's applied for, she will be delighted. 7) What would you do if you suddenly (win)_____ half a million pounds? 8) If he (get up) _____earlier, he would get to work on time. 9) If we have _____more time, I could tell you more about it. 10) If you sell _____more products, you would earn more money. 11) I could help you if you (trust) _____me more. 12) His car would be a lot safer if he (buy) _____some new tyres. 13) The children could be better swimmers if they (go)_____swimming more frequently. 14) I would not mind having children if we (live) _____in the country. 15) If I (be) _____you, I would not worry about going to the university. 16) If I (have) _____any money, I would give you some. 17) Your parents (be) _____a lot happier if you phoned them more often. 18) If she (have)_____a mobile I would call her. 19) If Sarah (not go) _____with John, Ann would try to become his girlfriend. 20) I wouldn't buy this computer if I (not need)_____it.

7. Open the brackets, use the second conditional

1) If Linda _____here (be), I am sure she _____help us. 2) What _____(do) if you _____(see) a ghost? 3) If I _____(find) some money in the street, I _____(take) it to the police. 4) Michael _____(be) angry if someone _____(take) his computer without permission. 5) If we _____(not catch) the nine o'clock bus, we _____arrive too late. 6) Carla _____(not be) upset if you _____(tell) her the truth. 7) If I _____(know) how to solve this problem, I _____(do) it. 8) If I _____(fail) the exam, I (be)_____very disappointed. I have studied so hard. 9) Jenny _____(make) a nice cake if she _____(know) how to cook well. 10) If my husband

_____(be) a famous actor, he _____earn a lot of money. 11) We _____(not learn) so quickly if we _____(not have) such a good teacher. 12) If _____(rain) tomorrow, we _____(not go) to the beach, but the sky is so clear. 13) If you _____stay at home tonight, you _____(not see) Tina at the party. 14) I _____(learn) japonese if I _____(have(time to do it. 15) What _____(do) if you _____(lose) ypur passport in a foreign coumntry? 16) If someone _____(steal) my car, I _____(report) it to the police immediately. 17) If you _____(try) to give up smoking, you _____(feel) much better. 18) Our friends _____(be) really angry if we _____(not go) to their party next Friday.

8. Complete the sentence

1) If I were a musician I _____
2) If I had a lot of momey I _____
3) If I graduated from university_____
4) 4) If I were a teacher I _____
5)If I lived abroad I _____
6) If I were a famous physicist _____
7) If I were invisible_____
8) If I had a big family _____
9) If I wrote a book it would be about_____
10) If I were hungry I would _____

9. Translate the sentences into English

1) Если бы я подготовился, я бы хорошо написал тест
2) Если бы погода была хорошая, мы бы пошли на пляж.
3) Если бы ты принес билеты, мы бы пошли в театр
4) Если бы он был известный музыкант он был бы обеспеченный

5) Если бы она не забыла ключи, она бы не ждала сестру так долго

6) Если бы у них было больше денег, они бы больше путешествовали

7) Если бы я жил у моря я был бы счастлив

8) Я бы купила те туфли, если бы получила зарплату

9) Он бы предпочел чай, но там был только кофе

10) Она бы сказала тебе раньше, но ты не спрашивал

11) Если бы у тебя дома была эта книга, ты бы ее прочел

12) Она бы пришла, если бы ты позвонил и попросил о помощи.

13) Если бы они взяли такси, они бы приехали раньше.

14) Если бы ты знал квантовую механику, ты бы объяснил, почему атомы стабильны и почему они поглощают или выделяют энергию только определенными способами.

15) Если бы у нас была хорошая лаборатория, мы бы чаще проводили физические эксперименты

16) Если бы он был известным физиком, он бы сделал важное открытие

17) Если я не работала учителем, я бы скорее всего стала ученым и работала в лаборатории

18) Если бы ты хорошо знал английский ты бы поехал на научный конгресс

19) Если бы я сдал экзамены на отлично я бы получил красный диплом.

20) Если бы у него было больше свободного времени он бы писал больше научных статей.

10. Read and translate the text

Niels Bohr

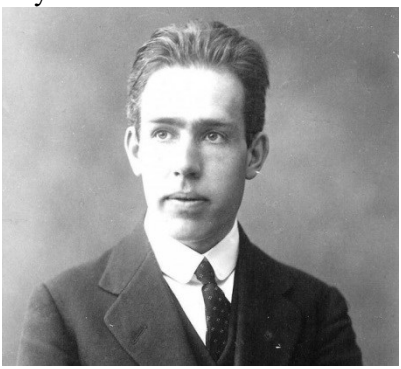
Niels Bohr was born in Hopenhagen in 1885, and died there in 1962. He was one of the most distinguished physicists of all time. He is best known for the development of the Bohr model of the atom, his theory explaining the existence of spectral lines, and the principles of complimentarity. His work won him the 1922 Nobel Prize in Physics.

His interest in science began at the early age because his father was a professor of physiology. Specialising in Mathematics and

Physics during his final years of school, Bohr continued these studies at university. He received his Master's degree from the University of Copenhagen in 1909 and his PhD in 1911. Later that same year, he went to England where he worked with Sir Joseph Thomson (who had discovered the electron), and Ernest Rutherford (who had put forward the concept of a mucleus within the atom).

He worked on the structure of the aton using quantum ideas from Max Plancks and Albert Einstein. In Bohr's model of the atom there is a nucleus, and electron move around the nucleus in the stable states (also known as orbits or energy levels) without radiating energy. When an electron moves from one state to another, only very specific amounts of energy are lost or gained. If the atom gains energy, the electron jumps to a level further from the nucleus. Whenever energy is lost or gained, a line in a spectrum is produced. This model is now known as quantized atom, from the term quantum intriduced by Planck to describe small packets of energy.

In 1927, Bohr put forward his principle of complementarity, which refers to effects such as wave-particle duality. Bohr's principle was the most groundbreaking scientific concept of the 20th century. In essence, the principle states that things may have dual or contradictory properties, but we can only experience one propererty at a time. For example, we can think of an electron as a wave or as a particle, but we cannot think of it as both at the same time, even thougj it may actually be both at once.



In 1920, Bohr had been appointed director of the Institute of Theoretical Physics and he continued to work there throughout the 1920s and 1930s. However, during the German occupation in World

War II, due to his having a jewish mother, it was nesessary for Bohr to avoid arrest by the police. He therefore escaped to Sweden. From there, he travelled to England and then to America, where he became involved in the Atomic Energy Project which aimed to build the first atomic bomb. He made a significant contribution by discovering that only uranium-235 could produce the fission chain reaction required for an atomic explosion. However, he was concerned about the political problems that the development of atomic weapons could cause, and supported the idea of sharing the new technology with other countries, particularly the USSR.

Niels Bohr held many important positions, and was honoured by many important scientific institutions. He was President of the Royal Danish Academy of Sciences, and a member of many other famous Academies. Bohr was awarded honorary doctorates by the world's greatest universities. Interestingly, Bohr's son also became a physisist and won the Noble Prize for Physics in 1975.

11. *Read the text and choose the correxct answer*

1) Bohr went to England
A) in 1909
B) to receive his PhD
C) to work with Planck and Einstein
D) and worked with two famous scientists.

2) A quantized atom does not
A) have electrons moving in stable states
B) produce a spectrum.
C) have electrons moving, radiating energy.
D) have a nucleus

3) Bohr's principle says
A) properties can only be experienced separately.
B) electrons are definetely waves and particles
C) properties can only disagree
D) an electron is actually a particle

4) Bohr thought atomic weapons
A) should be supported whatever the circumstances

B) could only be developed in cooperation with the USSR
C) should be developed in cooperation with the USSR
D) should make a significant contribution to politics

5) Niels Bohr
A) had a successful son
B) won the Noble prize in 1922 and 1975
C) was president of many academies
D) worked for many inmportant scientific institutions.

12. Read the purposes of education and fill the table

To have fun, to learn job skills, to learn social skills, to prepare for tests, to make connections, to develop your body, to become well-rounded, to increase IQ, to prepare for living in society, to learn how to learn, to develop artistic skills, to make friends, to become open-minded, to get a good salary in future, to become a qualified specialist, to get practical skills, to become cultured, to learn how to research, to meet professionals, to change experience

	The primary purpose of education is	The primary purpose of education should be
elementary school		
High school		
University		

13. Divide into groups of 4-5 people. You group has been appointed to the Ministery of Education. Answer the questions

1) What changes would your make in the school system?
2) How will you improve the quality of education?

3) Are your changes fair?
4) Are they efficient?
5) What are some of your best memories of high school?
6) What about your worst memories of high school?
7) Do you know what a prism is?
8) Do you know how a prism works?

14. Fill the blanks with the words from the box

snowmen	frost	blizzards	build
season	breaking	fireplace	slip
icicles	snow angels	blackouts	gloves
hot chocolate	heavy	enjoy	snowball
slide	below	freezes	drop
snowfall	forms	keep	covers
scarves	catch	boots	hockey

Winter weather:

Winter is _____when temperatures _____, snow _____the ground, _____covers windows and _____hang from roofs. When the temperature is _____zero, water _____and ice _____on puddles, ponds and lakes. Children have great fun _____the ice in puddles on their way to school.

Winter fun:

After a heavy _____, children play in the snow. They _____snow forts, make _____and _____, and have _____fights. People also _____skiing, skating, and sledging in the winter. Another popular winter sport is _____.

Winter dangers:

The cold weather can also be dangerous: people _____on the ice and cars _____down hills crashing into each other. As well, heavy snowstorms called _____can knock down

power lines and cause _____. Some people also _____a cold when they stay out in the cold.

Keeping warm:

Because winter is so cold, people have to find ways to _____warm. People wear _____coats, _____for their necks, _____for their hands, and _____on their feet. Children drink _____when they come in from the cold. And families sit around the _____at night and talk about what they did during the day.

15. Translate the sentences into Russian

1) Niels Bohr is best known as one of the founders of quantum mechanics and spectroscopy and as a scientist who suggested his own model of the atom.

2) Bohr's father was a professor of psysiology so Niels became interested in science while he was still very young.

3) In England, Bohr worked with famous scientists such as Sir Joseph Tompson, who discovered the electron, and Ernest Rutherford, who conceived the notion of the nucleus within the atom.

4) The discovery that only uranium-235 could produce the fission chain reaction was a significant contribution towards building the first atomic bomb.

5) It is important to mention that Bohr supported the idea of sharing new technologies with other countries, including the USSR.

6) The world's greatest universitites awarded him honorary doctorates.

7) Bohr created the theory of spectral lines and formulated the principle of comlementarity, which refers to a wave-particle duality.

16. Translate the sentences into English

1. Мысль о том, что свет состоит из мельчайших частиц, предложенная Ньютоном, была доказана экспериментальным путем.
2. В 1900 году Макс Планк предположил, что горячие тела излучают энергию порциями, которые называются квантами.
3. Теория фотоэлектрического эффекта объясняет, почему фотоны могут выбивать электроны из атома.
4. Установлено, что электроны в атоме могут поглощать и излучать определенное количество энергии только при переходе с одной стационарной орбиты на другую. Находясь на стационарной орбите, электроны не излучают энергию.
5. Полагают, что свет одновременно является как потоком частиц, так и волной.
6. Квантовая механика объясняет, почему атомы стабильны и почему они поглощают или выделяют энергию только определеннными способами.
7. Ученые использовали квантовую механику для объяснения ряда явлений, которые не удавалось объяснить ранее.
8. Более всего Нильс Бор известен как один из основателей квантовой механики и спектроскопии и как ученый, предложивший свою модель атома.
9. Отец Бора был профессором физиологии, поэтому Нильс уже в раннем возрасте заинтересовался наукой.
10. В Англии Бор работал с такими знаменитыми учеными, как сэр Джозеф Томсон, открывшим электрон, и Эрнест Резерфорд, открывшим атомное ядро.

11. Важным фактором создания первой атомной бомбы явилось открытие, что только в уране 235 может возникнуть цепная ядерная реакция деления.

12. Важно отметить, что Бор поддерживал мнение о необходимости делиться новыми технологиями с другими странами, включая СССР.

13. Крупнейшие университеты мира избрали его своим почетным доктором.

14. Бор создал теорию спектральных линий и сформулировал принцип дополнительности, относящийся к корпускулярно-волновому дуализму.

17. Write an essay about quantum mechanics according to the model

Quantum physics or mechanics deals with the behaviour of the smallest matter: atoms, molecules and nuclei. It is used to understand the behaviour of systems of atomic length scales or smaller.

At the beginning of the 20^{th} century, Planck coined the term quanta to mean the energy packets he believed hot things emitted. A little later, Einstein did some work based on Planck's ideas which explained the photoelectric effect. He called Planck's energy packets of light photons. He believed when a light shone on a metal surface, the photons in the light carried enough energy to hit the electron out of the atom in the metal.

One very important figure in quantum physics was Niels Bohr. In the 1920s, drawing on the ideas of Planck and Einstein, he made a model of the atom with a nucleus around which the electrons move in stable states without radiating energy. Only when the electron moved to another stable orbit did it absorb or radiate energy. Loss or gain of energy caused a line to appear on a spectrum. This is known as the quantized atom. Added to this, Bohr came up with the idea of complementarity which basically says althought an electron may be a wave or a particle at the same time, we cannot think of it in that way. This is considered a ground breaking concept.

In conclusion, we can see that quantum physics is very important as it has explained stability and energy levels. However, it has not provided an answer to the issue of wave-particle duality.

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