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**Language is Easy
Physics**

Учебное пособие

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Настоящее учебно-методическое пособие предназначено для использования на занятиях по дисциплинам «Иностранный язык», «Основы профессионально-ориентированного перевода» для физических специальностей. Учебное пособие нацелено на совершенствование навыков чтения и перевода литературы, овладение базовой терминологией. Материал пособия представляет собой сборник грамматических упражнений и текстов по физическим специальностям, а также контрольные работы.

Рекомендуют к использованию в учебном процессе:

Кафедра английского языка и межкультурной коммуникации
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Предисловие

Предлагаемое учебно-методическое пособие предназначено для студентов физического факультета, специальностей «Физика», «Физика (пед.)», «Радиофизика и электроника», «Биохимическая физика», «Медицинская физика», а также для студентов ФНБМТ специальностей «Материаловедение и технология новых материалов», «Управление качеством», изучающих английский язык.

Первая и вторая части пособия включают два раздела: в первом приводятся справочные материалы по грамматике и тренировочные упражнения, а во втором разделе рассматриваются тексты по специальности, предусмотренные рабочей программой. Первая часть – «1 семестр». В данной части рассматриваются грамматические темы: страдательный залог, времена Present Perfect и Past Simple, Past Perfect и Future Perfect. Во второй раздел входят тексты по специальности. Первая часть завершается контрольной работой, проверяющей усвоение рассмотренного в 1-м семестре материала, и является одной из форм отчетности в зимнюю сессию.

Вторая часть – «2 семестр». В данной части представлены следующие грамматические темы: инфинитив и -ing форма, косвенная речь, условные предложения и модальные глаголы. Во второй раздел второй части включены тексты по специальности. Как и вторая часть, третья включает контрольную работу, которая предназначена для проверки знаний во 2-м семестре (летняя сессия).

Третья часть пособия предназначены для студентов 3-го курса; содержат тексты по специальности (тексты на английском языке по специальности). Настоящее пособие рассчитано, главным образом, на письменное выполнение всех упражнений. Контрольные работы оформляются отдельно от тренировочных упражнений и сдаются преподавателю.

III семестр

Раздел 1

1. Страдательный (пассивный) залог (**Passive Voice**)

Страдательный залог употребляется в том случае, если в центре внимания говорящего находятся лицо или предмет, подвергающийся воздействию со стороны другого лица.

Страдательный залог образуется при помощи вспомогательного глагола **to be** в соответствующей форме и причастия прошедшего времени (**past participle**) смыслового глагола.

	Active Voice	Passive Voice
Present Simple	He paints the house.	The house is painted.
Past Simple	He painted the house.	The house was painted.
Future Simple	He will paint the house.	The house will be painted.
Present Continuous	He is painting the house.	The house is being painted.
Past Continuous	He was painting the house.	The house was being painted.
Present Perfect	He has painted the house.	The house has been painted.
Past Perfect	He had painted the house.	The house had been painted.
Future Perfect	He will have painted the house.	The house will have been painted.

В вопросительной форме вспомогательный глагол ставится перед подлежащим. В отрицательной форме отрицательная частица **not** ставится после вспомогательного глагола:

Was my application accepted? – Your application was not accepted.

Если указано лицо, производящее действие, то оно вводится предлогом **by**. Если указывается предмет, при помощи которого было совершено действие, он вводится предлогом **with**.

A new law has been passed by the government. – *Новый закон был принят правительством.*

Fish is cut with a special knife. – *Рыбу режут специальным ножом.*

Задание 1.1. Поставьте глаголы в нужную форму, используя пассивный залог:

- 1) Bread ___ every day (eat).
- 2) The letter ___ yesterday (receive).
- 3) A very interesting book ___ at the library next Friday (take).
- 4) Many houses ___ in our town every year (to build).
- 5) These trees ___ next spring (plant).
- 6) I ___ at the lesson yesterday (ask).
- 7) The clock ___ now (repair).
- 8) The trucks ___ at twelve o'clock yesterday (load).
- 9) The new children's book ___ in that shop when I entered it yesterday
(sell).
- 10) The new bridge over the river ___ now (build).
- 11) The sweets ___ already ___ when I came home (eat).
- 12) The text ___ recently (translate).
- 13) All the trees ___ by the middle of last autumn (plant).
- 14) The work ___ by 5 o'clock tomorrow (finish).
- 15) The novel ___ already ___ (discuss).
- 16) The letter ___ by 10 o'clock tomorrow (write).

Задание 1.2. Переведите предложения из активного залога в пассивный:

- 1) People chop down a lot of trees every year.
- 2) They chose him as the best actor of the year.
- 3) Steven Spielberg has directed a lot of successful films.
- 4) A number of reporters will meet the professor at the airport.
- 5) Astronauts are exploring space.
- 6) The Romans founded Bath in the first century AD.

7) The traffic warden had already given him a ticket for illegal parking.

8) Homer wrote the “Iliad”.

9) People must obey the law.

10) A nightmare woke Mary up.

11) Someone’s has stolen Mike’s bicycle.

12) The judge has fined him \$ 300.

13) Van Gogh painted “Sunflowers”.

14) Someone had broken our door down.

15) The government will introduce new measures against crime.

16) Someone has burgled Ann’s house.

2. Present Perfect и Past Simple

Изучающие английский язык часто испытывают сложности в разграничении глагольных времен **Present Perfect** и **Past Simple**, так как и то, и другое называет законченное действие. Необходимо помнить, что **Past Simple** связан с прошедшим периодом времени, который может быть указан в предложении или ясен из контекста. Действия, которые называет **Present Perfect**, всегда связаны с настоящим временем. Ниже мы приводим таблицу, в которой сравниваются эти времена:

Present Perfect и Past Simple	
Present Perfect	Past Simple
законченное действие, которое произошло в прошлом, но время совершения не указано в предложении: Don has left for Madrid. <i>Дон уехал в Мадрид.</i> (Мы не знаем, когда он уехал. Время совершения действия не указано.)	законченное действие, которое произошло в определенное время в прошлом (время указано в предложении). She left yesterday. <i>Она уехала вчера.</i>
действие в прошлом, связанное с настоящим и	действие в прошлом, не связанное с настоящим и

имевшее место в определенное время в прошлом, которое не упоминается в предложении:

I've spoken to Richard Gere.

Я общался в Ричардом Гиром. (Мне, возможно, удастся пообщаться с ним еще. Период времени еще не завершился).

имевшее место в определенное время в прошлом, которое не упоминается в предложении:

I met John Lennon.

Я встречал Джона Леннона. (Мне уже не удастся его встретить)

Необходимо также помнить, что **Present Perfect** часто употребляется для того, чтобы начать разговор. Однако для продолжения разговора на ту же тему используется **Past Simple**, даже если время не упоминается, так как действия ассоциируются с прошедшим временем.

Задание 2.1. Поставьте глаголы в скобках в Present Perfect или Past Simple:

- 1) "Where's your key?" – "I don't know. I ___ it (lose)."
- 2) I ___ very tired, so lay down on the bed and went to sleep (be).
- 3) Mary ___ to Australia for a while but she's back again now (go).
- 4) "Where's Ken?" – "He ___ out. He'll be back in about an hour (go)."
- 5) I did German at school but I ___ most of it (forget).
- 6) I meant to phone Diane last night but I ... (forget).
- 7) Look! There's an ambulance over there. There ___ an accident (be).
- 8) I ___ a headache earlier but I feel fine now (have).
- 9) They're still building the new road. They ___ it (not finish).
- 10) "Is Helen still here?" – "No, she ___ out (just / go)."

Задание 2.2. Поставьте глаголы в скобках в Present Perfect или Past Simple:

- 1) A: Is your father at home? B: No, I'm afraid he ___ out (go). A: When exactly ___ out (he / go)? B: About ten minutes ago.

2) A: Where do you live? B: In Boston. A: How long ___ there (you / live)? B: Five years. A: Where ___ before that (you / live)? B: In Chicago. A: And how long ___ in Chicago (you / live)? B: Two years.

3) A: Look! Somebody ___ coffee on the carpet (spill). B: Well, it ___ me (not / be). I ___ it (not / do).

4) A: Ben ___ his leg (break). B: Really? How ___ (that / happen)? A: He ___ off a ladder (fall).

5) A: Your hair looks nice. ___ a haircut (you / have)? B: Yes. A: Who ___ it (cut)? ___ to the hairdresser (you / go)? B: No, a friend of mine ___ it for me (do).

2. Past Perfect

Past Perfect образуется при помощи вспомогательного глагола **to have** в форме **Past Simple** и причастия прошедшего времени (**past participle**) смыслового глагола.

Past Perfect употребляется для выражения прошедшего действия, которое совершилось до определенного момента в прошлом. Этот момент может обозначаться:

1) обстоятельством времени с предлогом **by** к (**in the end of the month, by 5 o'clock yesterday, by that time** и др.)

By that time he had already signed the letters. – К тому времени он уже подписал письма.

2) другим (более поздним по времени) прошедшим действием, которое выражается глаголом в **Past Simple**.

He thought that they had completed the work. – Он думал, что они уже закончили работу.

Past Perfect может употребляться и в том случае, когда время, до которого совершилось действие, не указано в самом предложении, а определяется контекстом.

My friend left for London yesterday. He had never been there before. – Вчера мой друг выехал в Лондон. Он никогда не бывал там раньше.

Задание 3.1. Поставьте глаголы в скобках в Past Perfect:

1) When I arrived at the station, the train ___ (leave).

2) We lit the candles because the lights ___ (go off).

3) When I got home I discovered that somebody ___ my flat (break into).

4) The patient ___ before the ambulance reached the hospital (die).

5) John ___ all cakes by the time the other children arrived (eat).

Задание 3.2. Поставьте глаголы в скобках в Past Perfect или Past Simple:

1) When I ___ the house, I ___ that I ___ my keys (leave) / (realize) / (forget).

2) After I ___ digging the garden I ___ to go for a walk (finish) / (decide).

3) I ___ Fiona some money only after she ___ to give it back the next day (lend) / (promise).

4) They kept arguing about the money their father ___ them in his will when he ___ (leave) / (die).

5) Kate ___ studying after John ___ (start) / (leave).

6) I ___ Beckie a plant yesterday because she ___ so well in the concert the night before (buy) / (sing).

7) When I ___ Julie, I ___ that I ___ her before (see) / (realize) / (meet).

3. Future Perfect

Future Perfect образуется при помощи вспомогательного глагола **have** в форме будущего времени (**will have**) и причастия прошедшего времени (**past participle**) смыслового глагола.

Future Perfect употребляется для выражения будущего действия, которое совершится до определенного момента в будущем.

Future Perfect употребляется:

1) для выражения действия, которое завершится ранее другого действия в будущем:

I will have washed up before my mother comes. – *К приходу мамы я помою посуду.*

2) для выражения действия, которое закончится к определенному моменту в будущем, при этом момент времени

может быть выражен или наречием времени, или придаточным предложением времени:

She will have finished the report by tomorrow. – *Она закончит отчет к завтрашнему дню.*

She will have finished the report by the time the library closes.
– *Она закончит отчет до закрытия библиотеки.*

Задание 4.1. Поставьте глаголы в скобках в Future Perfect:

1) What time will you have finished painting your room? – I ___
by 7 o'clock, I hope (finish).

2) Are you seeing Julie tonight? – No, I ___ by the time she gets
here (leave).

3) Have they built their house yet? – No, they ___ by the end of
May (build).

4) Will you have done your homework by tomorrow? – No, I ___
until Friday (not do).

5) Tom ___ his third novel by the end of this year (write).

6) He ___ by tomorrow afternoon (finish).

Задание 4.2. Поставьте глаголы в скобках в Future Perfect:

1) We ___ the shed by Friday (build).

2) She ___ dressing by the time the guests arrive (finish).

3) I ___ three letters by 7 o'clock tonight (write).

4) She ___ enough money to buy a car by Christmas (save).

5) I ___ here for ten years by the end of this month (work).

Раздел 2

Текст 1

1. Прочитайте текст и переведите на русский язык:

Gravitation

The force that causes objects to drop and water to run downhill is the same force that holds the Earth, the sun, and the stars together and keeps the moon and artificial satellites in their orbits. Gravitation, the attraction of all matter for all other matter, is both the most familiar of the natural forces and the least understood.

Gravity is the weakest of the four forces that are currently known to govern the way physical objects behave. The other three forces are electromagnetism, which governs such familiar phenomena as electricity and magnetism; the “strong force,” which is responsible for the events in nuclear reactors and hydrogen bombs; and the “weak force,” which is involved with radioactivity. Because of its weakness, gravity is difficult to study in the laboratory.

An example shows why gravity is called a weak force. A drop of strong glue can bond two pieces of chain so tightly that they can then be used to lift an automobile. That means that the chemical forces in the drop of glue, which are basically electromagnetic in nature, are stronger than the gravitational attraction between the car, weighing a billion times more than the drop, and the Earth, which is a million, trillion, trillion (10^{30}) times bigger than the drop.

Despite its weakness, gravitation is important because, unlike the other three forces, it is universally attractive and also acts over an infinite distance. Electromagnetic forces are both attractive and repulsive and as a result generally cancel out over long distances. The strong and weak forces operate only over extremely small distances inside the nuclei of atoms. Thus, over distances ranging from those measurable on Earth to those in the farthest parts of the universe, gravitational attraction is a significant force and, in many cases, the dominant one.

Both Sir Isaac Newton in the 17th century and Albert Einstein in the 20th century initiated revolutions in the study and observation of the universe through new theories of gravity. The subject is today at the forefront of theoretical physics and astronomy.

Vocabulary

artificial – искусственный

satellite – спутник

currently – в настоящее время

gravity – сила тяжести

attraction – притяжение

infinite – бесконечный

repulsive – отталкивающий

measurable – измеряемый

2. Ответьте на вопросы:

- 1) What is gravitation?
- 2) What are the four currently known forces?
- 3) What is the strongest force?
- 4) Why is gravitation so important?
- 5) What is the main characteristic feature of gravitation?

3. Напишите, соответствуют ли утверждения тексту: правда – true (T), неправда – false (F). Исправьте неправильные утверждения.

- 1) The force that causes objects to drop and water to run downhill is the same force that holds the Earth, the sun, and the stars together.
- 2) Gravity is easy to study in the laboratory because of its strength.
- 3) Gravitation acts over an infinite distance.
- 4) Electromagnetic forces generally cancel out over long distances
- 5) New theories of gravity are at the forefront of biology and chemistry

4. Заполните пропуски в предложениях следующими словами:

infinite, satellite, artificial, gravity, currently

1) The product contains no ___ colours or flavours. 2) He is ___ appearing in the new play. 3) Human possibilities are almost ___. 4) We have pictures of the disaster live via ___. 5) New theories of ___ were developed by Sir Isaac Newton and Albert Einstein.

Текст 2

1. Прочитайте текст и переведите на русский язык:

Matter

An electron, a grain of sand, an elephant, and a giant quasar at the edge of the visible universe all have one thing in common—they are composed of matter. A beam of light, the motion of a falling stone, and the explosion of a stick of dynamite all have one thing in common—they are expressions of energy. Energy and matter together make up the physical universe.

What is matter? Not too many years ago scientists defined matter rather simply as anything that has mass and takes up space. However, with new developments in science this definition became inadequate. Before discussing new concepts of matter, it might help to examine some of its common properties.

Most of the matter that people ordinarily observe can be classified into one of three states, or phases: solid, liquid, or gaseous. Solid matter generally possesses and retains a definite size and shape, no matter where it is situated. A pencil, for example, does not change in size or shape if it is moved from a desktop and placed upright in a glass. A liquid, unlike a solid, assumes the shape of its container, even though,

like a solid, it has a definite size, or volume. A pint of water changes its shape when it is poured from a glass into a bowl, but its volume remains the same. A gas expands to fill the complete volume of its container.

At a given temperature and pressure, a substance will be in the solid, liquid, or gaseous state. But if the temperature or the pressure changes, its state may also change. At constant atmospheric pressure the state of water, for example, changes with changes in temperature. Ice is water in the solid state. If it is removed from a freezer and placed in a warm pan, the ice warms up and changes to the liquid—water. If the pan is then placed over a hot fire, the water heats up and changes to the gaseous state of water—steam.

Most substances can exist in any of the three states (provided that they do not decompose chemically, as sugar, for example, often does when it is heated in air). Oxygen must be cooled to very low temperatures before it becomes a liquid or a solid. Quartz must be heated to very high temperatures before it becomes a liquid or a gas.

Vocabulary

composed of – состоящий из

beam – луч

inadequate – неподходящий, не отвечающий требованиям

property – свойство

solid – твёрдый

retain – сохранять

volume – объём

substance – вещество

steam – пар

2. Ответьте на вопросы:

- 1) What makes up the physical universe?
- 2) What was the first definition of matter?
- 3) What are the main states of matter?
- 4) Give the examples of solid, liquid and gaseous states?
- 5) Why is temperature an important factor for every state of matter?

3. Напишите, соответствуют ли утверждения тексту: правда – true (T), неправда – false (F). Исправьте неправильные утверждения.

- 1) Energy and matter together make up the physical universe.
- 2) Not too many years ago scientists defined matter rather simply as anything that has mass and takes up space.
- 3) Most of the matter that people ordinarily observe can be classified into one of four states, or phases.
- 4) A liquid, like a solid, assumes the shape of its container.
- 5) All substances can exist in any of the three states.

4. Заполните пропуски в предложениях следующими словами и выражениями:

steam, volume, property, composed of, solid

1. It remains ___ even at room temperatures.
2. The total ___ of trade has reached \$800 million.
3. The ___ form the volcano rose into the air.
4. This substance is ___ many elements.
5. These elements share the same ___ .

Контрольная работа III (2 курс, 3 семестр)

Часть 1.

1. Прочитайте текст и переведите на русский язык письменно:

Energy

A rock falling off a cliff is different from the same rock lying on the ground below. The lively child eager to join his playmates after a night's rest and a hearty breakfast is different from the child who can barely keep his eyes open after dinner. A glowing light bulb is different from the same bulb when the electricity is switched off. In each case, an agent of change has acted upon the rock, child, and light bulb. It is the same rock, the same child, the same light bulb. The difference is one of energy.

Energy is one of the most basic ideas of science. All occurrences in the universe can be explained in terms of energy and matter. But the definition of energy is not at all simple since energy occurs in many different forms, and it is not always easy to tell how these forms are related to one another and what they have in common. One of the best-known definitions of energy is the classical definition used in physics: Energy is the ability to do work.

Physicists define work in a way that does not always agree with the average person's idea of work. In physics, work is done when a force applied to an object moves it some distance in the direction of the force. Mathematically, $W=Fs$, where W is the work done, F is the force applied, and s is the distance moved. If either F or s is equal to zero, W is also equal to zero.

If a person walks up a flight of stairs he may regard it as work—he exerts effort to move his body to a higher level. In this instance, he also does work according to the definition accepted by physicists, for he exerts a force to lift himself over a distance—the distance from the bottom to the top of the stairs.

However, if a person stands without moving with a 100-pound weight in his outstretched arms, he is not doing any work as physicists

define work. He is exerting a force that keeps the 100-pound weight from falling to the floor, but the position of the weight remains unchanged. It is not moved any distance by the force. The person is, of course, exerting considerable muscular effort to avoid dropping the weight, and the average man would say that he is working very hard indeed. But he is not doing any work according to the definition accepted in physics.

Vocabulary

glowing – светящийся

bulb – электрическая лампа

occurrence – явление

matter – материя

define – определять

equal – равный

exert – прилагать

average – средний, среднестатистический

2. Ответьте на вопросы:

- 1) What is energy?
- 2) Why is it difficult to define energy?
- 3) How does physics explain work?
- 4) Why can we say that walking up is work?
- 5) What is the formula for defining work?

3. Напишите, соответствуют ли утверждения тексту: правда – true (T), неправда – false (F). Исправьте неправильные утверждения.

1) The lively child eager to join his playmates after a night's rest and a hearty breakfast is not different from the child who can barely keep his eyes open after dinner.

2) All occurrences in the universe can be explained in terms of energy and matter.

3) Physicists define work in a way that always agrees with the average person's idea of work.

4) If a person walks up a flight of stairs he may not regard it as work – he does not exert effort to move his body to a higher level.

5) If a person stands without moving with a 100-pound weight in his outstretched arms, he is doing some work.

4. Заполните пропуски в предложениях следующими словами:

define, equal, average, bulb, matter

1) She came back and took the ____ . 2) Her results of the test were quite ____ . 3) ____ and energy can explain everything in the world. 4) He believed that all men and women were ____ . 5) No one has ____ the importance if this project.

Часть 2.

1. Поставьте глаголы в нужную форму, используя пассивный залог:

- 1) TV ____ by Baird (invent).
- 2) Pyramids ____ by Egyptians (build).
- 3) His hat ____ away by the wind now (blow away).
- 4) Coffee ____ in Brazil (grow).
- 5) Chopsticks ____ in China (use).
- 6) The plants ____ by water at the moment (water).
- 7) The thief ____ yesterday (chase).
- 8) The robber ____ last week (arrest).
- 9) The injured man ____ to hospital now (take).
- 10) The car ____ tomorrow (repair).
- 11) The vase ____ just ____ (break).
- 12) The dishes ____ yet (not / wash).
- 13) The long dresses ____ in 1890 (wear).
- 14) Dinner ____ in ten minutes (serve).
- 15) The letters ____ at the moment (type).
- 16) Guernica ____ by Picasso (paint).

- 17) The parcel ___ yet (not / deliver).
- 18) Alpha Romeo cars ___ in Italy (make).
- 19) The thief ___ late last night (arrest).
- 20) The letter ___ next week (deliver).

2. Переведите предложения из активного залога в пассивный:

- 1) The gardener has planted some trees.
- 2) Doctor Brown will give you some advice.
- 3) A famous designer will redecorate the hotel.
- 4) Steven Spielberg directed "E.T."
- 5) Someone has broken the crystal vase.
- 6) His parents have brought him up to be polite.
- 7) Fleming discovered penicillin.
- 8) They will advertise the product on television.
- 9) Someone is remaking that film.
- 10) The police arrested him.
- 11) The traffic warden had already given him a ticket for illegal parking
- 12) People must obey the law.
- 13) Someone had broken our door down.
- 14) They chose him as the best actor of the year.
- 15) Somebody has stolen a bus from outside the school.

3. Переведите предложения из активного залога в пассивный:

- 1) He gave me a present.
- 2) The waiter will bring us the bill.
- 3) The Queen presented him with a medal.
- 4) Her mother bought Mary some sweets.
- 5) Bob has sold Ted a second-hand car.
- 6) Larry is going to send a letter to Tom.
- 7) Someone is helping her with the housework.
- 8) A pickpocket robbed me.
- 9) The mail-order company sent Mrs Green a parcel.
- 10) Someone will pay you within the next few days.
- 11) You can improve your health with more exercise.

- 12) A dog is chasing the child.
- 13) My friend sent me an invitation.
- 14) The farmer is building a new barn.
- 15) The secretary has given Mrs Jones some letters.

4. Поставьте глаголы в скобках в Present Perfect:

- 1) The train to Moscow ____ (already/leave).
- 2) Michael ____ to my home town twice (be).
- 3) I ____ my leg once (break).
- 4) We ____ here for a year (live).
- 5) I ____ the film twice (watch).
- 6) My sister ____ the book (read).
- 7) We ____ to London (never/be).
- 8) Mary ____ her friend (just/see).
- 9) My friends ____ in the Atlantic Ocean (never/swim).
- 10) I think I ____ her before (not see).
- 11) She ____ a holiday this year (not have).
- 12) The shop ____ yet (not open).
- 13) John ____ a bicycle (never/ride).
- 14) We ____ our homework yet (not do).
- 15) I ____ to the cinema for ages (not be).
- 16) Our letter ____ (yet/arrive).
- 17) My parents ____ in the same city all their lives (live).
- 18) The Smiths ____ a house (move).

5. Поставьте глаголы в скобках в Present Perfect:

- 1) What organizations ____ he ____ for (work)?
- 2) How many flowers ____ we ____ (sell)?
- 3) ____ you ____ an arm (ever/ break)?
- 4) ____ the post ____ (arrive)?
- 5) ____ Ms Smith ____ here longer than you (work)?
- 6) ____ your daughter ____ in a tent (ever/sleep)?
- 7) Where ____ you ____ (be)?
- 8) How long ____ they ____ their house (have)?
- 9) How many books ____ Michael ____ (write)?
- 10) What cities ____ you ____ to (be)?

6. Заполните пропуски в предложениях используя for или since:

- 1) I haven't been at home ___ Christmas.
- 2) We've been here ___ ten o'clock.
- 3) I have worked for this company ___ more than eight years.
- 4) I haven't been to the theatre ___ ages.
- 5) I have studied for the exam ___ 9.15.
- 6) I have had this toy ___ I was eight.
- 7) She hasn't had a day off ___ 2007.
- 8) John has been in France ___ more than three weeks now.

7. Раскройте скобки, поставив глаголы в скобках в Present Perfect или Past Simple:

- 1) I ___ 10 km (run / just) .
- 2) I ___ 20 km last week (run) .
- 3) I ___ a composition two days ago (write).
- 4) I ___ two compositions this month (write / already) .
- 5) I ___ my friend (ring / just) .
- 6) I ___ my friend 10 minutes ago (ring) .
- 7) Two days ago, I ___ a Madonna concert on TV (watch) .
- 8) I ___ Madonna live in concert (see / already) .
- 9) I ___ my summer holiday in Sochi last year (spend).
- 10) I ___ to Sochi yet (be / not).

8. Ознакомьтесь с ситуациями и составьте предложения из слов в скобках, используя Past Perfect:

1) You went to Jill's house, but she wasn't there. (*she/go/out*) ***She had gone out.***

2) You went back to your home town after many years. It was not the same as before. (*it/change/a lot*).

3) I invited Rachel to the party but she couldn't come. (*she/arrange/to do something else*)

4) You went to the cinema last night. You arrived to the cinema late. (*the film/already/begin*)

5) I was very pleased to see Tim again after such a long time. (*I/not/see/him for five years*)

6) I offered Sue something to eat but she wasn't hungry. (*she/just/have/breakfast*)

9. Поставьте глаголы в скобках в Past Perfect или Past Simple:

- 1) John _____ the candles when she arrived (light).
- 2) She _____ lunch before the children came home (cook).
- 3) When she arrived at the theatre he _____ the tickets (buy).
- 4) After Jim and Terry had finished their breakfast, they _____ to fish (go).
- 5) The party _____ by the time I arrived (already/start).
- 6) She sealed the letter, put a stamp on it and _____ it (post).

10. Поставьте глаголы в скобках в Future Perfect:

- 1) She _____ by 8 o'clock (finish).
- 2) I _____ this book by next week (read).
- 3) They _____ a new school by the end of this year (build).
- 4) He _____ from University by 2009 (graduate).
- 5) She _____ doing her homework when her mother comes home (finish).

IV семестр

Раздел 1

1. Infinitive and –ing forms

В системе английского глагола принято выделять две группы форм – личные и неличные. К личным формам относят формы прошедшего и не прошедшего времени, которые функционируют в предложении в качестве сказуемого (обратите внимание на временные формы, рассматриваемые в настоящем пособии и в его первой части).

В английском языке существуют три неличные формы глагола: инфинитив, причастие (причастие I и причастие II) и герундий. Неличные формы глагола не изменяются по лицам и числам и не употребляются самостоятельно в роли сказуемого. Важной особенностью неличных форм глагола является отсутствие у них категории времени. Это значит, что они не могут помещать действие на определенный отрезок времени и лишь указывают на соотношение обозначаемого ими действия с действием, которое названо глаголом сказуемым.

Мы не будем подробно останавливаться на анализе отдельных свойств неличных форм и остановимся только на особенностях их употребления.

Infinitive

Инфинитив в английском языке имеет следующие формы:

	Active	Passive
Indefinite	(to) send	(to) be sent
Continuous	(to) be sending	----- ----
Perfect	(to) have sent	(to) have been sent
Perfect Continuous	(to) have been sending	----- ----

Инфинитив (с частицей **to**) употребляется в следующих случаях:

- для выражения цели:

She went out to buy some milk. – Она вышла, чтобы купить молоко.

- после определенных глаголов (**advise, agree, appear, decide, expect, hope, promise, refuse** и т.д.):

He promised to be back at 10 o'clock. - Он обещал вернуться к 10 часам.

- после определенных прилагательных (**angry, happy, glad** и т.д.):

She was glad to see him. – Она была рада встретиться с ним.

- после вопросительных слов (**where, how, what, who, which**, исключение составляет только вопросительное слово **why**):

Has she told you where to meet them? – Она сказала вам, где их встречать?

- после **would like/ would love/ would prefer**:

I'd love to go for a walk. – Я бы с удовольствием прогулялась.

- после существительных:

It's a pleasure to work with you. – Работать с Вами – одно удовольствие.

- после конструкций со словами **too** и **enough**:

He's too short to reach the top shelf. – Он слишком мал, чтобы дотянуться до верхней полки.

Инфинитив (без частицы **to**) употребляется в следующих случаях:

- после модальных глаголов (**must, can, will** и т.д.):

You must be back at 12 o'clock. – Вы должны вернуться в 12 часов.

- после **had better/would rather**:

I'd rather have stayed in last night. – Лучше бы я остался дома вчера.

- после **make/let/see/hear/feel** + дополнение:

Mum let me watch TV. – Мама разрешила мне посмотреть телевизор.

–ing forms

Употребляя термин **–ing forms**, мы имеем в виду причастие I и герундий (в данном разделе мы не даем характеристику причастию II). Приведем эти формы:

	Active	Passive
Non-perfect	sending	being sent
Perfect	having sent	having been sent

–ing forms употребляются в следующих случаях:

- после определенных глаголов (**admit, avoid, consider, continue, delay, deny, enjoy, escape, excuse, fancy, finish, forgive, imagine, involve, keep, look forward to, mention, mind, miss, object to, postpone, practice, prevent, report, resist, risk, save, stand, suggest, understand** и т.д.):

He admitted (to) stealing the painting. – *Он признался в краже картины.*

- после **love, like, dislike, hate, enjoy, prefer**:

He likes cooking. – *Он любит готовить.*

- после **I'm busy, It's no use, It's (no) good, It's (not) worth, what's the use of, can't help, there's no point (in), be/get used to, be/get accustomed to, have difficulty (in)**:

It's no use complaining. – *Бесполезно жаловаться.*

- после **“go”** для обозначения физических упражнений:

They go skiing every winter. – *Зимой они катаются на лыжах.*

- после предлогов:

He entered without knocking at the door. – *Он вошел, не постучавшись.*

- после **see, hear, listen, watch** для выражения незаконченных и длительных действий:

I saw Kate painting the kitchen. – *Я видел, как Кейт красила кухню.*

Задание 1.1. Поставьте глагол в скобках в нужную форму (-ing-form или инфинитив)

- 1) They denied _____ the money (steal).
- 2) I don't want _____ out tonight. I'm too tired (go).
- 3) The baby began _____ in the middle of the night (cry).
- 4) Why do you keep _____ me questions? Can't you leave me alone (ask)?
- 5) I don't enjoy _____ very much (drive).
- 6) Can you remind me _____ some coffee when we go out (buy)?
- 7) One of the boys admitted _____ the window (break).
- 8) The boy's father promised _____ for the window to be repaired (pay).
- 9) I refuse _____ any more questions (answer).
- 10) I can't afford _____ out tonight. I haven't got enough money (go).

Задание 1.2. Вставьте указанные глаголы в следующие предложения:

answer	use	be	mak e	try	wor k
apply	be	liste n	see	was h	writ e

- 1) Could you please stop _____ so much noise?
- 2) He tried to avoid _____ my question.
- 3) I considered _____ for the job but in the end I decided against it.
- 4) I enjoyed _____ to music.
- 5) Have you finished _____ your hair yet?
- 6) I've put off _____ the letter so many times. I really must do it today.
- 7) I don't mind you _____ the phone as long as you pay for all your calls.
- 8) If you walk into the road without looking, you risk _____ knocked down.
- 9) Sarah gave up _____ to find a job in this country and decided to go abroad.
- 10) Jim is 65 but he is not going to retire yet. He wants to carry on _____.

11) What a stupid thing to do! Can you imagine anybody ____ so stupid?

12) Hello! Fancy ____ you here! What a surprise!

2. Reported Speech (косвенная речь)

I. В английском языке время глагола в придаточном предложении зависит от времени глагола в главном предложении.

Если глагол в главном предложении стоит в одном из настоящих или будущих времен, глагол придаточного предложения может употребляться в любом необходимом по смыслу времени.

Если глагол в главном предложении стоит в одном из прошедших времен, то в придаточном предложении начинает действовать правило согласования времен:

Direct Speech	Reported Speech
Present Simple "I like walking," she said.	Past Simple / Present Simple She said she liked / likes walking.
Present Continuous "He is watching TV," she said.	Past Continuous She said he was watching TV.
Present Perfect "He has just left," she said.	Past Perfect She said he had just left.
Past Simple "He left an hour ago," she said.	Past Perfect She said he had left an hour before.
Future Simple "He'll be back in an hour," she said.	Future-in-the-Past She said he would be back in an hour.

Правило согласования времен не соблюдается, если глагол придаточного предложения выражает общеизвестную истину:

Everybody knew the sun rises in the east. – *Все знают, что солнце встает на востоке.*

При трансформации предложений из прямой речи в косвенную изменяются по смыслу личные и притяжательные местоимения, а также наречия места, времени и указательные местоимения:

Direct Speech	Reported Speech
this	that
these	those
now	then
today	that day
yesterday	the day before, the previous
tomorrow	day
next week	the next day, the following
last week	day
a year ago	the following week
here	the previous week
in two	the year before
minutes	there
	two minutes later

I. Вопросы в косвенной речи

Общий вопрос в косвенной речи вводится союзами **if** или **whether**, после которых следует прямой порядок слов.

Общий вопрос в косвенной речи обычно вводится глаголами **to ask, to wonder, to want to know**:

He said to me: "Do you speak English well?" – He asked me if I spoke English well. – Он сказал мне: «Ты хорошо говоришь по-английски?» - Он спросил меня, хорошо ли я говорю по-английски.

He said to me: "Did you come here at two o'clock?" – He asked me if I had come there at two o'clock. – Он сказал мне: «Ты приходил сюда в два часа?» - Он спросил меня, приходил ли я туда в два часа.

Специальный вопрос в косвенной речи вводится тем же вопросительным словом, что и в прямой речи. Порядок слов становится прямым. Специальный вопрос в косвенной речи вводится теми же глаголами, что и общий вопрос:

He said to me: "When did you enter the University?" – He asked me when I entered the University. – *Он сказал мне: «Когда ты поступил в университет?» - Он спросил меня, когда я поступил в университет.*

He said to me: "What hotel are you going to stay at?" – He asked me what hotel I was going to stay at. – *Он сказал мне: «В какой гостинице ты собираетесь остановиться?» - Он спросил меня, в какой гостинице я собираюсь остановиться.*

II. Повелительные предложения в косвенной речи

Повелительные предложения в косвенной речи вводятся утвердительным или отрицательным инфинитивом. Повелительные глаголы в косвенной речи вводятся глаголами **to ask, to tell, to order, to let, to make, to advise** и т.д.

He said to me: "Open the window, please." – He asked me to open the window. – *Он сказал мне: «Открой, пожалуйста, окно.» - Он попросил меня открыть окно.*

He said to me: "Don't go there." – He told me not to go there. – *Он сказал мне: «Не ходи туда». – Он велел мне не ходить туда.*

Задание 2.1. Передайте следующие предложения в косвенной речи:

- 1) Tracy said: "I hope we will go to the same place next year."
- 2) Mr Jones said: "I had a brilliant time."
- 3) Jimmy said: "I liked the food."
- 4) Grandmother said: "The waiters were very rude."
- 5) Danny said: "I like swimming."
- 6) Judy said: "I am looking forward to going back to school."
- 7) Mrs Jones said: "I am getting bored of lying on the beach."
- 8) Paul said: "I've never had so much fun in my life."
- 9) Tina said: "I am exhausted."
- 10) Patrick said: "I will go there next summer."

Задание 2.2. Передайте следующие вопросы в косвенной речи:

The boy asked: ...

- 1) "Where is the main tourist office?"
- 2) "Did you find my suitcase?"
- 3) "How long have you worked here?"
- 4) "What are we going to do today?"
- 5) "What time do we leave tomorrow?"
- 6) "Who made the sculpture in the square?"
- 7) "What time do the shops open?"
- 8) "When is breakfast served in the hotel?"
- 9) "Is there a shopping centre near here?"
- 10) "Do you know where the nearest bank is?"

Задание 2.3. Передайте следующие предложения в косвенной речи:

Mrs Baxton told her cleaner:

- 1) "Clean the bathroom."
- 2) "Make the beds."
- 3) "Don't forget to tidy the bedroom."
- 4) "Feed the dogs."
- 5) "Don't leave the rubbish in the kitchen."
- 6) "Do the washing-up."
- 7) "Don't let anyone into the house."

3. Условные предложения

В английском языке выделяют четыре типа условных предложений:

1) Условные предложения **нулевого типа** выражают общеизвестные факты, обычно относящиеся к настоящему времени:

If you interrupt people, they get angry. – *Если перебивать людей, они начинают сердиться.*

В условных предложениях этого типа и в главном, и в придаточном предложениях употребляется **Present Simple**.

2) Условные предложения **I типа** выражают реальные, осуществимые условия, обычно относящиеся к будущему или настоящему времени:

If the weather is fine, we will go for a walk. – *Если погода будет хорошая, мы пойдем гулять.*

В условных предложениях I типа, относящихся к будущему, в придаточном предложении после союза **if** глагол ставится в **Present Simple**, а в главном предложении употребляется **Future Simple**.

3) Условные предложения **II типа** выражают маловероятные и нереальные условия, относящиеся к настоящему или будущему времени:

If I won a lottery, I would buy a plane. – *Если бы я выиграл лотерею, я бы купил самолет.*

В условных предложениях II типа в придаточном предложении употребляется **Past Simple**, а в главном – **would (could) + инфинитив**.

Глагол **to be** в условном придаточном предложении часто употребляется в форме множественного числа:

If I were you I would go to the doctor at once. – *На твоём месте я бы сразу же пошел ко врачу.*

4) Условные предложения **III типа** выражают условия, не реализованные в прошлом, поэтому совершенно невыполнимые.

If I had had time yesterday, I would have gone to the concert, but I was busy. – *Если бы у меня было время вчера, я бы пошел на концерт, но я был занят.*

В условных предложениях III типа в придаточном предложении употребляется **Past Perfect**, а в главном – **would (could) + перфектный инфинитив (have + причастие прошедшего времени)**.

Задание 3.1. Составьте условные предложения первого типа, используя слова в скобках:

- 1) If you ___ busy, I ___ you alone (be) / (leave).
- 2) If I ___ in Moscow, I ___ the Tretyakov Gallery every year (live) / (visit).

- 3) If I ___ a ticket, I ___ to the concert (buy) / (go).
- 4) If my father ___ early, we ___ TV together (come) / (watch).
- 5) If mother ___ a cake, we ___ a very nice tea-party (buy) / (have).
- 6) If you ___ systematically, you ___ an examination (not work) / (fail).
- 7) I ___ you if I ___ time (phone) / (have).
- 8) Mum ___ if you ___ her (worry) / (not phone),
- 9) He ___ angry if he ___ you there (get) / (see).
- 10) If you ___ at ten, I ___ ready to start (come) / (be).

Задание 3.2. Составьте условные предложения второго типа, используя слова в скобках:

- 1) If I ___ near a lake, I ___ swimming every day (live) / (go).
- 2) If she ___ English, she ___ to enter the University (know) / (try).
- 3) If my friend ___ to see me, I ___ glad (come) / (be).
- 4) If we ___ a telegram from him, we ___ (receive) / (not worry).
- 5) If he ___ so much, he ___ be so clever (not read) / (be).

Задание 3.3. Составьте условные предложения третьего типа, используя слова в скобках:

- 1) If he ___ hard, he ___ great progress (work) / (achieve).
- 2) I ___ the composition long ago if you ___ me (write) / (not disturb).
- 3) If they ___ to Moscow last year, they ___ that famous musician (not go) / (not hear).
- 4) If she ___ me yesterday, I ___ her all about it (ask) / (tell).
- 5) If they ___ it before, they ___ measures (know) / (take).

4. Модальные глаголы (Modal Verbs)

Глаголы **can (could), may (might), must, shall, should, will, would, ought to, have to, need** являются модальными.

Модальные глаголы не выражают конкретных действий, а показывают лишь отношение говорящего к действию, оценку

действия, т.е. возможность, необходимость, предположительность, долженствование, разрешение и т.д.

Модальные глаголы имеют ряд отличительных особенностей:

- не имеют окончания **-s** в третьем лице ед. ч. настоящего времени группы **Simple** (за исключением глаголов **have to** и **need**);
- образуют вопросительную и отрицательную формы без вспомогательного глагола;
- требуют употребления инфинитива без частицы **to**;
- не имеют неличные формы (инфинитива, герундия, причастия);
- не имеют временные формы (за исключением форм настоящего и прошедшего времени группы **Simple** у некоторых модальных глаголов).

В настоящем пособии мы остановимся на подробном анализе самых употребительных модальных глаголов: **can (could)**, **may (might)**, **should**, **must**.

Модальный глагол *can (could)*

Модальный глагол **can (could)** употребляется для выражения следующих значений:

- возможности, умения, способности:

Anna can run fast. – Анна умеет быстро бегать.

I can pay you next week. – Я смогу заплатить тебе на следующей неделе.

- разрешение:

You can go home. – Вы можете пойти домой.

- сомнения, удивления, недоверия:

She can't feel hurt. We've explained everything to her. – Не может быть, чтобы она чувствовала себя обиженной. Мы ей все объяснили.

Can it be true? – Неужели это правда?

В значении сомнения, недоверия и т.п. глагол **can (could)** употребляется, как правило, в отрицательных и, реже, вопросительных предложениях и соответствует в русском языке словам *не может быть, чтобы ..., вряд ли, неужели*.

В этом значении модальный глагол **can (could)** может употребляться:

а) с простым инфинитивом, если высказывание относится, как правило, к настоящему и, реже, к будущему времени:

He can't know this man. I am sure they've never met. – *He может быть, чтобы он знал этого человека. Я уверен, что они никогда не встречались.*

б) с инфинитивом **Continuous**, если сомнение выражается в отношении действия, происходящего в момент речи:

They cannot be working in the garden. It is raining hard. – *He может быть, чтобы они сейчас работали в саду. Идет сильный дождь.*

в) с перфектным инфинитивом, если высказывание относится к прошедшему времени:

Can she have read such a big book in two days? – *Heужели она прочитала такую толстую книгу за два дня?*

г) с инфинитивом **Perfect Continuous**, если сомнение выражается в отношении действия, совершившегося в течение какого-то промежутка времени:

He can't have been working six hours running. He has done so little. – *He может быть, чтобы он работал шесть часов подряд. Он так мало сделал.*

Модальный глагол **can** – один из немногих модальных глаголов, которые имеют форму прошедшего времени. Форма прошедшего времени **can – could**:

She could play violin when she was six. – *В шесть лет она умела играть на скрипке.*

Отрицательная форма образуется при помощи отрицательной частицы **not**, которая с глаголом **can** всегда пишется слитно – **cannot**:

My little son cannot write yet. – *Мой маленький сын еще не умеет писать.*

My son could not read when he was three. – *Когда моему сыну было три года, он не умел читать.*

В разговорной речи употребляются сокращенные отрицательные формы глагола **can – can't, could – couldn't**:

She couldn't pass her driving test. – *Она не смогла сдать экзамен по вождению.*

Для образования вопросительной формы модальный глагол **can (could)** ставится перед подлежащим:

Can you do it now? – *Вы можете сделать это сейчас?*

Could you read English books last year? – *У Вас была возможность читать английские книги в прошлом году?*

Модальные глаголы являются недостаточными (у них отсутствуют некоторые глагольные формы), поэтому для восполнения недостающих форм употребляются синонимичные обороты. Синонимичным оборотом глагола **can** в значении возможности, умения, способности является **to be able to** быть в состоянии. Но, как всякий синоним, **to be able to** несколько отличается по своему значению от модального глагола **can**. Модальный глагол **can** выражает возможность вообще, а оборот **to be able to** – возможность совершить действие в данном конкретном случае в данное время.

I can play football, but I am not able to play now. I don't feel well. – *Я умею играть в футбол, но я не в состоянии играть сейчас: я плохо себя чувствую.*

В прошедшем времени различие между **can** и **to be able to** при выражении этого оттенка значения ощущается больше:

He was in London two years ago, so he could see English films every day. – *Два года тому назад он был в Лондоне и имел возможность смотреть английские фильмы каждый день.*

I am very glad you were able to come. – *Я очень рад, что Вы смогли прийти.*

С глаголами восприятия (**to see, to hear** и др.), а также в отрицательной форме, как правило, употребляется модальный глагол **could**:

I could see him very well. – *Мне его очень хорошо было видно.*

I couldn't see that book yesterday. – *Я не смог достать эту книгу вчера.*

Модальный глагол **can** может употребляться для выражения разрешения в будущем времени:

You can come at ten tomorrow. – *Вы можете прийти завтра в 10.*

В значении умения, возможности, способности совершить действие глагол **can** для будущего времени употребляется не

может, потому что он не имеет инфинитива; для будущего времени в этих значениях употребляется оборот **to be able to**.

Модальный глагол *may (might)*

Модальный глагол **may (might)** имеет два значения:

- разрешения:

May I smoke here? – *Можно здесь курить?*

В этом значении глагол **may** соответствует русскому *можно, разрешите* и может употребляться только с простым инфинитивом в утвердительном и вопросительном предложении. Отрицательная форма глагола **may** используется сравнительно редко.

- предположения, допускаемой возможности:

He may come any minute now. – *Он может прийти (возможно, придет) в любую минуту.*

В этом значении глагол **may** соответствует в русском языке словам *может (могу...), может быть, возможно* и может употребляться:

а) с простым инфинитивом, если предполагаемое действие относится к будущему и, реже, к настоящему времени:

They may arrive tomorrow or the day after. – *Они, возможно, приедут завтра или послезавтра.*

б) с перфектным инфинитивом, если предполагаемое действие относится к прошедшему времени:

They may have arrived already, but I am not sure. – *Они, возможно, уже приехали, но я в этом не уверен.*

в) с инфинитивом **Continuous**, если предполагаемое действие происходит в момент речи:

He is in his room. But I am not sure that he is not busy. He may be writing letters or reading. – *Он в своей комнате. Но я не уверен, что он не занят. Он, возможно, пишет письма или читает.*

г) с инфинитивом **Perfect Continuous**, если предполагаемое действие совершается в течение какого-то промежутка времени:

They may have been discussing the question for two hours. – *Возможно, они обсуждают этот вопрос уже два часа.*

Модальный глагол **may** в значении предположения, допускаемой возможности употребляется в утвердительных и вопросительных предположениях.

Форма **might** может иметь значение предположения, но выражает меньшую степень уверенности, чем **may**:

Your friend might still come, but I don't think he will. – *Ваш друг, может быть, еще и придет, но это маловероятно.*

В прошедшем времени модальный глагол **may** имеет форму **might**.

Отрицательная и вопросительная формы модального глагола **may** образуются так же, как и у модального глагола **can**.

Модальный глагол **should**

Модальный глагол **should** имеет значение личного совета, личного мнения и соответствует в русском языке словам *следует, следовало, следовало бы, должен был бы, нужно, нужно было бы*. Модальный глагол **should** может употребляться:

а) с простым инфинитивом, если высказываемое мнение относится к будущему или настоящему времени:

He should do exercises every morning. – *Ему следует делать зарядку каждое утро.*

С вопросительным словом **why** модальный глагол **should** выражает нерасположенность, нежелание выполнять указанное действие:

Why should I go there? – *С какой стати мне идти туда?*

б) с перфектным инфинитивом, если высказываемое мнение относится к прошедшему времени. В этом случае высказывание имеет значение порицания, упрека:

You should have called on your friend long ago. – *Вам давно уже следовало навестить вашего друга.*

Модальный глагол **should** имеет только одну форму. Отрицательная и вопросительная формы модального **should** глагола образуются так же, как и у модальных глаголов **can** и **may**.

Модальный глагол **must**

Модальный глагол **must** в утвердительной форме имеет следующие значения:

- обязанность, приказание, приказ – в этом значении он переводится на русский язык как *должен, обязан*:

You must do as I tell you. – *Вы должны поступить так, как я вам говорю.*

- настоятельный совет или приглашение – в этом значении он переводится на русский язык (обязательно) *должен, (обязательно) нужно*:

You must come and have dinner with us some day. – *Вы (обязательно) должны как-нибудь прийти к нам на обед.*

- внутренне осознанную необходимость – в этом значении он переводится на русский язык *надо, нужно, необходимо, должен*:

I must do it today, I can't leave it till tomorrow. – *Мне надо сделать это сегодня, я не могу оставить это до завтра.*

В вопросительном предложении употребление глагола **must** ограничено значением *обязательно ли должен*, так как в вопросе **must** часто выражает нежелание выполнить данное действие, раздражение и т.п.

Must I do it now? – *Я обязательно должен сделать это сейчас?*

В отрицательной форме глагол **must** имеет значение категорического запрещения и переводится на русский язык *нельзя, запрещается, не должен*.

You mustn't do it. – *Нельзя так делать.*

- предположение с большей степенью уверенности в совершении действия, чем глагол **may** (в утвердительных предложениях):

He must be home by now. He left an hour ago. – *Должно быть, он уже дома. Он ушел час тому назад.*

В этом значении глагол **must** соответствует в русском языке словам модальным словам *должно быть, вероятно, наверное, по всей вероятности* и может употребляться:

а) с простым инфинитивом, если предполагаемое действие относится к настоящему времени:

It must be 9 o'clock now. – *Должно быть, уже 9 часов.*

б) с инфинитивом **Continuous**, если предполагаемое действие происходит в момент речи:

Hurry up! They must be waiting for us already. – *Торопись! Они, наверное, уже ждут нас.*

в) с перфектным инфинитивом, если предполагаемое действие относится к прошедшему времени:

They must have arrived at the station by now. – *Они уже, вероятно, приехали на станцию.*

г) с инфинитивом **Perfect Continuous**, если предполагаемое действие совершается в течение какого-то промежутка времени:

I must have been reading for two hours. It is getting dark. – *Я читаю уже, наверное, два часа. Уже темнеет.*

Глагол **must** в этом значении не употребляется, если предполагаемое действие относится к будущему времени.

Модальный глагол **must** в значении предположения употребляется только в утвердительных предложениях. Для передачи предположения в отрицательных предложениях используются другие средства (в том числе лексические).

Модальный глагол **must** не имеет формы прошедшего времени. В прошедшем времени употребляется синонимичный оборот **to have to**.

Оборот **to have to** употребляется для выражения значения необходимости, вызванной обстоятельствами, показывает, что лицо, обозначенное подлежащим, вынуждено выполнить действие:

I have to lose weight. The doctor says so. – *Я должен похудеть. Мне это советует врач.*

Вопросительная и отрицательная формы оборота **to have to** образуются при помощи вспомогательного глагола **to do**:

When do I have to do it? – *Когда я должен сделать это?*

You do not have to stay. – *Вы можете не оставаться.*

Форма прошедшего времени оборота **to have to** – **had to** употребляется для выражения значения долженствования и необходимости в прошлом:

I had very little time, and I had to take a taxi. – *У меня было мало времени, и мне пришлось взять такси.*

Вопросительная и отрицательная формы образуются при помощи вспомогательного глагола **did**:

Did you have to write to him again? – *Вам пришлось писать ему еще раз?*

I am glad you didn't have to do it again. – *Я рад, что вам не пришлось делать это снова.*

Оборот **to have to** употребляется для передачи указанных выше значений и в будущем времени.

Задание 4.1. Вставьте can или be able to:

- 1) George has travelled a lot. He ___ speak four languages.
- 2) I haven't ___ sleep well recently.
- 3) Sandra ___ drive but she hasn't got a car.
- 4) I can't understand Martin. I've never ___ understand him.
- 5) I used to ___ stand on my head but I can't do it now.
- 6) I can't see you on Friday but I ___ meet you in Saturday morning.
- 7) Ask Catherine about your problem. She might ___ help you.

Задание 4.2. Составьте предложения с модальными глаголами can / can't / could / couldn't, используя следующие глаголы:

come eat hear run sleep wait

- 1) I'm afraid I ___ to your party next week.
- 2) When Tin was 16, he was a fast runner. He ___ 100 metres in 11 seconds.
- 3) "Are you in a hurry?" – "No, I've got plenty of time. I ___."
- 4) I was feeling sick yesterday. I ___ anything.
- 5) Can you speak up a bit? I ___ you very well.
- 6) "You look tired." – "Yes, I ___ last night."

Задание 4.3. Вставьте could, couldn't или was/were able to:

- 1) My grandfather was a very clever man. He ___ speak five languages.
- 2) I looked everywhere for the book but I ___ find it.
- 3) They didn't want to come with us at first but we ___ persuade them.
- 4) Laura had hurt leg and ___ walk very well.
- 5) Sue wasn't at home when I phoned but I ___ contact her at her office.
- 6) I looked very carefully and I ___ see a figure in the distance.

7) I wanted to buy some tomatoes. The first shop I went to didn't have any but I ___ get some in the next shop.

8) My grandmother loved music. She ___ play the piano very well.

9) A girl fell into river but fortunately we ___ rescue her.

10) I had forgotten to bring my camera so I ___ take any photographs.

Задание 4.4. Вставьте must или can't:

1) You've been travelling all day. You ___ be very tired.

2) That restaurant ___ be very good. It's always full of people.

3) That restaurant ___ be very good. It's always empty.

4) You're going on holiday next week. You ___ be looking forward to it.

5) It rained every day during their holiday, so they ___ have had a very nice time.

6) Congratulations on passing your exam. You ___ be very pleased.

7) You got here very quickly. You ___ have walked very fast.

8) Bill and Sue go away on holiday very often, so they ___ be short of money.

Задание 4.5. Составьте предложения со словами в скобках, используя may или might:

1) I can't find George anywhere. I wonder where he is.

A (he / go / shopping) B (he / play / tennis)

2) I'm looking for Helen. Do you know where she is?

A (she / watch TV / in her room) B (she / go / out)

3) I can't find my umbrella. Have you seen it?

A (it / be / in the car) B (you / leave / in the restaurant last night)

4) Why didn't Tom answer the doorbell? I'm sure he was in the house at the time.

A (he / be / in the bath) B (he / not / hear / the bell)

Задание 4.6. Напишите предложения, используя may или might:

1) Where are you going for your holidays? (to Ireland???) – I haven't decided yet. I ___ .

2) What sort of car are you going to buy? (a Mercedes???) – I'm not sure yet. I ____ .

3) What are you going to do this weekend? (go to London???) – I haven't decided yet. _____

4) Where are you going to hang that picture? (in the dining room???) – I haven't made up my mind yet. _____

5) When is Tom coming to see us? (on Saturday???) – I don't know yet. _____

6) What is Julia going to do when she leaves school? (go to university) – She hasn't decided yet. _____

Задание 4.7. Вставьте must или have to:

1) It's later than I thought. I ____ go now.

2) Jack left before the end of the meeting. He ____ go home early.

3) In Britain many children ____ wear uniform when they go to school.

4) When you come to London again, you ____ come and see us.

5) Last night Don became ill suddenly. We ____ call a doctor.

6) You really ____ work harder if you want to pass the examination.

7) I'm afraid I can't come tomorrow. I ____ work late.

8) I'm sorry I couldn't come yesterday. I ____ work late.

9) Paul doesn't like his new job. Sometimes he ____ work at weekends.

10) Caroline may ____ go away next week.

11) We couldn't repair the car ourselves. We ____ take it to a garage.

12) Julia wears glasses. She ____ wear glasses since she was very young.

Раздел 2

Текст 1

1. Прочитайте текст и переведите на русский язык:

Electrical Energy

One of the most important kinds of energy in the modern technological world is electrical energy. Electric currents turn motors and drive machinery. Electric currents provide the energy of labor-saving appliances such as electric mixers, power drills, vacuum cleaners, and automatic dishwashers. Clearly, the currents possess energy.

Electrical energy is linked with the basic structure of the atom. According to modern atomic theory an atom has a heavy, positively charged center called the nucleus. One or more light, negatively charged electrons circulate around the nucleus. The positive nucleus and the negative electrons attract one another. This attraction keeps most of the electrons circulating near the nucleus. But sometimes a neighboring nucleus will also attract the electrons of the first atom. This is how a chemical bond is formed. So, in a way, all chemical energy is a special, microscopic kind of electrical energy.

Metals are made up of atoms that contain many electrons. Because of the peculiar structure of metal atoms, the atomic nuclei are not strong enough to hold on to all their electrons. Some of the electrons more or less float from nucleus to nucleus. These free electrons can take part in an electric current.

Work must be done to separate positive and negative charges if one is to produce a surplus of electrons in one place and nuclei that are missing one or more electrons at another place. When this situation occurs, as in a battery, energy is stored. If one end of a metal wire is connected to the place where excess electrons are collected (the negative terminal on a battery) and the other end of the wire is connected to the place where excess nuclei are collected (the positive terminal on a battery), the electrons of the wire flow to join the nuclei.

Electrons farther down the wire flow after the first electrons, and the electrons from the battery move into the wire. This total electron flow from the negative terminal of the battery through the wire and into the positive terminal is called an electric current. Since a force is applied that makes the electrons move a certain distance down the wire, work is done.

Vocabulary

current – ток

provide – обеспечивать

appliance – устройство

nucleus – ядро

bond – связь

peculiar – особенный

surplus – излишек

excess – дополнительный

2. Ответьте на вопросы:

- 1) What do electric currents provide?
- 2) What are the components of an atom?
- 3) Why do some electrons float from nucleus to nucleus?
- 4) How is energy stored in a battery?
- 5) What is electric current?

3. Напишите, соответствуют ли утверждения тексту: правда – true (T), неправда – false (F). Исправьте неправильные утверждения.

- 1) The currents don't possess energy.
- 2) The positive nucleus and the negative electrons attract one another.
- 3) The atomic nuclei are strong enough to hold on to all their electrons.
- 4) Some of the electrons more or less float from nucleus to nucleus.
- 5) If one end of a metal wire is connected to the place where excess electrons are collected and the other end of the wire is connected

to the place where excess nuclei are collected the electrons of the wire don't flow to join the nuclei.

4. Заполните пропуски в предложениях следующими словами и выражениями:

peculiar, provide, current, surplus, appliance

1) Keep one cup if the liquid and throw away the _____. 2) The hotel ____ a playroom for children. 3) We haven't got many ____ here. 4) Each person's handwriting has its own ____ characteristics. 5) Electric ____ can provide much energy.

Текст 2

1. Прочитайте текст и переведите на русский язык:

Sources of Light

Unlike many other animals, humans depend primarily on sight to learn about the world around them. During the day early peoples could see by the light that came from the sun; but night brought darkness and danger. One of the most important steps people have taken to control their environment occurred when they learned to conquer the dark by controlling fire—a source of light.

Torches, candles, and oil lamps are all sources of light. They depend on a chemical reaction—burning—to release the energy we see as light. Plants and animals that glow in the dark—glowworms, fireflies, and some mushrooms—change the chemical energy stored in their tissues to light energy. Such creatures are called bioluminescent. Electric-light bulbs and neon lights change electrical energy, which may be produced by chemical, mechanical, or atomic energy, into light energy.

Light sources are necessary for vision. An object can be seen only if light travels from the object to an eye that can sense it. When the object is itself a light source, it is called luminous. Electric lights are luminous. The sun is a luminous object because it is a source of light. An object that is not itself a source of light must be illuminated by a luminous object before it can be seen. The moon is illuminated by the sun. It is visible only where the sun's rays hit it and bounce off toward Earth—or to an observer in a spacecraft.

In a completely dark room, nothing is visible. When a flashlight is turned on, its bulb and objects in its beam become visible. If a bright overhead bulb is switched on, its light can bounce off the walls, ceiling, floor, and furniture, making them and other objects in its path visible.

Heating some things causes them to give off visible light rays as well as invisible heat rays. This is the case for electric-light filaments, red-hot burners on electric stoves, and glowing coals. The light of such objects is incandescent. Other light sources emit light energy but no heat energy. They are known as luminescent or cold light, sources. Neon and fluorescent lights are luminescent.

Vocabulary

occur – происходить, случаться

tissue – ткань

vision – зрительное восприятие, вид, зрелище, видимость

bounce – отскакивать, отражаться

filament – нить накаливания

incandescent – накалённый, светящийся от накаливания

2. Ответьте на вопросы:

- 1) How did early peoples manage to control the environment?
- 2) What are the main sources of light?
- 3) What natural sources of light do you know?
- 4) Why do people see objects around them?
- 5) What is luminescent source of light?

3. Напишите, соответствуют ли утверждения тексту: правда – true (T), неправда – false (F). Исправьте неправильные утверждения.

1) One of the most important steps people have taken to control their environment occurred when they learned to conquer the dark by controlling the sun.

2) Torches, candles, and oil lamps depend on a chemical reaction – burning – to release the energy we see as light.

3) Electric lights are not luminous.

4) Heating some things doesn't cause them to give off visible light rays as well as invisible heat rays.

5) Neon and fluorescent lights aren't luminescent.

4. Заполните пропуски в предложениях следующими словами и выражениями:

tissue, bounce, occur, incandescent, vision

1) Do you think that light is important for your ____ ? 2) Josh knew that the ray ____ across the street. 3) This lamp has been made very hot and now it's ____ . 4) The cells are grouped together to form ____ . 5) The police said that the accident ____ at about 4 p.m.

**Контрольная работа IV
(2 курс, 4 семестр)**

Часть 1.

I. Прочитайте текст и переведите письменно:

Nuclear Energy

Yet another kind of energy is locked in the nuclei of atoms. The nuclei of atoms contain two kinds of particles—protons and neutrons. The nuclear particles can store energy. Some nuclei spontaneously rearrange, or lose some particles, and emit energy. This process is called radioactivity. For example, a radium nucleus can spontaneously eject a cluster of two neutrons and two protons (called an alpha particle) and a gamma ray (electromagnetic radiation). These carry away energy from the nucleus, which changes into a smaller, more stable form.

Two techniques exist by which nuclear energy is released by human intervention. The first makes use of elements with very heavy atoms, such as uranium. More energy is required to hold together the uranium nucleus than to hold together two nuclei that are half the size of a uranium nucleus.

In atom bombs and in fission reactors, free neutrons bombard uranium atoms. When a neutron hits a nucleus, the nucleus splits into two smaller nuclei, releasing a great deal of energy. In the reaction, some of the neutrons of the uranium nucleus fly off and hit other nuclei, causing them to split in two and release more energy and more neutrons. The process can continue explosively unless metal rods are inserted in the middle of the uranium to capture some of the neutrons and slow down the reaction. This sort of reaction is called a fission reaction because in it nuclei are broken apart.

The second kind of nuclear reaction is harder to produce and control. It makes use of the fact that very small nuclei, such as hydrogen and its isotopes, require slightly more energy per proton and neutron to exist than do somewhat heavier nuclei. (The situation is exactly opposite to that of the uranium nucleus, where the lighter nuclei require less energy.) If two hydrogen nuclei can be combined to form one heavier nucleus, energy is released. This type of reaction goes on in the

sun. By a somewhat complicated series of reactions, four hydrogen nuclei join together to form a new helium nucleus, giving off a great deal of energy in the process. This is the source of all the energy emitted by the sun.

Temperatures in this kind of reaction must be very high (in the millions of degrees) before the nuclei have enough energy to collide with the force needed for them to join together. The reaction is called a thermonuclear fusion reaction. “Thermonuclear” refers to the heat required for the nuclei to react, and “fusion” means that in the reaction nuclei join together.

Vocabulary

particle – частица

spontaneously – спонтанно, самопроизвольно

rearrange – перестраиваться, перегруппироваться

eject – испускать, выпускать

cluster – сгусток, группа, скопление

capture – захватывать

complicated – сложный

fusion – объединение, слияние

2. Ответьте на вопросы:

- 1) What particle does the nucleus contain?
- 2) What is radioactivity?
- 3) How do neutrons in atom bombs behave?
- 4) What happens if two hydrogen nuclei combine?
- 5) What is the difference between nuclear and thermonuclear reaction?

3. Напишите, соответствуют ли утверждения тексту: правда – true (T), неправда – false (F). Исправьте неправильные утверждения.

- 1) The nuclei of atoms contain one kind of particles.
- 2) Two techniques exist by which nuclear energy is released by human intervention.
- 3) In atom bombs and in fission reactors, free neutrons bombard uranium atoms.

- 4) If two hydrogen nuclei can be combined to form one heavier nucleus, energy isn't released.
5) Temperatures in the second kind of reaction must be very low.

5. Заполните пропуски в предложениях следующими словами и выражениями:

fusion, rearrange, particle, spontaneously, complicated

- 1) The process when nuclei ___ spontaneously is called radioactivity. 2) The situation seems to be getting more and more ____ . 3) She represented the ___ of art and science. 4) ___ is an extremely small piece of atom. 5) David is the person that always acts ____ .

Часть 2

1. Используйте глаголы в скобках в инфинитиве или ing-форме:

- 1) I don't like ___ in public (sing).
2) It's no use ___ her. She won't listen (tell).
3) I'm still too upset ___ about it (talk).
4) Don't disturb him. He's busy ___ (work).
5) Stop ___ your nails (bite).
6) Don't expect him ___ you any money (lend).
7) I've decided ___ him (leave).
8) Mum made me ___ my medicine (take).
9) She agreed ___ him \$ 1,000 (lend).
10) He denied ___ the stolen goods (receive).

2. Используйте глаголы в скобках в инфинитиве или ing-форме:

Yesterday I went with my sister 1) ___ (buy) something for her birthday. She didn't really know what 2) ___ (get) but she seemed 3) ___ (like) the idea of a pet, so we went to the nearest pet shop. She started 4) ___ (look) around at all the animals. The man in the shop let her 5) ___ (pick up) the rabbits and stroke the hamsters, but when she saw some puppies 6) ___ (play) in a box, she said that she would like 7) ___ (have) one of them. I didn't know if we had enough money 8) ___ (buy) one and I hoped my mother wouldn't object 9) ___ (have) a dog in the house, but my sister promised 10) ___ (look after) it properly and we did have enough money, so we bought a little brown dog. The man gave us a special brush for 11) ___ (brush) him and some special food. Tomorrow we're going to take Splash to the beach.

3. Употребите глаголы в скобках в инфинитиве или ing-форме:

My mother is an amazing woman. She is 87 years old and she still enjoys 1) ___ (go out) for a walk every day. She doesn't mind 2) ___ (do) all her housework and she's glad 3) ___ (help) her elderly neighbours when they can't 4) ___ (go) to the shops. She's too old 5) ___ (dig) the garden any more – she stopped 6) ___ (do) that last year – but she's still healthy enough 7) ___ (mow) the grass! In the summer she still goes 8) ___ (swim) when it's warm and she lets her grandchildren 9) ___ (bury) her in the sand. She often says. "It's no good 10) ___ (be) alive if you don't enjoy herself." I'd love 11) ___ (be) like my mother when I'm her age.

4. Передайте следующие предложения в косвенной речи:

- 1) Miss Moore said: "They'll make a lovely couple".
- 2) Mr Smith said: "They're going to live in Brighton".
- 3) Mrs Jones said: "The bride and the groom are very nice young people".
- 4) Mr Roberts said: "The bride is wearing a beautiful wedding dress".
- 5) Mr Clarke said: "The couple's parents look happy".
- 6) Miss Mayall said: "The bride's father has bought them a big flat".

5. Передайте следующие вопросы в косвенной речи:

The police officer asked: ...

- 1) "What's your name?"
- 2) "Did you see the robbers?"
- 3) "What were they wearing?"
- 4) "How do you think they got in?"
- 5) "What did they take?"
- 6) "Has this ever happened before?"

6. Передайте следующие предложения в косвенной речи:

Mrs Lane told her babysitter ... :

- 1) "Don't answer the door to anyone! "
- 2) "Phone me if there's an emergency!"
- 3) "Don't let the children eat any sweets!"
- 4) "Send the children to bed at 9 o'clock!"
- 5) "Give the children a bath before they go to bed!"
- 6) "Don't take the dog into the children's bedroom!"
- 7) "Close all the windows!"
- 8) "Put the toys away in the cupboard!"

7. Передайте следующие предложения в косвенной речи:

- 1) "I've ordered a pizza for dinner," he said.
- 2) "I will come tomorrow and fix the tap," the plumber said to them.
- 3) "This is the best holiday I've ever had," she said to her friend.
- 4) "Why did you say that to me?" she asked him.
- 5) "Don't speak to your father like that," she said to them.
- 6) "Could you show me where the manager's office is?" he asked the secretary.
- 7) "Take your books with you," she said to her son.

8. Закончите условные предложения первого типа:

- 1) If the dog ____ (keep) barking, the neighbours will complain.
- 2) The boss ____ (be) angry if you arrive late for work.
- 3) If you ____ (study) hard, you will pass your exam.
- 4) If we go by plane, it ____ (be) more expensive.
- 5) We will miss the plane if he ____ (come) late.

6) If you are a good girl, I ____ (buy) you some chocolate.

9. Составьте условные предложения первого типа, используя слова в скобках:

- 1) (eat too much / put on weight);
- 2) (snow / make a snowman);
- 3) (be sunny / go for a picnic);
- 4) (rain / stay home);
- 5) (not work hard / lose job).

10. Для каждой из приведенных ниже ситуаций напишите условные предложения второго типа, используя выражения в таблице:

call an ambulance	run away	walk to the nearest garage to get some
complain to the manager	try to catch it	ring the police

- 1) You find a fly in your soup. _____
- 2) You see a burglar breaking into your house. _____
- 3) You see a mouse in your kitchen. _____
- 4) Your car runs out of petrol. _____
- 5) You see an accident. _____
- 6) You see a ghost in your room. _____

11. Раскройте скобки в тексте, обращая особое внимание на условные предложения третьего типа:

John is in prison. If John 1) ____ (not / oversleep), he 2) ____ (not / be) late for work. If he 3) ____ (not / be) late for work, his boss 4) ____ (not / fire) him. If John 5) ____ (not / lose) his job, he 6) ____ (not / need) money and he 7) ____ (not / rob) the bank. If he 8) ____ (not / rob) the bank, the police 9) ____ (not / arrest) him.

12. Определите тип приведенных ниже условных предложений и поставьте глаголы в скобках в нужную форму:

- 1) If it ____ (not / be) cold, they would not have lit the fire.

- 2) If she studied more, she ____ (be) a better student.
 3) They ____ (not / see) the Queen if they hadn't visited London that day.
 4) Those plants ____ (not / grow) if you don't water them.
 5) I would buy that bag if it ____ (be) cheaper.
 6) If I lived in France, I ____ (speak) French well.
 7) We ____ (have) a party if Alan passes his driving test.
 8) If she ____ (open) the letter, she would have been surprised.

13. Заполните пропуски в приведенном ниже диалоге, используя can, could и be able to:

John: _____ you ski?

Dave: Yes, I _____. I went skiing last year and I _____ go down the learner's slope easily.

John: I _____ ski when I was younger but since I hurt my leg I _____.

Dave: Actually, I think ice-skating is much easier. I _____ ice-skating when I was five years old.

John: Really? I tried ice-skating once, I _____ stand up at all.

14. Заполните пропуски в приведенном ниже диалоге, используя can, may, could, mustn't и can't:

Jim: Mum, 1) _____ I go to the library?

Mother: Of course you 2) _____, Jim, but you 3) _____ stay very long.

Jim: 4) _____ stay until 8 o'clock?

Mother: No, you 5) _____, because the concert starts at 8.30.
(At the library)

Jim: 6) _____ I look at the latest "Musician" magazine, please?

Librarian: Yes, you _____, but remember that you _____ take it out of the library.

15. Закончите приведенные ниже предложения, используя модальный глагол must и глаголы в таблице. Переведите предложения на русский язык:

be	go	lear	mee	was	win
		n	t	h	

- 1) Marilyn is a very interesting person. You _____ her.
- 2) My hands are dirty. I _____ them.
- 3) You _____ to drive. It will be very useful.
- 4) I _____ to the post office. I need some stamps.
- 5) The game tomorrow is very important for us. We _____.
- 6) You can't always have things immediately. You _____ patient.

16. Закончите приведенные ниже предложения, используя модальный глагол *should* и глаголы в таблице. Переведите предложения на русский язык:

n	clea	go	take	visit	ch	wat	r	wea
---	------	----	------	-------	----	-----	---	-----

- 1) When you play tennis, you _____ the ball.
- 2) It's late and you're tired. You _____ to bed.
- 3) You _____ your teeth twice a day.
- 4) If you have time, you _____ the Science Museum. It's very interesting.
- 5) When you're driving, you _____ a seat belt.
- 6) It's too far to walk from here to the station. You _____ a taxi.

3 курс

V семестр

Текст 1

1. Прочитайте текст и переведите на русский язык:

Sound

It is easy to detect the vibrations of many sources of sound. A radio loudspeaker, for example, vibrates strongly, especially when the volume is turned up. If you lightly touch the speaker cone, you can feel its vibrations as a kind of tickling sensation in your fingertips. If you touch your throat while singing a low note, you can feel the vibrations of the vocal cords. A common experiment in physics classes is to strike a tuning fork and dip the end of it in water. The vibrating fork splashes the water and sets up little waves that are easy to see.

Sound waves are often compared with water waves but are actually a very different sort of wave. What they are can be seen by considering what happens when an object vibrates in the air. Suppose someone strikes a gong. As the gong vibrates, it alternately bends outward and inward very rapidly. This movement pushes and pulls at the air next to the surface of the metal. Air is made up of tiny molecules, billions of them to every cubic inch. Therefore, when the metal gong bends outward, it crowds together those air molecules that are close to its surface. These molecules push outward against other molecules, and they in turn push against still others. Thus a compression wave is set

into motion. The wave travels outward from the gong, becoming weaker and weaker until it dies away.

A single sound wave such as this does not actually produce a sound, of course. As the gong continues to vibrate, each outward bending of the metal sets up a new compression wave. Between each pair of compression waves is an area in which the molecules of air are spread apart more widely than normal. Such a wave of rarefaction corresponds to a moment in which the gong is bent inward, pulling instead of pushing the molecules. The whole series of compression and rarefaction waves traveling outward from the gong make up what is heard as sound. The sound waves travel in all directions from their source.

Vocabulary

volume – громкость

cone – диффузор громкоговорителя

tickling – щекочущий

vocal cord – голосовая связка

crowd – собирать, скапливать

rarefaction – разрежение

2. Ответьте на вопросы:

- 1) What is the most common sound experiment in physics?
- 2) Why are sound waves often compared with water waves?
- 3) What happens with air when a gong vibrates?
- 4) Where do sound waves travel?
- 5) Which waves form the sound?

3. Напишите, соответствуют ли утверждения тексту: правда – true (T), неправда – false (F). Исправьте неправильные утверждения.

- 1) A radio loudspeaker vibrates strongly, especially when the volume is turned down.
- 2) Sound waves are the same as water waves.
- 3) When someone strikes a gong alternately bends outward and inward very rapidly.

4) Between each pair of compression waves is an area in which the molecules of air are spread apart more widely than normal.

5) The sound waves travel in one direction from their source.

4. Заполните пропуски в предложениях следующими словами и выражениями:

tickling, vocal cord, rarefaction, volume, crowd

1) You use your ___ for making sounds. 2) Everyone in the restaurant ___ round them and started singing. 3) The fur of this coat is very ____ . 4) Can you turn the _____ up a little, please?

Текст 2

1. Прочитайте текст и переведите на русский язык:

Quantum Mechanics

In what he called an “act of desperation,” the German physicist Max Planck proposed the quantum theory of light in 1900 to account for certain mysterious facts about the emission of light. He proposed that light was emitted only in tiny bundles. The light emitted by a glowing piece of iron, for instance, was actually “grainy,” composed of minuscule light “grains” too small to be seen. Planck called a light “grain” a quantum, from the Latin word meaning “how much?”

Planck was trying to explain the way certain substances give off light. Light is the movement of energy through space in the form of electromagnetic waves. These electromagnetic waves, of which light is but one type, are caused by certain motions of tiny, negatively charged particles called electrons, which generally surround the dense core, or nucleus, of an atom.

Planck proposed that electrons, for some unknown reason, can give off light only in certain specific amounts of light energy—in quanta. Only whole quanta can be given off, never a fraction of a quantum. The energy of these quanta varies directly with the frequency of the light. Energetic light of higher frequency, such as violet or ultraviolet light, consists of higher-energy quanta than does light of lower frequency, such as red or infrared light.

Planck made some calculations of the relation between energy and frequency of a light quantum. The greater the one, the greater the other. He then derived a conversion factor, now known as Planck's constant, that describes the energy of an individual quantum and is one of the fundamental constants of physics.

Planck's constant is expressed in terms of energy multiplied by time—a unit called action—and may be given in erg-seconds or joule-seconds. An erg is defined as the amount of energy needed to raise a milligram (roughly the weight of a grain of sand) a distance of 1 centimeter (about $\frac{1}{3}$ inch). This is not a great deal of energy. Planck's constant (h) is about 6.626×10^{-27} erg-second. An electromagnetic wave with a frequency of millions of cycles per second (a typical radio wave) has quanta with energies on the order of 10^{-21} erg. A quantum leap is indeed extremely small. Quanta may come in different energies, but they must always be whole-number multiples of Planck's constant times the radiation frequency.

Vocabulary

propose – предлагать

emission – термоэлектронная эмиссия

bundle – пучок, большое количество

dense – плотный

core – ядро

derive – извлекать, получать

2. Ответьте на вопросы:

- 1) What did max Planck propose in 1900?
- 2) What does a quantum mean?
- 3) What is light?
- 4) What does ultraviolet light consist of?

5) What is Planck's constant?

3. Напишите, соответствуют ли утверждения тексту: правда – true (T), неправда – false (F). Исправьте неправильные утверждения.

1) The German physicist Max Planck proposed the quantum theory of light in 1905.

2) Planck was trying to explain the way certain substances give off light.

3) Electrons can give off only a fraction of a quantum.

4) The greater the energy, the greater the frequency of a light quantum.

5) A quantum leap is indeed large.

5. Заполните пропуски в предложениях следующими словами и выражениями:

dense, derive, propose, core, bundle

1) This job gives a ___ of opportunities. 2) Most metals are ___ because of the arrangement of atoms. 3) Einstein ___ his theory of relativity in 1915. 4) These 2500 words form the core of the language. 5) She doesn't eat products that are ___ from animals.

Текст 3

1. Прочитайте текст и переведите на русский язык:

Mechanics

The acceleration of an automobile, the recoil of a fired gun, the motion of a space rocket, and the action of a spinning top—all can be analyzed and understood through the science of mechanics. In all these

actions, certain general principles, or laws of nature, hold true. These principles make up the science of mechanics. Mechanics deals with the behavior of bodies under the influence of forces, and the laws of mechanics apply whether the bodies are large or small, solid or fluid, resting on the Earth's surface or traveling in outer space.

The field of mechanics that deals with bodies at rest or in motion with constant velocity is called statics, while the field dealing with accelerating bodies—that is, bodies that are undergoing changes in their state of motion—is called dynamics. Special terms are generally used to denote further subdivisions of dynamics. Thus fluid mechanics is concerned with the dynamics of liquids and gases at low speeds, gas dynamics deals with the high-speed flow of gases, and mechanics of materials deals with the stresses and deformations experienced by bodies when loads are applied to them.

Engineers must be familiar with the laws of mechanics in order to provide proper support for structures such as buildings and bridges. These structures may seem motionless, but many forces act constantly to move and deform them. Structures must be able to stand up against the constant downward pull of gravity, and bridges must carry heavy loads. To offset these forces, builders provide supports such as arches, buttresses, and latticeworks made of triangles, called trusses. Trusses are strong because triangles hold their shape firmly against bending, pulling, or pressing until the material of which they are made is noticeably deformed or broken.

In general, the rules of classical mechanics do not apply to bodies moving at speeds close to that of light. In such cases relativity is necessary to describe correctly the bodies' behavior. Similarly, the behavior of a number of very small bodies—the size of molecules or smaller—is best described by statistical and quantum mechanics. As used here, the term mechanics applies to rigid bodies, or bodies that do not alter their shapes when forces are applied to them.

Vocabulary

recoil – отдача

influence – влияние

velocity – скорость

motionless – неподвижный, без движения

offset – компенсировать

buttress – подпорка

truss – связка

rigid – жёсткий, твёрдый

2. Ответьте на вопросы:

- 1) What does mechanics deal with?
- 2) What is fluid mechanics concerned with?
- 3) Why must engineers be familiar with the laws of mechanics?
- 4) What do builders do to offset the force of gravity?
- 5) Why is relativity necessary in classical mechanics?

3. Напишите, соответствуют ли утверждения тексту: правда – true (T), неправда – false (F). Исправьте неправильные утверждения.

- 1) Mechanics deals with the behavior of bodies under the influence of forces.
- 2) The field of mechanics that deals with bodies at rest or in motion with constant velocity is called dynamics.
- 3) Biologists must be familiar with the laws of mechanics in order to provide proper support for structures such as buildings and bridges.
- 4) The rules of classical mechanics apply to bodies moving at speeds close to that of light.
- 5) The behavior of a number of very small bodies is best described by statistical and quantum mechanics.

4. Заполните пропуски в предложениях следующими словами и выражениями:

offset, rigid, motionless, influence, velocity

- 1) This door is made up of very ___ material.
- 2) The object developed certain ___ and then stopped.
- 3) Without his famous father's influence he can't get this job.
- 4) He lay motionless on the bed.
- 5) It's obvious that these losses should be ___ .

Контрольная работа V (3 курс, 5 семестр)

1. Прочитайте текст и переведите на русский язык письменно:

Solid State Physics

In 1912 Max von Laue established that crystals diffract X rays in an orderly manner. X-ray diffraction photographs revealed that a crystal is an ordered arrangement of atoms or molecules in a regular repeating pattern. The particular pattern often helps explain properties of a given crystal. For example, metals that have one kind of crystalline arrangement become brittle at low temperatures, while metals that have another kind remain strong.

While crystallographers were analyzing the patterns of crystal atoms, atomic and quantum theorists tried to determine what forces caused these patterns. Atomic theory postulates that an atom has a central, positively charged nucleus surrounded by outer, negatively charged electrons. Crystalline solids have been classified as ionic, covalent, metallic, or molecular crystals, depending on how the outermost of these electrons interact.

Quantum mechanics is a way of describing the relationships between energy and matter. This discipline is preferred because it has been very successful in explaining otherwise inaccessible atomic phenomena. Its predictions are the most precise and the best checked of

any in physics; some of them have even been tested and found accurate to better than one part per billion. For this reason, quantum mechanics has been used to explain mathematically the electrical conductivity of metals, semiconductors, and insulators. In such calculations, three energy regions are significant.

Filled energy bands contain all the electrons that are attached to their atoms. When electrons occupy the conduction band they are completely free of their atoms and available to an electric current. Energies falling between the conduction band and a filled band are said to be in a forbidden region. Quantum calculations predict that other atoms in the crystal reflect electrons having forbidden energies, thereby preventing their movement in an electric current.

In metals, some electrons have enough energy to occupy the partially empty conduction band even at very low temperatures (in other words, they are free from their atoms). In insulators, all the bands are completely filled (electrons are attached to their atoms), and no electrons are left over to join the conduction band. Furthermore, the jump to the empty conduction band is very great—five to seven electron volts—so electrons are not likely to gain enough energy to reach it. Finally, in semiconductors, the energy bands are completely filled, with no electrons left over. But the gap between one filled band and the empty conduction band is very small—about 0.5 electron volts—so a small energy input such as the thermal energy at ordinary temperatures can boost some of the electrons into the conduction band.

Vocabulary

reveal – показывать

arrangement – расположение

outer – внешний

interact – взаимодействовать

inaccessible – недоступный, недостижимый

conductivity – проводимость

insulator – изолятор

2. Ответьте на вопросы:

- 1) What did Max von Laue establish in 1912?
- 2) What does atomic theory postulate?

- 3) Why is quantum mechanics preferred?
- 4) What do quantum calculations predict?
- 5) What is the gap between one filled band and the empty conduction band?

3. Напишите, соответствуют ли утверждения тексту: правда – true (T), неправда – false (F). Исправьте неправильные утверждения.

- 1) Metals that have one kind of crystalline arrangement become brittle at high temperatures.
- 2) Atomic theory postulates that an atom has a central, positively charged nucleus surrounded by outer, negatively charged electrons.
- 3) Quantum mechanics is a way of describing the relationships between energy and light.
- 4) Energies falling between the conduction band and a filled band are said to be in a forbidden region.
- 5) In metals, all electrons have enough energy to occupy the partially empty conduction band.

4. Заполните пропуски в предложениях следующими словами и выражениями:

inaccessible, outer, arrangement, interact, reveal

- 1) The ___ walls of the castle were over six feet thick.
- 2) In large classes, children can't ___ with the teacher properly.
- 3) This company specializes in expeditions to ___ areas.
- 4) She refused to ___ the contents of the letter to us.
- 5) She explained to us the ___ of the atoms.

Приложение

Texts for reading

Текст 1

Electromagnetism

It was James Clark Maxwell who, in 1865, finally unified the concepts of electricity and magnetism into one theory of electromagnetism. The force is mediated by the electromagnetic field. The various derivatives of this field lead to the electric and the magnetic fields, respectively. The theory is not totally symmetric in the electric and the magnetic fields though, since it only introduces direct sources to the electric field, the electric charges. A fully symmetric theory would also introduce magnetic charges, (predicted to exist by modern quantum theory but with such huge magnitudes that free magnetic charges must be extremely rare in our universe). For two static bodies with charges e_1 and e_2 the theory leads to *Coulomb's Law* giving the force

$$F = ke_1e_2/r^2,$$

where again k is a proportionality constant. Note the resemblance with Newton's law for gravity. There is one difference though. While the gravitational force always is attractive, the electromagnetic one can also be repulsive. The charges can either have negative signs such as for the electron or be positive as for the proton. This leads to the fact that positive and negative charges tend to bind together such as in the atoms and hence, screen each other and reduce the electromagnetic field. Most of the particles in the earth screen each other in this way and the total

electromagnetic field is very much reduced. Even so we know of the magnetic field of the earth. Also in our bodies most charges are screened so there is a very minute electromagnetic force between a human being and the earth. The situation is very different for the gravity field. Since it is always attractive, every particle in the earth interacts with every particle in a human body, setting up a force which is just our weight. However, if we compare the electromagnetic and the gravitational forces between two electrons we will find that the electromagnetic one is bigger by a factor which is roughly 10^{40} . This is an unbelievably large number! It shows that when we come to microcosm and study the physics of elementary particles we do not need to consider gravity when we study quantum electrodynamics, at least not at ordinary energies.

When examining Maxwell's equations one finds that the electromagnetic field travels with a finite velocity. This means that *Coulomb's Law* is only true once the electromagnetic field has had time to travel between the two charges. It is a static law. One also finds that the electromagnetic field travels as a wave just in the same way as light does. It was Rømer who discovered that the velocity of light is finite and Newton and Huygens who discovered that light travels as waves in the late 17th century, and by the end of the 19th century the velocity of light was well established and seen to agree with the velocity of the electromagnetic field. Hence it was established that light is nothing but electromagnetic radiation. In 1900 Max Planck proposed that light is quantised in order to explain the black body radiation. However, it was Albert Einstein who was the first to really understand the revolutionary consequences of this idea when he formulated the *photoelectric* effect. The electromagnetic field can be understood as a stream of corpuscular bodies to be called *photons* that make up the electromagnetic field. The revolutionary aspect of this idea was that a stream of particles also could behave as a wave and there was much opposition to the idea from many established scientists of the day. It was not until 1923 when Arthur Compton experimentally showed that a light quanta could deflect an electron just like a corpuscular body would do it, that this debate was over.

If we think about the electric force between two charges as the electromagnetic field mediating it over a distance, we can now get a more fundamental picture as a stream of photons sent out from one

particle to hit the other. This is a more intuitive picture than a force acting over a distance. Our macroscopic picture of a force is that something hits a body that then feels a force. In the microscopic world this is then again a way to understand a force. However, it is more complex. Suppose there are two charged particles that interact. Which particle is sending out a photon and which is receiving the photon if the two particles are identical as quantum mechanics tells us about fundamental particles? The answer must be that the picture should include both possibilities. The discovery that the electromagnetic field is quantised started the development of quantum mechanics and led us to a microcosm that is just built up by point-like objects and where forces occur when two particles hit each other.

Quantum mechanics as such led to many new revolutionary concepts. One of the most important ones is *Heisenberg's Uncertainty Relation* formulated by Werner Heisenberg in 1927, which states that one cannot measure position and momentum or energy and time exactly simultaneously. For a nucleus, one can either determine the position of an electron and know nothing of its momentum or know its momentum and nothing about its position. In the picture showing the force field between two charges, we should think of it as photons travelling from one charge to another. Hence the energy cannot be determined better than what the uncertainty relation tells us because of the uncertainty in the determination of the time. Hence the special relativity relation for light that the photon is massless which translates into the relation that the energy²=momentum²c² need not be satisfied. If we put the energy and the three-dimensional momentum together into the four-momentum we see that it is not constrained by the masslessness condition, we say that the photon is virtual and consequently has a (virtual) mass. We can thus interpret the process above as either a certain photon going from particle 1 to particle 2 with a certain four-momentum or as one from particle 2 to particle 1 with the opposite four-momentum. When two charges are far away the uncertainty relation gives little freedom and the photon is closer to masslessness, We know that *Coulomb's law* seems to be valid at the longest distances so it must be set up by the photons close to masslessness. If two charges are close there should be more terms to the force. Incidentally in order to measure the velocity of light the photons must interact. Hence there is a slight uncertainty in its mass and a slight uncertainty in its velocity. However, we measure always the

same velocity for light which means that at the macroscopic distances that we measure, the virtuality and hence the mass of the photon is essentially zero to a very good accuracy. It is then consistent to say that the velocity of light is constant.

Текст 2

Nuclear Forces

Since there were only two basic forces known in the beginning of the 20th century, gravitation and electromagnetism, and it was seen that electromagnetism is responsible for the forces in the atom, it was natural to believe that it was also responsible for the forces keeping the nucleus together. In the 1920's it was known that the nuclei contain protons, in fact the hydrogen nucleus is just a proton, and somehow it was believed that electrons could be involved in keeping the protons together. However, an idea like this has immediate problems. What is the difference between the electrons in the nucleus and the ones in orbit around the nucleus? What is the consequence of Heisenberg's uncertainty relation if electrons are squeezed into the small nucleus? The only support for the idea, apart from there being no other known elementary particles, was that in certain radioactive decays electrons were seen to come from the nucleus. However, in 1932 James Chadwick discovered a new type of radiation that could emanate from the nuclei, a neutral one and his experiment showed that there are indeed electrically neutral particles inside the nuclei, which came to be called neutrons. Soon after Eugene Wigner explained the nuclei as a consequence of two different nuclear forces. The *Strong Nuclear Force* is an attractive force between protons and neutrons that keep the nucleus together and the *Weak Nuclear Force* is responsible for the radioactive decay of certain nuclei. It was realized that the strength of the two forces differed a lot. The typical ratio is of the order of 10^{14} at ordinary energies.

Текст 3

Strong Interactions

A natural idea now was to search for a mechanism like the one in electromagnetism to mediate the strong force. Already in 1935 Hideki Yukawa proposed a field theory for the strong interaction where the mediating field particle was to be called a meson.

However, there is a significant difference between the strong force and the electromagnetic one in that the strong force has a very short range (typically the nuclear radius). This is the reason why it has no classical counterpart and hence had not been discovered in classical physics. Yukawa solved this problem by letting the meson have a mass. Such a particle was also subsequently seemingly found from cosmic rays by Carl Anderson. The discovery of nuclear fission in the late 1930's led to an enormous interest in nuclear physics and in the war years most physicists worked on problems with fission so it was not until after the war that Yukawa's ideas were taken up again. It was then realized that the particle found by Anderson could not be the meson of strong interactions, since it interacted far too little with matter, and it was then shown that this particle, now called the muon, is a heavy cousin of the electron. However, the meson, now called pion, was finally discovered in cosmic rays by Cecil Powell in 1947 and its properties were measured. A new dilemma now appeared. When the big accelerators started to operate in the 1950's, the pions were produced vindicating Yukawa's theory, but when his field theory was scrutinised according to the rules set up by Feynman, it was shown that indeed the theory is renormalisable but the coupling constant is huge, larger than one. This means that a diagram with several interactions will give a

larger contribution than the naive one with the exchange of only one pion, which is the one though that does gives a rough picture of the scattering of two protons. The perturbation expansion does not make sense. Also the scattering of protons produced new strongly interacting particles beside the pion, which were named hadrons. Indeed a huge menagerie of elementary particles were discovered, some of them with a life time of some 10^{-8} to 10^{-10} s and some with a lifetime of 10^{-23} s. This problem was solved by Murray Gell-Mann when he proposed that all the strongly interacting particles are indeed bound states of even more fundamental states, the *quarks*. This idea was eventually experimentally verified in the Stanford experiments in the years around 1970 led by Jerome Friedman, Henry Kendall and Richard Taylor. To understand the forces inside the nucleus one really had to understand the field theory for quarks. Before describing the forces between quarks we have to discuss the other nuclear force, the weak one.

Текст 4

Weak Interactions

In 1896 Henri Becquerel discovered that uranium salts emit a radiation; they are *radioactive*. His work was followed up by Marie and Pierre Curie who discovered that several atoms disintegrated by sending out radioactivity. With the discovery of the neutron it was realized that this phenomenon is another aspect of a force at work. It was found that the neutron decays into a proton and an electron and a then hypothetical particle proposed by Wolfgang Pauli, which came to be called the neutrino (really the antineutrino). Since in the nucleus the mass of the nucleons are virtual the process can also go the other way in which a proton decays into a neutron, a positron and a neutrino. The first to set up a model for this interaction was Enrico Fermi in which it was supposed that the interaction was instantaneous among the matter particles. In the late 1950s Fermi's theory was modified to account for parity violation by Marshak and Sudarshan and by Feynman and Gell-Mann. Parity violation of the weak interactions had been postulated by Tsung-Dao Lee and Chen Ning Yang in 1956 and experimentally verified by Wu and collaborators the year after. (The weak interactions can distinguish between left and right.)

However, the model introduced had severe problems. It is not renormalisable so it cannot really make sense as a general theory. On the other hand the model worked extremely well for many processes. How could one reconcile these two facts? During the 1960's new field theoretic descriptions were proposed and to reconcile the facts above one introduced mediating particles that were extremely heavy. For low energy processes such a particle can only propagate a very short

distance and in practice it will look as if the interaction takes place in one point giving the model above for the energies that at the time could be probed. The scheme used, the so-called 'Non-Abelian Gauge Theories' were used by Sheldon Glashow, Steven Weinberg and Abdus Salam in independent works to suggest a model that would generalise the model above. Such a field theory is a generalisation of QED in which there are several mediating particles which also can have self interactions. In the beginning of the 1970's this scheme of models were proven to be renormalisable and hence good quantum theories by Gerhard 'tHooft and Tini Veltman. Overwhelming experimental evidence for the model was gathered in the 1970's and finally in 1983 the mediating particles were discovered at CERN in an experiment led by Carlo Rubbia and Simon van der Meer. Indeed the mediating particles are very heavy, almost 100 times the mass of the proton.

Текст 5

The Wave-Particle Duality

A particle on the classical view is a concentration of energy and other properties in space and time, whereas a wave is spread out over a larger region of space and time. The question whether light are streams of particles (corpuscles) or waves is a very old one. This "either - or" formulation was classically natural and alien to the advanced "both - and" even the "neither - nor" solution of today. Early in the nineteenth century experiments were suggested and made to show that light is a wave motion. A key figure in this endeavour was Thomas Young, one of the most intelligent and clever scientists ever to live, who studied diffraction and interference of light already in 1803 with results that gave strong support to the wave theory of Christian Huygens as opposed to the particle or corpuscular theory of Isaac Newton. Further contributions were made by many other researchers, among them Augustin Jean Fresnel, who showed that light is a transverse wave.

Newton's theory of light had seemed suitable to explain the straight-line casting of sharp shadows of objects placed in a light beam. But wave theory was needed to explain interference where the light intensity can be enhanced in some places and diminished in other places behind a screen with a slit or several slits. The wave theory is also able to account for the fact that the edges of a shadow are not quite sharp. The mathematical theory of electromagnetism by James Clerk Maxwell, set up in 1864, led to the view that light is of electromagnetic nature, propagating as a wave from the source to the receiver. Heinrich Hertz discovered experimentally the existence of electromagnetic waves at radio-frequencies in the 1880s. Maxwell died in 1879 and Hertz died

only 37 years old in 1894, two years before Alfred Nobel's death. At the end of the 19th century, which also is the time when the Nobel Prizes were instituted, the wave nature of light seemed definitely established. Thus the decisive research into the wave nature of light came too early to be considered for Nobel Prizes. However, there is one exception - the case of X-rays. Discoveries relating to the particle nature of light belong to our century and thus one might expect Nobel Prizes be awarded for such achievements. This is almost true - but the Nobel archive tells a more complicated story as will be uncovered below.

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