ПЕРМСКИЙ
ГОСУДАРСТВЕННЫЙ
НАЦИОНАЛЬНЫЙ
ИССЛЕДОВАТЕЛЬСКИЙ
УНИВЕРСИТЕТ

А. В. Лучникова

ИНОСТРАННЫЙ ЯЗЫК В ПРОФЕССИОНАЛЬНОЙ СФЕРЕ ДЕЯТЕЛЬНОСТИ (АНГЛИЙСКИЙ)

ENGLISH FOR MASTERING NATURAL SCIENCES AS A PROFESSION

Perm University Press
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МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ
РОССИЙСКОЙ ФЕДЕРАЦИИ

Федеральное государственное автономное
образовательное учреждение высшего образования
«ПЕРМСКИЙ ГОСУДАРСТВЕННЫЙ
НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ УНИВЕРСИТЕТ»

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по направлениям подготовки бакалавров и специалистов
биологического, географического, геологического
и химического факультетов*

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Целью издания является развитие у студентов коммуникативной компетенции в профессионально значимых ситуациях.

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CONTENT

ВВЕДЕНИЕ

Целью данного пособия является развитие у студентов навыков чтения оригинальных текстов с использованием терминологии английского языка по изучаемой специальности, формирование собственного терминологического глоссария, а также формирование навыков устных выступлений, участия в круглых столах и научно-практических конференциях.

Учебно-методическое пособие состоит из 3 частей: первый модуль содержит материалы общего научного знания и сведений в целом о науке и научном подходе. Во второй модуль включены темы по четырем естественным дисциплинам, а также грамматический материал, представленный теоретической частью и упражнениями по основным грамматическим темам. Каждый модуль содержит блок Remember в качестве рекомендательного материала. Темы модулей не зависят друг от друга и могут изучаться в любом порядке. Третья часть, приложение, состоит из трех частей и содержит: 1 часть – полезную информацию общенаучного характера, в частности, рекомендации по переводу, оформлению презентаций и ведению дискуссий, глоссарий, помощь в написании рефератов и аннотаций; 2 часть – свод грамматических правил; 3 – сборник упражнений для повторения и закрепления грамматики. Предоставляемые ссылки на сайты дают возможность студентам глубже изучить материал.

Теория закрепляется в разнообразных лексико-грамматических заданиях и упражнениями на перевод с английского на русский и наоборот. Материалом для упражнений служат аутентичные научно-популярные тексты. Пособие содержит приложение, в котором приведен перечень основных терминов, необходимых для усвоения текстовой информации и выполнения заданий. Данное пособие позволит студентам расширить лексико-грамматический запас, приобретённый за время учебы, сформировать навыки чтения аутентичной литературы с целью использования информации для написания курсовых и дипломных работ и, в целом, повысить свой уровень владения английским языком.

Представляется целесообразным использовать данное пособие как для групповой аудиторной, так и внеаудиторной работы студентов как очной, так и заочной формы обучения.

Материал представлен для изучения студентами разных профилей, так как относится к области общих знаний.

SUMMARY

Name	Grammar	Vocabulary	Speaking
Module 1. Science	Present, Past Simple, Present Perfect, Modals,	The universe and its origin	Why we study science
Module 2. The Geosciences	Infinitive, Passive Voice	Geology, geography, biology, chemistry terms	The history and discoveries in the fields
Appendix			
Glossary		According to the subjects presented	Speaking on professional topics
Discussion Phrases			Making discussion
Summary-Review	Grammar for written speech	special	Writing summary and review
Presentation	for presenting	special	Making the presentation
Dictionaries		for specific purposes	
How to make an outline.	Using short constructions, looking for key sentences	looking for key words	Writing all kinds of scientific papers and speaking about science
The functions of the verb to be	To be	special	Speaking on professional topics
The functions of the verb to have	To have	special	Speaking on professional topics
The functions of the verb to do	To do	special	Speaking on professional topics
The grammatical function of word order	Word order in the sentence	special	Speaking on professional topics
Present Simple Tense	Using Present Simple in special speech	general and special	Organizing scientific speech on the conferences
Past Simple Tense	Using Past Simple in special speech	general and special	Speaking about the sciences in the past, their history and scientists.
Present Perfect Tense	Using Present Perfect in special speech	general and special	Speaking about scientific achievements
Infinitive and its functions	Using infinitive construction in special speech	general and special	Organizing scientific speech on the conferences
Modals	Using modals in special speech	general and special	Organizing scientific speech on the conferences
Passive Voice	Using Passive Constructions in special speech	general and special	Speaking about scientific achievements
Grammar Revision	exercises	for specific purposes	

MODULE 1. SCIENCE

Module 1: Everything about science. Famous Scientists. Space science.
Grammar: Present, Past Simple, Present Perfect, Modals
Vocabulary: general scientific terms

Why should we study science?

According to Richard Feynman, Nobel Prize winning physicist, – *"Religion is a culture of faith; science is a culture of doubt".*

Do you agree with this statement? Explain in your own words what science is.

Task 1. Read the text and find the proof for your ideas.

Science is a system of knowledge that is concerned with the physical world and its phenomena and that entails unbiased observations and systematic experimentation. In general, a science involves a pursuit of knowledge covering general truths or the operations of fundamental laws.

Science is divided into different branches based on the subject of study. The ***physical sciences*** study the inorganic world and comprise the fields of astronomy, physics, chemistry, and the Earth sciences. The ***biological sciences*** such as biology and medicine study the organic world of life and its processes. ***Social sciences*** like anthropology and economics study the social and cultural aspects of human behavior.

https://www.britannica.com/science/science

REMEMBER:

An opinion is how you feel or think about a particular issue. It's usually a personal viewpoint based on your experiences. In our daily life, we express opinions on various issues at home or office.

To express your opinion, start with an open-up statement, show the reason(s) to justify your opinion, and conclude with your final comment. As your opinion may at times go against someone else, you should be very polite so that your opinion doesn't offend them.

Neutral Opinions: Examples

- I think
- I believe
- I guess
- I assume.
- I predict
- I reckon
- I feel like
- I feel that
- I gather that
- I have a feeling that

Strong Opinions: Examples

- I really think
- I firmly believe
- I genuinely feel that
- I completely agree with what you have said
- I can't agree more with you.
- I can't entirely agree with you on this matter.
- I am confident that
- In my honest opinion
- Frankly speaking, I am sure that
- I'm in complete agreement with the observation of Mr. Saint.

General Opinions: Examples

- One could say…. So, I suggest you rethink.
- Generally
- Some people say that
- Many people think that
- It's often said that
- It's universally acclaimed that
- It's generally accepted that
- Everybody knows that
- It is generally thought that
- It is usually considered unethical.

Personal Opinions: Examples

- Personally, I don't think
- In my experience
- If you ask me
- From my understanding.
- As I observed it
- If you ask me
- As far as I am concerned,
- As far as I know
- As far as I understand,

Expressing Opinions in a Formal Situation

In addition, you are expected to express yourself objectively rather than being subjective. Give proper evidence, logic, and reasons to support your opinion.

- It could be argued
- It would appear to be mismanagement.
- I would argue that
- My thoughts on this are very positive. I think
- My opinion would be "YES."
- I would say that it.
- One could say that
- It appears that …..I also wholly agree with you.
- It could be believed that.

Task 2. So, why should we study Science? Give your opinion. Then read the text and compare with your answer.

Model: In my opinion, people should study science because…

Firstly, science helps our understanding of the world around us. Everything we know about the universe, from how trees reproduce to what an atom is made up of, is the result of scientific research and experiment.

Human progress throughout history has largely rested on advances in science. From our knowledge of gravity to cutting-edge medicines, students of Science have shaped our modern world.

All of these advances can trace their origin back to individuals learning about science as students. That is why it is in the interests of governments, companies and wider society to promote Science as a subject at schools; it ensures the next wave of progress in all of the fields that affect our daily lives.

In schools across the world, Science is typically initially broken down into the 3 classical fields: **Biology, Chemistry and Physics**.

Task 3. Why else should we study science?

Here are some **more specific** reasons to study each type of science:

BIOLOGY – is the study of anything that is alive; there are many sub-categories like microbiology, botany, and zoology:

- learning how living things work helps you to understand your own body and your health.
- learning how living things survive helps you to understand why people act the way they do.

• learning how living things are all connected helps you to see why it is important that we preserve our plants.

PHYSICAL SCIENCE – these are the sciences that study nonliving things, including astronomy (studying the stars and other planets), Earth Sciences (geology, meteorology, oceanography, etc.), and physics:

• Learning how the universe works helps you to understand why things happen.

• Learning how the earth is made helps you to understand why the world is the way it is.

• Learning how the earth works helps you to plan and survive natural events like earthquakes, tornadoes, and tsunamis.

• Learning how the universe works helps you to see connections between all things.

SOCIAL SCIENCE – these are sciences dealing with human beings; some examples of Social Sciences include Anthropology, geography, economics, and history:

• Learning how people interact helps you to get along with others better.

• Learning how the world works helps you to be more successful.

• Learning what people have done in the past helps you to avoid making the same mistakes and to see new things that could be tried in the future.

• Learning how people in different cultures live helps you to understand them and avoid conflicts.

Scientists learn about the natural world through investigations, which produces evidence that helps scientists answer questions. Investigations may involve experiments or observations about the natural world. Scientists use scientific practices to do science. These include some options:

Task 4. Match the words from the left column to the relevant words from the right one.

1. Asking questions	and communicating information
2. Developing	and defining problems
3. Planning	in argument from evidence
4. Analyzing	and using models
5. Using mathematics	explanations
6. Constructing	carrying out investigations
7. Engaging	and interpreting data
8. Obtaining, evaluating	and computational thinking

Task 5. The more evidence we have about a theory, the more confident we are about it. Why do scientists carry out experiments? What is their main purpose? Continue the sentence.

Model: When scientists carry out investigations, they ……..

If scientists collect lots of data that supports the hypothesis, then the hypothesis may become a theory. Theories continue to be tested, and sometimes they become well-established because there is a lot of evidence to back it up. Sometimes, it may be thrown out because there is evidence showing it might not be true.

Task 6. Do you agree with the statement?
Scientists must always be willing to examine new evidence and change their views.

Scientists frequently find new evidence by conducting experiments. Well-held theories are sometimes tossed out because scientists make new discoveries.

We no longer believe some of the theories that used to be considered true. For centuries, people believed that the Earth was flat. At that time, it was a reasonable thought, until scientists found evidence that changed their minds. Scientists must look at new evidence with an open mind, and consider that other possible explanations may exist.

Task 7. Discussion questions.

Before starting discussion, watch the video: https://www.engvid.com/how-to-discuss-a-topic-in-a-group/ – "How to discuss" and answer the questions.

1. Which phrase could you use to end the discussion?
   ○ Furthermore, ○ In conclusion

2. What can you say when someone is trying to interrupt you?
   ○ Please let me finish. ○ Don't get me wrong.
3. How can you disagree with someone respectfully?
   ○ That's true, but... ○ Are you kidding

4. What does the expression "***in a nutshell***" mean?

○ In short ○ In my opinion

5. What does "***Don't get me wrong***" mean?

○ Don't misunderstand me. ○ I don't care if you understand me.

6. "You make a very good point, and I would also like to add..." means:

○ I don't agree with you and I have another comment.

○ I agree with you and I have another comment.

7. What does it mean to "`sum up`"?

○ to make calculations ○ to end the discussion

8. What is a polite way to enter the discussion?

○ May I say something? ○ Do I get a chance to speak?

9. Which of these expressions can be used to contradict someone?

○ However,... ○ On the other foot,...

10. How can you tell people what you think?

○ I believe... ○ I apologize...

Task 8. Divide into groups of 3 and discuss the points below. Then exchange your answers with your group mates. Use special phrases for discussion in the appendix.

How does a person start ‘doing science’?
What does it mean to be a scientist?
How can you tell if something is a science, or not a science?
Do scientific answers ever change?
What do we do if our observations are not the same as before?

Possible answers. Read them and decide whose answers are the best and why, or you have similar opinions.

How does a person start ‘doing science’? – Science starts when a person is curious about the world around them and asks questions about how it works. They

think of ways to learn about the world by doing investigations, keep track of their data as evidence, and tell other people what they have found. There are eight "science and engineering practices" which is what we do when we are "doing science."

What does it mean to be a scientist? – It means to study the natural world around us using observation and experimentation. Scientists use the scientific practices, which are Asking questions, Developing and using models, Planning and carrying out investigations, Analyzing and interpreting data, Using mathematics and computational thinking, Constructing explanations, Engaging in argument from evidence, and Obtaining, evaluating, and communicating information. Not all of these are used in every study and they don't always happen in the same order.

How can you tell if something is science, or not science? – Something is science if there is evidence that supports the claims that people make, and if the evidence is collected using recognized scientific methods such as the eight "science and engineering practices." If claims do not have evidence to support them, it is not science.

Do scientific answers ever change? – Yes. Scientific answers change when new evidence is discovered that disproves what we thought was fact. For example, people believed that the earth was flat, but as scientific equipment improved, observations that are more accurate were made, and it became evident that the earth is spherical, or shaped like a ball.

What do we do if our observations are not the same as before? – If an observation cannot be repeated then more evidence must be collected by trying to repeat past observations in different ways or by trying new methods to collect the data. For a scientific idea to be valid, other scientists should be able to repeat your work and reach the same conclusion.

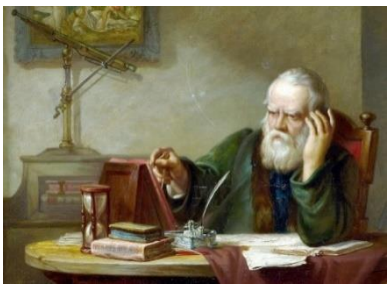
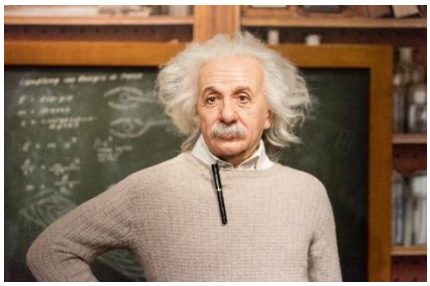
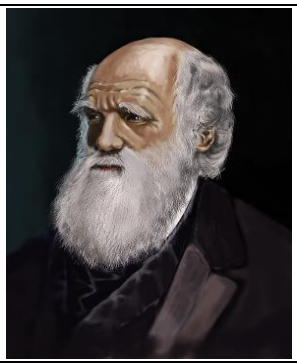
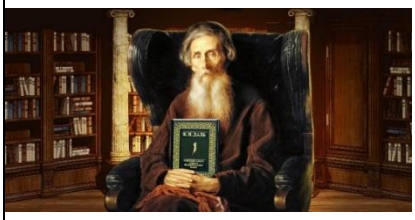
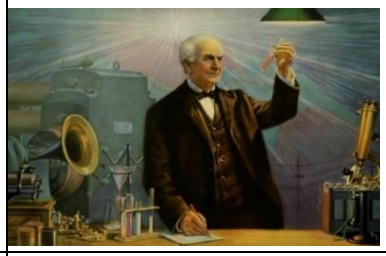
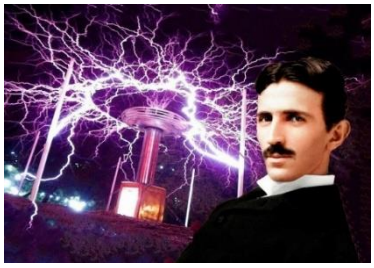
Task 9. Using the table, say what branches of science study the following:

Chemistry	quantity (numbers), structure, structure, space, change
Biology	fundamental forces, light, heat
Astronomy	Plants and their natural environment
Genetics	living things
Physics	the habits and classification of animals
Zoology	space, planets, stars, etc.
Botany	past as it is described in written documents
Mathematics	how elements combine and react
Linguistics	inherited characteristics
History	Language meaning and language in context

Task 10. Word Formation. Read and remember the names of professions using correct suffixes:

-st	**-ian**	**-er**
Science	Zoology	Astronomy
Physics	History	Biology
Mathematics	Chemistry	Philosophy
Botany	Genetics	Linguistics

Task 11. You see the portraits of outstanding scientists. Say in what branches of science they worked and what they were. If you are in a doubt, match the pictures to the information below the table.

1. 	2. 	3. 
4. 	5. 	6. 
7. 	8. 	9. 

A) Isaak Newton worked in the field of Physics and Mathematics. He is a famous physicist and mathematician.

B) Nicola Tesla worked in the field of Physics. He is a famous physicist.

C) Thomas Elva Edison worked in the field of Physics. He is a famous physicist.

D) Vladimir Dal worked in the field of Linguistics. He is a famous linguist.

E) Marie and Pierre Curie worked in the field of Physics and Chemistry. They are famous physicists and chemists.

F) Charles Darwin worked in the field of Biology. He is a famous biologist

G) Dmitri Mendeleev worked in the field of Chemistry. He is a famous chemist.

H) Galileo worked in the field of astronomy. He is a famous astronomer.

I) Albert Einstein worked in the field of Physics. He is a famous physicist.

Task 12. Answer the questions. *(Grammar revision section, p.165)*

- Who explained the law of gravity and the laws of motion?
- Who revolutionized our understanding of the world, successfully proving the Earth revolves around the Sun and not the other way around?
- Who discovered the radiation and helped to apply in the field of X-ray?
- Who opened the theory of relativity?
- Who developed the theory of evolution?
- Who played a key role in the development of modern electricity?
- Who is the founder of the Moscow State University?
- Who invented the Periodic Table of chemical elements?

REMEMBER:

How do you Guess Meaning?

Take a look at this example:

- *It had been raining hard through the night so the ground was saturated.*

What does '*saturated*' mean? You may already know, but if you don't, you should be able to have a good guess from the rest of the sentence.

It had **been raining** which means the ground must be **wet**. It was raining '*hard*' so this means the ground is probably **very wet**.

- *saturated = completely wet*

By doing this you are guessing meaning from context and you should try and use this technique for words you do not know.

It may not always be clear from the actual sentence and you may have to look at other sentences around the word.

However, only do this for words that seem important for an understanding of the text. If it looks like they are not, then leave it and move on with the reading. You probably won't have time to do it with every word, especially if you are at a lower reading level.

Task 13. Read and translate the text paying attention to the words in bold. Try to guess their meaning from the context.

Science

Science is important for most people living in the modern world for a number of reasons. In particular, science is important for world peace and understanding, for our outstanding of technology and the world.

On the one hand, scientists have helped to develop many of the **modern tools of war**.

On the other hand, they have also helped **to keep peace** through research, which has **improved people's lifestyle**. Scientists have helped us to understand the problem of **supplying** the world with energy; they have begun to develop a number of solutions to the energy problem – for example, using energy from the sun and atom. Scientists have also analyzed the world's resources. Science studies the Universe and how to use its possibilities for the **benefit** of men.

Science is also important for everyone who **is affected by modern technology**. Many of the things that make our lives easier and better are the results of **advances in technology** and, if the present patterns continue, technology will affect us even more in the future than it does now. In some cases, such as technology for taking salt out of ocean water, technology may **be essential for** our lives on Earth.

The study of science also provides people with some knowledge of the natural world. Scientists are learning **to predict earthquakes**, continuing to study many other natural events, such as storms. Scientists are also studying various aspects of human biology, the origin, and the development of the human race. The study of the natural world may help improve life for many people in the world.

A basic knowledge of science is essential for everyone. It helps people to find their way in the changing world.

Task 14. Agree or disagree with the statements. Prove your answer.

- ☻ Science has improved people's lifestyle.
- ☻ Technology may not be essential for our lives on the Earth.
- ☻ The study of science provides people with some knowledge of the natural world.

Task 15. Before reading, read and translate the following words:

Science, cover, broad, deal with, relationship, wide, variety, search for, clue, universe, origin, cell, research, solve, complicated, unity, attempt, happen, consider, prove, divide, major, grow, complicated, boundary, clear, numerous, overlap, interconnect, influence, provide, discovery, invention, shape, Universe, tool.

REMEMBER:

How to Define the Main Idea

The main idea of a paragraph is the primary point or concept that the author wants to communicate to the readers about the topic. Hence, in a paragraph, when the main idea is stated directly, it is expressed in what is called the *topic sentence*. It gives the overarching idea of what the paragraph is about and is supported by the details in subsequent sentences in the paragraph. In a multi-paragraph article, the main idea is expressed in the *thesis statement,* which is then supported by individual smaller points.

How to Find the Main Idea

1) Identify the Topic

Read the passage through completely, then try to identify the topic. Who or what is the paragraph about? This part is just figuring out a topic like "cause of World War I" or "new hearing devices;" don't worry yet about deciding what argument the passage is making about this topic.

2) Summarize the Passage

After reading the passage thoroughly, summarize it in your own words in **one sentence**. Pretend you have just ten to twelve words to tell someone what the passage is about–what would you say?

3) Look at the First and Last Sentences of the Passage

Authors often put the main idea in or near either the first or last sentence of the paragraph or article, so isolate those sentences to see if they make sense as the overarching theme of the passage. Be careful: sometimes the author will use words like *but, however, in contrast, nevertheless,* etc. that indicate that the second sentence is actually the main idea. If you see one of these words that negate or qualify the first sentence, that is a clue that the second sentence is the main idea.

4) Look for Repetition of Ideas

If you read through a paragraph and you have no idea how to summarize it because there is so much information, start looking for repeated words, phrases, or related ideas.

https://www.thoughtco.com/how-to-find-the-main-idea-3212047

Task 16. Read the texts and find their main ideas.

Text 1. Science

The word “science” comes from the Latin word “scientia”, which means “knowledge”. Science covers the broad field of knowledge that deals with facts and the relationship among these facts. Scientists study a wide variety of subjects. Some scientists search for clues to the origin of the Universe and examine the structure of the cells of living plants and animals. Other researches investigate why we act the way we do, or try to solve complicated mathematical problems. Scientists use systematic methods of study to make observations and collect facts. They develop theories that help them order and unity facts. Scientific theories consist of general principals or laws that

attempt to explain how and why something happens or happened. A theory is considered to become a part of scientific knowledge if it has been tested experimentally and proved to be true. Scientific study can be divided into three major groups: the natural, social and technical sciences. As science knowledge grew and became more complicated. Many new fields of science appeared. At the same time, the boundaries between scientific fields became less clear. Numerous areas of science overlap each other and it is often hard to tell where one science ends and another begins. All sciences are closely interconnected.

Science has great influence on our life. It provides the basis of modern technology – the tools and machines that make our life and work easier. The discoveries and inventions of scientists also help shape our view about ourselves and our place in the Universe.

Model: The text is devoted to…
The article informs the readers about…

Task 16.1. Find the English equivalents for*: большая область знаний, иметь дело с, отношения между, большое множество, и происхождение Вселенной, решать проблемы, граница между, различать, близко взаимосвязаны, оказывать влияние, сформировать взгляд на.*

Task 16.2. Find the synonyms for: *learn, a large number of, look for, decide, difficult problems, try, scientific research, major groups, various.*

REMEMBER:

How to match heading to the text.

Strategy 1: Read the question first

1. First, read each heading

Try to completely understand the meaning of each heading by reading all of them thoroughly. Understanding the main idea of the heading can be made easier by paraphrasing.

2. Circle keywords within the headings

Underline or circle keywords in each heading such as names, places, dates, and nouns, once you have read them fully. Connecting the correct heading to the appropriate paragraph may become easier with this step.

3. Any similarities or differences between the headings should be noted

In this type of question, headings are often very similar or completely opposite. Similarities and differences will become clearer among the headings, once you have picked out keywords. This will make choosing an option clearer.

4. Read the first and last sentence of the paragraph

The first and/or last sentence of a paragraph often contains the main idea. It is good practice to read these sentences carefully as it will save time. It is also important to skim the other sentences quickly within the paragraph because the main idea might not be apparent until the second or third sentence.

5. The heading that is most suitable for the paragraph should be chosen

Choose the heading that most closely matches the paragraph once you have read through them again. Make a note if you are unsure of the difference between multiple headings, and move on. You may be able to cross some heading options out and answers may become clearer once you've read all of the paragraphs. Remember, a heading is the **main idea** of the paragraph, **NOT a specific detail**. The same detail in the paragraph such as a matching word may be in the heading, but it may not be the main idea. This can be confusing to test takers.

Strategy 2: Read the text first

Some test takers prefer to skim through the text reading each paragraph quickly to get the general gist of what the text is about and what the main idea of each paragraph is. However, be very careful with timing. Remember you only have 20 minutes per Reading part, so you don't want to spend the full 20 minutes on one question type.

1. Read one paragraph at a time

Again, spend more time on the first and last sentences of a paragraph, trying to identify the main idea.

2. Create your own heading

As soon as you have skimmed through the paragraph, think of your own heading or short sentence that summarizes what you have read. Your heading should encompass the main idea and not just specific details.

3. Read each individual heading

For a complete understanding of the meaning, read the headings thoroughly. This time, try to choose a heading that is closely related to the heading that you made up for the same paragraph. Again, make note of multiple options that may fit the paragraph and move on. As you read more paragraphs you may be able to eliminate options. Mark keywords that note similarities and differences as this will aid in eliminating headings with similar meanings.

Task 16.3. Choose the most suitable heading for each paragraph.

1. The fields of scientific research.
2. Different groups of sciences.
3. The importance of science.
4. What is science?
5. Methods of scientific research.

Text 2. Technology

Technology means the use of people's inventions and discoveries to satisfy their needs. Since people appeared on the Earth, they had to get food, clothes and shelter. Through the ages people invented tools, machines and materials to make work easier.

Nowadays, when people speak of technology, they generally mean industrial technology. Industrial technology began about 200 years ago with the development of the steam engine, the growth of factories, and the mass production of goods. It influenced different aspects of people's lives. The development of the car influenced where people lived and worked. Radio and television changed their leisure time. The telephone revolutionized communication.

Science contributed much to modern technology. Science attempts to explain how and why things happen. Technology makes things happen. But not all technology is based on science. For example, people made different objects from iron for centuries before they learnt the structure of the metal. But some modern technologies, such as nuclear power production and space travel, depend heavily on science.

Task 16.4. Find the English equivalents for: *изобретения и открытия, удовлетворять потребности, инструменты, облегчить работу, промышленная технология, паровой двигатель, развитие, рост, массовое производство товаров, влиять, способствовать, делать попытку, атомная энергия, сильно зависеть от.*

Task 16.5. Find the words, which have the opposite meanings to the following:

Narrow, easy, practice, to try, artificial, old, more, to begin, small, different, little

Task 16.6. Read, translate the sentences, change the words in italics into the words with similar and opposite meanings

1. He happened to meet her in that *broad* street.
2. They are investigating *complex* problems.
3. It was a very *difficult* experiment.
4. They *started* researching this problem.
5. It was a *big* contribution.

Task 16.7. Fill in the blanks with the articles *a, an, the* where necessary.

... most common type of... computer is... digital computer.... largest digital computers are... parts of.... computer system that fill... large room.... smallest digital computers – some so small they can pай through... eye of... needle – are found inside... watches,... pocket calculators, and... other devices.

Task 17

a) Read and state the function of the verbs *be, have* *(Appendix, p.140)*

All digital computers *have* two basic parts: a memory and a processor. The memory *is* receiving data and holding them until they *are* needed. The memory *is* made up of a big collection of switches (переключатели). The processor *is* changing data into useful information by the converting numbers into other numbers. It reads numbers from the memory, performs basic arithmetic calculations, and puts the answer back into the memory. The processor *is* performing this activity and over again until the desired result *is* achieved. Both the memory and the processor *are* electronic.

b) Fill in the blanks with the verbs *be, have*

People... used calculating devices since ancient times. The first electronic digital computer... built in 1946. Since then rapid improvement in computer technology... led to the development of smaller, more powerful, and less eexpensive computers. But computers... not able to think. A user... to tell the computer in very simple terms exactly what to do with the data it receives. A list of instructions for a computer to follow... called a program.

Task 18. The word order (*Appendix, p.156, Grammar revision p. 165)*

Extend the following sentences with the words given in brackets.

a) Scientists solve problems (complicated, some, mathematical, to try).
b) Researchers make observations (facts, and, collect).
c) The boundaries have become clear (fields, scientific, between, less).
d) Science has influence on lives (our, great).
e) Technology makes life easier (our, and, work, modern).

Task 19. Put the words in the following sentences in order, the first word in each sentence is in *italics.*

1. interconnected, sciences, *All,* closely, are.
2. provides, *Science,* of, technology, modern, the, basis.
3. people, the, ages, *Through,* tools, invented, have, machines, materials, and.
4. influenced, aspects, people's, of, different, *Industrial,* technology, lives.
5. our, time, *Radio,* television, and, leisure, changed.

Task 20. Complete the following sentences in a logical way

1. The word "science" comes from
2. Science deals with...
3. Scientists study...
4. Some scientists search for...
5. Other researchers solve...
6. Scientific theories consist of...
7. A theory becomes...
8. Scientific study can be divided into...
9. The boundaries between scientific fields have become...
10. Science provides...
11. Technology means...
12. Industrial technology began...
13. Technology influenced...
14. Science attempts to explain...
15. Technology makes...

Task 21. Make up special question according to the model, and answer them

a) ***Model:*** Technology influences all aspects of people's life. – *What does technology influence?*

1. Science provides the basis of modern technology.
2. Technology means the use of people's inventions and discoveries to satisfy their needs.
3. This scientist uses systematic methods of study.
4. He usually tests any theory experimentally.
5. Science attempts to explain how and why things happen.

b) ***Model:*** Scientists can study a wide variety of subjects. – *What can scientists study?*

1. The scientists can examine the structure of the cells of living plan and animals.
2. The scientists can solve different mathematical problems.
3. Scientists can use systematic methods of study.
4. They can make observations.
5. They can develop theories.

Task 22. Make up questions the answers to which will be words in italics. The words in brackets will help you

1.The word "science" means *"knowledge*"(what).
2. The scientists can order *facts* (what).
3. The scientists can unity *facts* (what).

4. They usually test *the theory* experimentally (what).
5. Technology influences d*ifferent aspects of our life* (what).

Task 23. Science skills for learning.

Match them and their definitions.

Observing	*Controlling variables*
Classifying	*Interpreting*
Quantifying	*Communicating*
Predicting	*Forming conclusions*

a) This is the most fundamental of science skills. That's because most students are born with five senses, which inform how they experience the world. It requires scientists to note the "big picture" and the fine details.

b) This skill builds upon observation. Scientists learn to separate and sort objects based on properties. Also, they learn to sort using a single factor (e.g., number of legs: spiders have eight and insects have six), and classify using several factors at once.

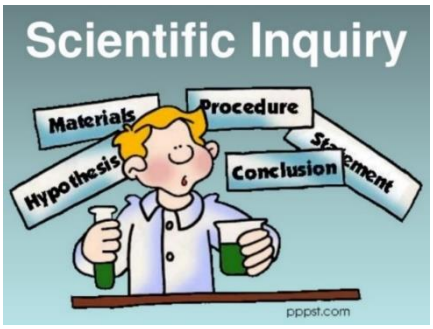
c) One of the most valuable skills needed for science study. Scientists know how to use a ruler and a measuring cup. As they get more experienced, they will acquire more complex measuring skills using mathematical equations and advanced equipment.

d) This skill derives from a person being able to spot patterns in past experiments or existing evidence (i.e., from the natural world). It is an educated guess about what's likely to happen when you introduce changes.

e) Before performing any experiment, a scientist think what will happen and write down the guesses. This is called making a *hypothesis*. (the questions such as: How many are in the jar? How much does this weigh? What will happen if we add something else?)**?** – Many different factors can affect the outcome of an experiment.

f) This skill is closely related to inferring, which means coming to a conclusion after analyzing information. It is inferring, from a point of view. Two people may interpret an experiment's results differently. Scientist should try to understand results, based on the records they keep. Their interpretation should align with the trend or big picture of the experiment.

g) This skill touches every other one. Scientists must be able to transmit information through words, charts, diagrams, and other mediums. They understand the importance of using accurate supporting mediums (charts, diagrams, etc.). As the saying goes, a picture is worth a thousand words. Audience members will often look at the pictures from a project without reading the words. That can lead them to one or more incorrect takeaways.



h) This skill is connected to interpreting. The conclusions must be reached through careful reasoning. When forming conclusions, scientists look back at their predictions and compare them with the actual results.

Task 24. Steps of the Scientific Method – a conclusion; an experiment, making observations, and tracking results; a question; a hypothesis.

Put them into a correct order.

Step 1 – _____
Step 2 – _____
Step 3 – _____
Step 4 – _____

Check your ideas.

Step 1: Start with a question. What do you wonder about? What would you like to know? In the first step of the scientific method, you may need to do some background research to learn more. It can help you define your question and decide what you want to discover.

Step 2: Form a hypothesis. A hypothesis is an educated guess or explanation for what you know. Forming a good hypothesis–a scientific hypothesis–is the starting point for the experiment (and further study). You can prove the hypothesis as *observably* correct or disprove it through experimentation. Observably, because scientific explanations for the results of an experiment evolve and change.

Step 3: Conduct an experiment, making observations, and tracking results. Set up a test experiment to see if your hypothesis is right or wrong. Make observations during your experiment and keep track of them by writing them down. Often replication of an experiment, in the exact same way, is necessary to be sure of your results.

Step 4: Come to a conclusion. Decide whether your hypothesis was right or wrong. What were the results of your experiment? Can you tell why it happened that way? Explain and communicate your results.

These principles can be used to study the natural world and navigate life's challenges. You can study anything from plants and rocks to biology or chemical reactions using these four steps. Even very young students can use a modified version of the scientific method to organize their thoughts.

Younger students can study practical science using a simple version of the scientific method. You can use their natural curiosity to guide them and make it memorable. Try teaching the earliest grades the same steps, but making the language easier to understand.

1. **Wonder** – What do I want to know about the world around me?
2. **Think** – What do I think will happen?
3. **Act** – Test my idea. What happens?
4. **Say** – Am I right?

REMEMBER:

How to give the definition. To explain the meaning of the word.

Reason

A definition explains the meaning of a word. Imagine, you cannot remember a certain word or you use a word that another person does not know. What can you do? Exactly, you can explain what you mean. So, it is in fact really handy to know a bit about definitions.

How can I define a word?

Describe (the most common form of definitions)

Think of a more general word and then specify how this term is different from other terms that belong to this group. Example: dog

A more general term? – animal. And how are dogs different from other animals? They bark. So our definition could be:

A dog is an animal that barks.

Name a few examples

Think of typical examples. Example: **month**

Can you think of any examples for months? – e.g. January, May, December. So our definition could be:

January, May and December are months.

Name the components

Think of the components the term consists of. Example: **Irish coffee**

What does an Irish Coffee consist of? – coffee, whiskey and sugar. So our definition could be:

An Irish coffee consists of coffee, whiskey and sugar.

Task 25. Scientific Method for Students. Read and explain the words and phrases in bold.

Older students can use the steps of the scientific method more independently to complete a science fair project or experiment on a topic in which they have an interest. Interest is key–without it, they'll get bored.

Guide students' learning with the following expansion on the last two steps of the scientific method, which require more advanced ***critical thinking skills***.

Conduct an experiment, making observations, and tracking results.

Upper elementary, middle school, and high school students can ***design experiments*** to answer questions about the world. The complexity of an experiment will depend on the student's abilities.

In designing their experiments, these students should pay close attention to:

- **Repeating an experiment**. To be sure of your results, an experiment will need to be repeated, always in the same way. The more times an experiment is repeated producing the same results, the more ***reliable*** it is said to be. Scientific progress depends on reliable experiments independent of the person conducting them.

- **Controlling variables**. A variable is a part of the experiment that can change. An experiment has an independent and dependent variable. You change or control the independent variable and ***record the effect*** it has on the dependent variable. It's important to change only one variable at a time during an experiment rather than try to combine the effects of ***variables*** in an experiment. To ensure confidence in your results, whether ***proving or disproving*** your original ***hypothesis***, nothing should change when an experiment is repeated. Everything that could vary, such as the amounts of a substance, the kind of a substance, the time of day, or the environment, should be "held constant" or "controlled."

- **Changing only one variable at a time**. All variables in an experiment affect ***the outcome***. That's why, when comparing experiments, it's important to change only one variable at a time. This allows you to attribute differences in outcomes correctly. For example, if you want to find out how a plant's growth rate is affected by water, you would control all variables (soil, light, air temperature) other than watering levels.

- **Tracking results**. What happened during your experiment? Identify all your variables and keep track of your observations in a science notebook. Once you have all the information recorded (i.e., data), you can start analyzing.

Task 26. Famous Quotes on Science. Choose the one you like most. Explain why.

"The science of today is the technology of tomorrow." – Edward Teller

"Think like a proton and stay positive." – Unknown

"I don't want to believe. I want to know." – Carl Sagan

"The people who are crazy enough to think they can change the world are the ones who do." – Rob Siltanen

"Technology should improve your life…not become your life." – Billy Cox

"It's still magic even if you know how it's done." – Terry Pratchett

"Technology is a useful servant but a dangerous master." – Christian Lous Lange

"Computers are useless. They can only give you answers." – Pablo Picasso

"The advance of technology is based on making it fit in so that you don't really even notice it, so it's part of everyday life." – Bill Gates

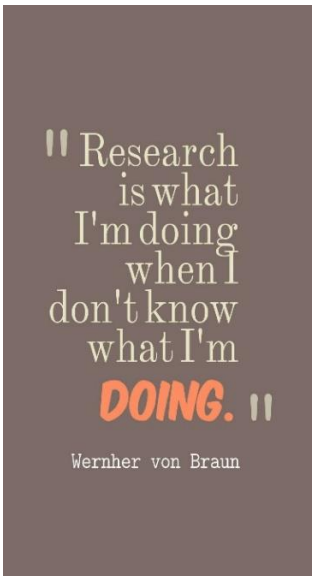
“Technology is nothing. What’s important is that you have a faith in people, that they’re basically good and smart, and if you give them tools, they’ll do wonderful things with them.” – Steve Jobs

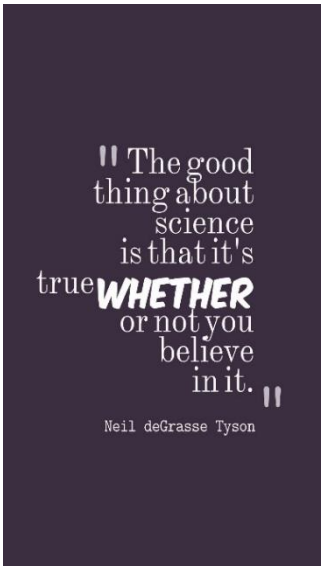
“Technology changes the quality of life. Technology cannot replace human intelligence.” – Unknown

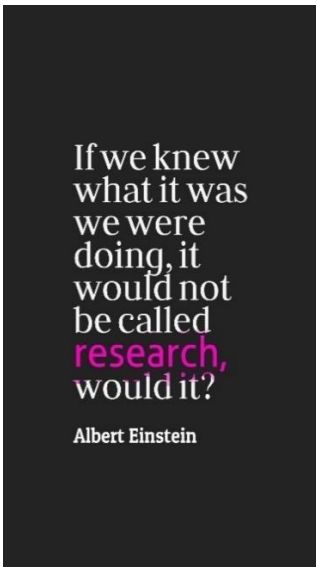
“This is why I loved technology: if you used it right, it could give you power and privacy.” – Cory Doctorow

“I cannot live on myths; somehow, science convinces me more easily. I am prone to lean towards science, ethics, and philosophy rather than myth, religion, and rituals.” – Kamal Haasan

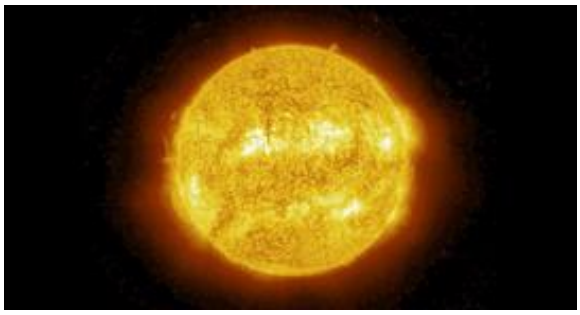
“Religion can have psychological and social roles, but in terms of really explaining how things work, science works differently. Science is based on material elements at the core.” – Lisa Randall







Space Sciences



Task 1. Mach the words and descriptions:

A planet	is a huge group of stars and planets.
a galaxy	is a place for above the Earth where there is no air.
the Solar System	is a rocket that can travel in space.
A spaceship	is a large, round object that goes round a star.
a space	is all space and everything that exists in it.
the universe	is the Sun together with the planets , comets and asteroids

Task 2. Guess the word.

1. An alien spaceship F O U
2. The distance light can travel in a year H T L I G/ R E Y A
3. A thousand million N O L I B I L M A O T
4. Someone who travels into space U N O C S M A O T
5. An object that goes round a planet L A S T L E I E T
6. A piece of rock flying through space T A S D E R I O
7. What the answer to number 6 becomes when it enters the Earth's atmosphere R O T E E M

Do you remember the poem? When reading it in your childhood what were you thinking about?

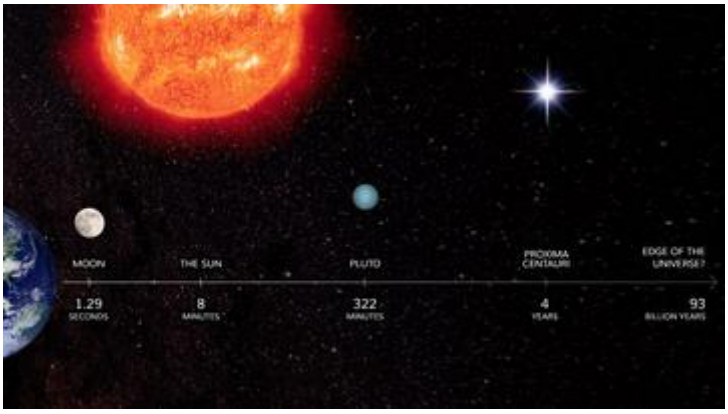
Twinkle, twinkle, little star!
How I wonder what you are!
Up above the world so high,
Like a diamond in the sky.
Twinkle, twinkle, little star,
How I wonder what you are.

(Jane Taylor)

Task 3. Read the text and explain the highlighted terms in English.

The Birth of the Sun

A New Day Begins



It was five billion years ago. A giant cloud of matter in our own galaxy, the Milky Way, condensed under its gravity, exploding in nuclear fusion.

This fusion released what we call ***sunshine.*** Very, very, very hot sunshine. And the newly formed star was our Sun. It drew in most of the surrounding matter, but some escaped. Then, some of this material clumped together, settling into a protoplanetary ***orbit.***

Tasty morsels of gas and rock

Those chemically rich ***leftovers*** orbiting our young Sun were stewing with all the ***ingredients*** to form the planets in our Solar System.

The intense heat of the young Sun drove away most of the lighter hydrogen and helium elements – 99% of the leftovers – the furthest. These eventually condensed to form the gassy outer giants – Jupiter, Saturn, Uranus, and Neptune. The ***tiny*** bit of heavier elements that remained made up the ***rockier*** Mercury, Venus, Earth, and Mars.

Through a combination of gentle ***collisions*** and gravity, these ***atoms and molecules*** began attracting other like-sized material. Over millions of years, they gradually shaped themselves into solid planetesimals, and later protoplanets with their own unique orbits.

Astronomers call all this smashing and joining together accretion. After 10 to 100 million years of this banging, eight spherical, stable planets remained. Our Solar System spun into place.

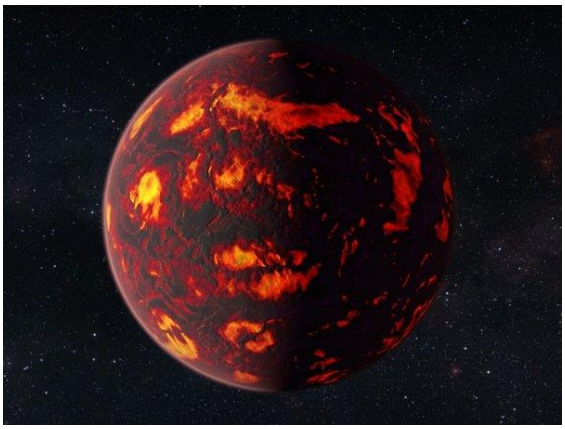
The Sun is currently ***stable***, about halfway through its lifecycle. It's estimated it will live for about another five billion years before consuming all the ***hydrogen*** in its core and transforming into a red giant.

Solar System

Task 4. How Did the Planets Form? – Tell the class if you know.

Task 4.1. Watch the video: https://bhp-public.oerproject.com/chapters/2# или https://www.youtube.com/watch?v=GkKOmGzYOkc and explain the process of their formation.

Task 4.2. What Did the Young Earth Look Like? Was it of different shape? Did it have anything that differs it from today



Though Earth was neatly orbiting the Sun as a rocky mass 4, 5 billion years ago, no organism could survive there. Radiation from the recent supernova kept the planet extremely hot, its surface molten, and oxygen was non-existent. Moreover, incredibly massive meteorites and asteroids frequently slammed onto the surface – creating even more heat.

The Earth got so hot, it began melting. Heavier material sank to the bottom, lighter stuff rose to the top. Some elements evaporated. This transformation created the Earth's layered core and mantle, crust, and atmosphere.

Even today, the Earth undergoes constant change. Shifting, sliding, and colliding tectonic plates "surf" atop its semi-molten mantle. This relentless drifting speeds along at the rate of fingernail growth, yet causes mountains to rise, volcanoes to erupt, and earthquakes to strike.

Task 4.3. Watch the video and answer the questions: https://bhp-public.oerproject.com/chapters/2?WT.tsrc=BHPFacebook#the-rock-we-call-home)

1. What troubles would a person had if he traveled to the early Earth?
2. Why was the early Earth so hot? (3 reasons)

3. What is going to the stuff which was put into the saucepan and heated up to thousands degrees?

4. Is it the same that seems to have happened to the early Earth?

5. What are the 4 main layers?

6. When did the scientists begin to understand that the Earth is always changing?

7. What questions could not early scientists answer?

8. When did the geologists try to create the map of the ocean floor?

9. What did they find while studying it?

10. What are the 2 basic types of crust? What could happen if they collide?

11. How were the Himalayas formed?

12. What is going along the Saint Andreas Fault in California?

13. Why is it necessary to study the theory of Plate Tectonics?

Task 4.4. Finding Earth. Can you name any of the ancient scientists and their discoveries? Read the text and tell in short about them.

It took billions of years for the Earth to form and settle into orbit around the Sun. But how do we know that? What makes it so?

To study the movements of heavens back then, you would look up into the sky. You would see the Sun and stars revolve around the very spot where you were standing, the Earth – just as **Ptolemy** did some 1,900 years ago. This geocentric view, backed by the very powerful religions at the time, endured for more than 1,400 years until it was toppled by **Copernicus** and confirmed by **Galileo.** Through their observational evidence, and by using the telescope, they produced data and logic supporting a Sun-centered, heliocentric model of the Solar System.

Through these revolutionary findings, geocentrism began to crumble. In the later 1600s, Newton developed his 3 basic laws of motion and the theory of universal gravity by combining physics, mathematics, and astronomy. These ideas laid the foundation for our current understanding of the Earth and the cosmos, and helped astronomer **Edwin Hubble** construct the modern-day Big Bang theory.

The geocentric view of the cosmos held by **Aristotle and Ptolemy** persisted for more than 1,400 years.

Task 4.5. Professional translation.

Земля

Земля – третья от Солнца планета Солнечной системы, крупнейшая из планет земной группы, является местом обитания миллионов биологических видов, включая людей. Земля – единственное известное на данный момент планетарное тело, населённое живыми существами. Научные данные указывают на то, что Земля образовалась около 4,54 млрд. лет назад, а вскоре после этого приобрела свой единственный естественный спутник – Луну.

Строение Земли

Земля относится к планетам земной группы, а значит она, в отличие от газовых гигантов, таких как Юпитер, имеет твёрдую поверхность. Это крупнейшая из четырёх планет земной группы в солнечной системе, как по размеру, так и по массе. Кроме того, Земля имеет наибольшую плотность (the highest density), самую сильную поверхностную гравитацию и сильнейшее магнитное поле среди этих четырёх планет.

Форма Земли (геоид) близка к вытянутому эллипсоиду-шарообразная (ellipsoid-spherical) форма с утолщениями (with thickening) на экваторе, средний диаметр планеты примерно равен 12 742 км.

Вращение земли создаёт экваториальную выпуклость (the equatorial bulge), поэтому экваториальный диаметр на 43 км больше, чем диаметр между полюсами планеты. Высшей точкой поверхности Земли Высшей точкой поверхности Земли является гора Эверест (8848 м над уровнем моря), а глубочайшей – Марианская впадина (10911 м под уровнем моря).

Task 4.6. Stargazers. Tell everything you know about these scientists.

		
Ptolemy (85-165)	Copernicus (1473-1543)	Galileo (1564-1642)

 Sir Isaac Newton (1643-1727)	 Henrietta Leavitt (1868-1921)	 Edwin Hubble (1889-1953)

Ptolemy

Claudius Ptolemy's theory extended the cosmological theories of Aristotle. Earth was at the center of a series of concentric spheres containing the Moon, the planets, the Sun, and a final sphere of fixed stars.

Copernicus

Polish astronomer, Nicolaus Copernicus, synthesized observational data to formulate a Sun-centered cosmology, launching modern astronomy and setting off a scientific revolution.

Galileo Galilei

An Italian Renaissance man used a telescope to collect evidence that supported the Sun-centered model of the Solar system.

Sir Isaac Newton

By combining physics, mathematics and astronomy, Newton developed the 3 basic laws of motion and the theory of Universal gravity.

Henrietta Leavitt

By measuring the amount of time between the fluctuating brightness levels of variable stars, Henrietta Leavitt discovered that it would be possible to estimate their distance away from the Earth, and possible to map the Universe.

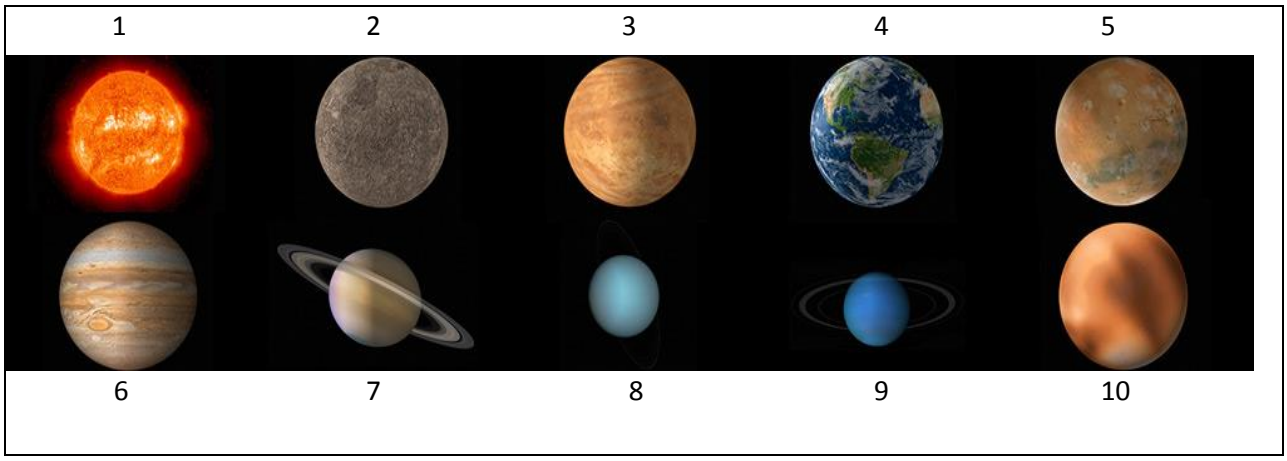
Edwin Hubble

Hubble drew upon existing ideas and evidence to demonstrate that the Universe was much larger than previously thought and proved that it is expanding – laying the foundations for the Big Bang theory.

Light travels fast. In one second, it races around the Earth seven times. Then in a blink of an eye, light reaches the Moon.

Going out to the stars, Astronomers know that by studying Cepheid variables, the fluctuation in brightness of certain stars, we can calculate the star's distance from Earth. The longer the period of fluctuation, the brighter the star. Therefore, even though a star might appear extremely dim, if it had a long period it must actually be extremely large. The star appeared dim only because it was extremely far away. By calculating how bright it appeared from Earth and comparing this to its intrinsic brightness, Astronomers could estimate how much of the star's light had been lost while reaching Earth, and how far away the star actually was.

Task 4.7. Not too hot... Not too cold... Where in our Solar System are the conditions just right to support life? Answer and then check or do it online:
https://bhp-public.oerproject.com/chapters/2?WT.tsrc=BHPFacebook#the-biosphere



1. The Sun Even the coolest sunspots on the surface of the Sun are 5,500◦C. So, yes, too hot.

2. Mercury. With no real atmosphere to retain heat, the temperature is a freezing -180◦C at night to a scorching oven of 430 ◦C during the day.

3. Venus. Because of a dense atmosphere (over 96% carbon dioxide), it's a runaway greenhouse effect. At 480 ◦C, actually makes it the hottest planet of the Solar System

4. Earth. Our planet contains just the right amount of energy and water to support a diverse variety of life.

5. Mars. Even though Mats reaches a temperate 20◦C at noon at the equator in summer, it's usually a frozen, arid world. The poles are way too cold to support humans – around -153 ◦C.

6. Jupiter. This is a gas giant – nothing more than a giant ball of hydrogen, helium, and other gases with little solid surface, with an average temperature of -148◦C.

7. Saturn is too cold and gassy. Life-supporting planets usually possess a heavy-metal core surrounded by a rocky mantle.

8. Uranus. The surface of Uranus is mostly composed of ice: methane, water, and ammonia. This -216◦C hydrogen and helium atmosphere isn't hospitable.

9. Neptune. The only energy is lightning, ultraviolet light, and charged particles. Although it's the kind of environment in which scientists believe life began, it's not viable today.

10. Pluto. Not only does liquid freeze solid on this dwarf planet, but even gases, like methane, will harden when Pluto is at its most distant, 5,9 billion kilometers from the Sun.

Task 4.8. Earth & Solar System.

What do you know about it?

1) Which of the following is not a necessary ingredient in planetary formation?

- New emerging stars
- Concentrations of matter
- Large differences in pressure and temperature

2) Which process best describes how new planets are planets?

- Fusion (слияние, синтез)
- Accretion (увеличение)
- Regeneration

3) Why are planets considered to be more complex than stars?

- Chemical diversity
- Shorter life spans
- The presence of life

The Nature of the Universe

Task 5. The Nature of the Universe

When Pluto was discovered in 1930, scientists already knew a lot about the stars beyond our own solar system. Now the frontiers of our knowledge have moved into deepest space. As this has happened, we have had to develop new ways of seeing and thinking. Here are two examples of what we think we understand.

The size of the universe. All space with everything in it, including all stars, is called the universe. If we measure space distances by light years instead of earth years, the universe still seems too large to understand. A light year is the distance light travels in a year. Light travels at 186,000 miles per second (300,000 kilometers per second).

By this measure, we know that:

Match two columns.

Earth to Sun is	11 light hours across.
Our solar system is	15,000 million light years away.
The nearest star (Proxima Centauri) is	2 million light years away.
Our galaxy (the Milky Way) is	light years away.
The galaxy Andromeda (visible to the naked eye) is	100,000 light years across and contains about 100,000 million stars.
We can now detect other galaxies	$8^{1/2}$ light minutes.

What does the last enormous number in the table really mean to us?

a) The light we now see, through a twentieth century telescope, started its journey toward us 15,000 million years ago.

b) The light started toward us billions of earth years before the sun or the earth had even started to form.

c) If the light has taken so long to reach us, then the stars that gave out that light have had 15,000 million years to change. They may have moved elsewhere, died, or

given birth to new kinds of stars. What we now see has not been there for billions of earth years.

d) We are looking back in time to the very beginning of the universe itself.

The expanding universe. All objects, including stars that give out light reveal facts about themselves in the kind of light they give out. The whole range of energy that can be given out is shown in the diagram below. Only a small part of it is visible light.

In the 1920s, the American astronomer **Edwin Hubble** began to measure the spectrum of distant galaxies. He discovered that the farther away the galaxy was, the longer were the wavelengths of red light. He realized he was experiencing something common to everyday life. When we hear a siren or horn, its noise changes as it moves toward or away from us. This is called the Doppler Effect. It is caused by the wavelengths of sound being shortened as the horn moves nearer and stretched out as it moves away.	 Hubble realized this was exactly what was happening with the light from the galaxies. But all the red light showed was lengthening; none showed shortening. Therefore, all the galaxies are moving away from us. From the amount of red shift, he could also tell how quickly they were moving away. His conclusion was that the farther away the galaxy was, the faster it was moving away.

This led to **two important theories** becoming widely accepted.

1. The universe is expanding, and space is being stretched apart between the galaxies.

2. The Big Bang Theory. As the theory of the expanding universe has been accepted, two important questions have been asked:

a) How long has the universe been expanding?

b) What was it like when it started to expand?

These questions led to the Big Bang Theory, which states that the entire universe we can see had a single point of origin about 15,000 million years ago. It suddenly came into existence in a gigantic explosion. This was when everything began, and the "fragments" are still moving apart. It is only a theory, but there is much evidence to support it.

Task 5.1. Define by suffix speech parts of the following words. Translate the words.

Solar, knowledge, galaxy, visible, detect, enormously, century, small, really, astronomer, spectrum, distant, wavelength, common, shorten, exactly, amount, quickly, conclusion, expand, widely, single, existence, suddenly, explosion, evidence.

Task 5.2. Find the sentences that can't be found in the text.

1. When Pluto was discovered, scientists knew little about the stars beyond our own solar system.
2. If we measure space distances by light years instead of earth years, the universe still seems too large to understand.
3. Light travels at 300,000 kilometers per second.
4. The farthest star from the Earth is Proxima Centauri.
5. The light started its journey toward us 15,000 million years ago.
6. All objects that give out light reveal facts about themselves in the kind of light they give out.
7. The Doppler effect happens, for example, when we hear a siren or horn and its noise changes as it moves toward or away from us.

Task 5.3. Find English equivalents in the text.

1. за пределами нашей солнечной системы _____
2. размер вселенной _____
3. включая все звезды _____
4. измерять расстояние в космосе _____
5. Млечный путь _____
6. невооруженный глаз _____
7. достигнуть нас _____
8. испускать свет _____
9. отдаленные галактики _____
10. длина волны _____
11. по мере того, как сирена приближается _____
12. чем дальше находилась галактика, тем быстрее она удалялась _____
13. теория Большого взрыва _____
14. расширяющаяся Вселенная _____
15. много свидетельств в поддержку этой теории _____

Task 5.4. Find Russian equivalents to the following expressions in the text.

1. beyond our own solar system _____
2. the frontiers of our knowledge _____
3. deepest space _____
4. space distances _____
5. too large to understand _____
6. per second _____
7. visible to the naked eye _____
8. to detect other galaxies _____
9. enormous number _____
10. toward us _____
11. to give out light _____
12. to give birth to new stars_____
13. the very beginning of the universe itself _____
14. the expanding universe _____
15. to reveal facts _____
16. red shift _____
17. a single point of origin _____
18. a gigantic explosion _____

Task 5.5. Fill in the missing words.

1. All space with everything in it, including all stars, is called the _____.

2. A light year is the distance _____ travels in a _____.

3. The light started toward us billions of _____ years before the sun or the earth had even started to _____.

4. In the 1920s, the American astronomer Edwin Hubble began to _____ the spectrum of distant _____.

5. He discovered that the father away the galaxy was, the _____ were the wave-lengths of _____ light.

6. The Doppler effect is caused by the wavelengths of _____ being shortened as the horn moves nearer and stretched out as it moves _____.

7. From the amount of red _____, Hubble could tell how quickly the galaxies were moving away.

8. It is only a theory, but there is much _____ to support it.

Task 5.6. Fill in the prepositions, if necessary.

1. When Pluto was discovered ___ 1930; scientists already knew a lot ___ the stars beyond our own solar system.

2. Light travels ___ 186,000 miles ___ second.

3. Our galaxy is 100,000 light years ___ and contains ___ 100,000 million stars.

4. The light we now see, ___ a twentieth century telescope, started ___ its journey ___ us 15,000 million years ago.

5. If the light has taken so long to reach us, then the stars that gave ___ that light have had 15,000 million years to change ___.

6. Hubble discovered that the farther ___ galaxy was, the longer were the wavelengths ___ red light.

7. When we hear a siren or horn, its noise changes ___ it moves toward or away ___ us.

8. All the galaxies are moving ___ from us.

9. The Big Bang Theory states that all the universe we can see ___ had a single point ___ origin about 15,000 million years ago.

10. It is only a theory, ___ there is much evidence to support it.

Task 5.7. Practice with someone asking and answering.

1. What is called the universe?
2. How do we measure space distances?
3. What is a light year?
4. At what speed does light travel?
5. When did the light we now see start its journey toward us?
6. Did the light start toward us billions of earth years before the sun or the earth had even started to form?
7. In what way do all objects, including starts, reveal facts about themselves?
8. Is all light, that stars give out, visible?
9. When did the American astronomer Edwin Hubble begin to measure the spectrum of distant galaxies?
10. What did he discover?
11. What is called the Doppler effect?
12. By what is the Doppler effect caused?
13. What does the Big Bang Theory state?

Task 5.8. Put questions to the following statements.

1. Light travels at 186,000 miles per second.
2. He realized he was experiencing something common to every day life.
3. Space is being stretched apart between galaxies.

The Big Bang Theory

Task 6. The Big Bang Theory.

6.1. Watch the short movie and explain the theory.
https://www.youtube.com/watch?v=rXER39AEE9k

6.2. Fill in the blanks in the summary with the necessary words.

You've probably heard of the big bang theory at some point. But do you know what it actually is? In this movie, you will learn what exactly this idea for how the universe began came to be in the first place. The big bang theory was first suggested by a ……. and …….named Georges Lemaître in the 1920s. He estimates that the universe started out as…… at the beginning of time. Rather than by an explosion, the universe simply started to expand in a fraction of a second due to……. Over time, the expansion slowed, but Lemaître and many other scientists believe the universe is…….. today. The force of gravity plays a huge role in everything when it comes to the universe. All the objects in space form when particles and gases from the universe's expansion…….. (through gravity). When small amounts of dust and gas pull together, planets form and ……..the star. Another force called ……..is also important. We don't have a lot of information about it, but scientists think it's what causes cosmos apart faster and faster.

6.3. Read the text and be ready to translate.

Astronomers believe that the expanding universe is the result of an enormous and powerful explosion called the Big Bang. The Big Bang theory may explain how the universe formed. The Big Bang theory states that the universe began to expand with the explosion of concentrated matter and energy and has been expanding ever since. According to the theory, all the matter and energy in the universe was once concentrated into a single place. This place, of course, was extremely hot and dense. Then

some 15 to 20 billion years ago, an explosion – the Big Bang – shot the concentrated matter and energy in all directions. The fastest moving matter traveled farthest away. Energy too, began moving away from the area of the Big Bang.

If the Big Bang theory is correct, the energy left from the Big Bang will be evenly spread out throughout the universe. This energy is known as background radiation. And indeed, scientists have discovered that the background radiation is almost the same throughout the entire universe. This constant background radiation is one observation that supports the Big Bang theory.

After the initial Big Bang, the force of gravity began to affect the matter racing outward in every direction. Gravity is a force of attraction between objects. All objects have a gravitational attraction. This force of gravity began to pull matter into clumps.

At some time, the clumps formed huge clusters of matter. These clumps became the galaxies of the universe. But even as the galaxies were forming, the matter inside the galaxies continued to race away from the area where the Big Bang had occurred. And this is just what astronomers have discovered. All of the galaxies are speeding away from the center of the universe.

Task 6.3.1. Translate the following statements into Russian.

1. All space with everything in it is called the universe.
2. A light year is the distance light travels in a year.
3. The light we now see started its journey toward us 15,000 million years ago.
4. All objects that give out light reveal facts about themselves in the kind of light they give out.
5. He discovered that the farther away the galaxy was, the longer were the wavelengths of red light.
6. All the galaxies are moving away from us.
7. It suddenly came into existence in a gigantic explosion.

Task 6.3.2. Translate into English.

1. Весь космос, включая звезды, называется Вселенной.
2. Если мы измерим космические расстояния при помощи световых лет вместо земных, то Вселенная все равно будет слишком огромной для нашего понимания.
3. Свет двигается со скоростью 186,000 миль в секунду.
4. Свет начал двигаться в нашу сторону за биллионы земных лет до того, как солнце и земля вообще начали формироваться.
5. Все объекты можно охарактеризовать исходя из природы того света, который они испускают.

6. В 20х годах XX века американский астроном Хаббл начал измерять спектр отдаленных галактик.

7. Он обнаружил, что чем дальше находилась галактика, тем длиннее были длины волн красного света.

8. Следовательно, все галактики удаляются от нас.

9. По количеству перемещения красного света можно сказать, насколько быстро галактики удаляются.

10. Вселенная непрерывно расширяется.

11. Теория Большого взрыва гласит, что Вселенная имеет единую точку происхождения.

12. Это только теория, но существует множество фактов ее подтверждающих.

https://ebooks.grsu.by/physics_world/unit-24.htm

Interesting facts about the Universe.

Task 7. So, you think you know your universe. Do you know anything interesting about it? We have our own **top 10 list** of the most interesting facts about the Universe.

1. It was hot when it was young

The most widely accepted cosmological model is that of the Big Bang. This was proved since the discovery of the cosmic microwave background radiation or CMBR. Although, strictly speaking, no one knows exactly what 'banged', we know from extrapolation that the Universe was infinitely hot at birth, cooling down as it expanded.

In fact, even only within minutes of expansion, scientists predict its temperature to have been about a billion Kelvin. Moving backward to 1 second, it is said to have been at 10 billion Kelvin. For comparison, today's universe is found to have an average temperature of only 2.725 Kelvin.

2. It will be cold when it grows old

Observations made especially on galaxies farthest from us show that the Universe is expanding at an accelerated rate. This, and data that show that the Universe is cooling allows us to believe that the most probable ending for our universe is that of a Big Freeze.

That is, it will be devoid of any usable heat (energy). It is due to this prediction that the Big Freeze is also known as the Heat Death. Accurate measurements made by the Wilkinson Microwave Anisotropy Probe (WMAP) on the current geometry and density of the Universe favor such an ending.

3. The Universe spans a diameter of over 150 billion light years

Current estimates as with regards to the size of the Universe pegs it at a width of 150 billion light years. Although it may seem peculiarly inconsistent with the age of the Universe, which you'll read about next, this value is easily understood once you consider the fact that the Universe is expanding at an accelerated rate.

4. The Universe is 13.7 billion years old

If you think that is amazing, perhaps equally remarkable is the fact that we know this to better than 1% precision. Credit goes to the WMAP team for gathering all the information needed to come up with this number. The information is based on measurements made on the CMBR.

Older methods which have contributed to confirming this value include measurements of the abundances of certain radioactive nuclei. Observations made on globular clusters, which contain the oldest stars, have also pointed to values close to this.

5. The Earth is not flat – but the Universe is

Based on Einstein's Theory of General Relativity, there are three possible shapes that the Universe may take: open, closed, and flat. Once again, measurements by WMAP on the CMBR have revealed a monumental confirmation – the Universe is flat.

Combining this geometry and the idea of an invisible entity known as dark energy coincides with the widely accepted ultimate fate of our universe, which as stated earlier, is a Big Freeze.

6. Large Scale Structures of the Universe

Considering only the largest structures, the Universe is made up of filaments, voids, super clusters, and galaxy groups and clusters. By combining galaxy groups and clusters, we come up with super clusters. Some super clusters in turn form part of walls, which are also parts of filaments.

The vast empty spaces are known as voids. That the Universe is clumped together in certain parts and empty in others is consistent with measurements of the CMBR that show slight variations in temperature during its earliest stages of development.

7. A huge chunk of it is made up of things we can't see

Different wavelengths in the electromagnetic spectrum such as those of radio waves, infrared, x-rays, and visible light have allowed us to peer into the cosmos and 'see' huge portions of it. Unfortunately, an even larger portion cannot be seen by any of these frequencies.

And yet, certain phenomena such as gravitational lensing, temperature distributions, orbital velocities and rotational speeds of galaxies, and all others that are evidence of a missing mass justify their probable existence. Specifically, these observations show that dark matter exists. Another invisible entity known as dark energy, is believed to be the reason why galaxies are speeding away at an accelerated rate.

8. There is no such thing as the Universe's center

Nope. The earth is not the center of the Universe. It's not even the center of the galaxy. And no again, our galaxy is not the entire universe, neither is it the center. Don't hold your breath but the Universe has no center. Every galaxy is expanding away from one another.

9. Its members are in a hurry to be as far away from each other as possible

The members that we are talking about are the galaxies. As mentioned earlier, they are rushing away from each other at increasing rates. In fact, prior to the findings of most recently gathered data, it was believed that the Universe might end in a Big Rip. That is, everything, down to the atoms, would be ripped apart.

This idea stemmed from this observed accelerated rate of expansion. Scientists who supported this radically catastrophic ending believed that this kind of expansion would go on forever, and thus would force everything to be ripped apart.

10. To gain a deeper understanding of it, we need to study structures smaller than the atom

Ever since cosmologists started to trace events backward in time based on the Big Bang model, their views, which focused only on the very large, got smaller and smaller. They knew, that by extrapolating backward, they would be led into a universe that was very hot, very dense, very tiny, and governed by extremely high energies.

These conditions were definitely within the realm of particle physics, or the study of the very small. Hence, the most recent studies of both cosmology and particle physics saw an inevitable marriage between the two.

Task 7.1. Which fact interested you the most?

Task 7.2. Correct the mistakes.

1. The most widely accepted cosmological model is that of the Big Bang. Although, strictly speaking, no one knows exactly what 'banged', we know from extrapolation that the Universe was infinitely cold at birth, warming as it expanded.

2. Observations made especially on galaxies closest to us show that the Universe is expanding at an accelerated rate. This, and data that show that the Universe is warming allows us to believe that the most probable ending for our universe is that of a Big Hot.

3. Current estimates as with regards to the size of the Universe pegs it at a width of 150 million light years.

4. The Universe is 13.7 billion years old. If you think that is amazing, perhaps equally remarkable is the fact that we know this to better than 10% precision.

5. Based on Einstein's Theory of General Relativity, there are four possible shapes that the Universe may take: open, closed, ellipsoid and flat. Once again, measurements by WMAP on the CMBR have revealed a monumental confirmation – the Universe is ellipsoid.

6. By combining galaxy groups and clusters, we come up with mega clusters. Some mega clusters in turn form part of walls, which are also parts of filaments.

7. Yet, certain phenomena such as gravitational lensing, temperature distributions, orbital velocities and rotational speeds of galaxies, and all others show that dark matter doesn't exist.

8. The earth is not the center of the Universe. It's the center of the galaxy. And our galaxy is not the entire universe, it is the center.

9. In fact, prior to the findings of most recently gathered data, it was believed that the Universe might end in a Big Unit. That is, everything, down to the atoms, would be united.

10. Ever since cosmologists started to trace events backward in time based on the Big Bang model, their views, which focused only on the very large, got bigger and bigger.

https://www.universetoday.com/37927/interesting-facts-about-the-universe/

Galaxy

Task 8. What Is a Galaxy? Can you give a short definition?

Task 8.1. What are Galaxies?

Galaxies are sprawling space systems composed of 1……..

Galaxies consists of a large number of 2……

It is believed that galaxies were formed due to 3……. billions of years ago. Just few milliseconds after the massive explosion took place the clouds of gases began to 4…… and……. under the gravity, forming galaxies.

Nearly 5……. belong to a group of galaxies.

to collapse and compress; all stars; star systems, clusters and interstellar clouds; dust, gas, and countless stars; a big cosmic bang.

Check your answers:

Galaxies are sprawling space systems composed of *dust, gas, and countless stars.*

Galaxies consists of a large number of *star systems, clusters and interstellar clouds.*

It is believed that galaxies were formed due to *a big cosmic bang* billions of years ago. Just few milliseconds after the massive explosion took place the clouds of gases began *to collapse and compress* under the gravity, forming galaxies.

Nearly *all stars* belong to a group of galaxies.

https://mocomi.com/what-is-gravity/

Gravity Fun Facts. Do you know them?

1. Gravity influences the growth of plants.
2. Black holes have the strongest gravitational pull in the universe.
3. Tides are caused by the earth's rotation and the sun and moon's gravitational effect.

4. The higher an object, the greater its potential energy. In the Middle Ages, there were weapons called trebuchets, using this principle.

5. Hydroelectricity is created today, using the gravitational potential of water.

6. Weight is a measure of the force of the earth's gravity on a body. Calculate your weight on other planets.

Task 8.2. Types of Galaxies

What Kinds of Galaxies Are There?

Astronomers classify galaxies into three major categories: ***elliptical, spiral and irregular***. These galaxies span a wide range of sizes, from dwarf galaxies containing as few as 100 million stars to giant galaxies with more than a trillion stars.

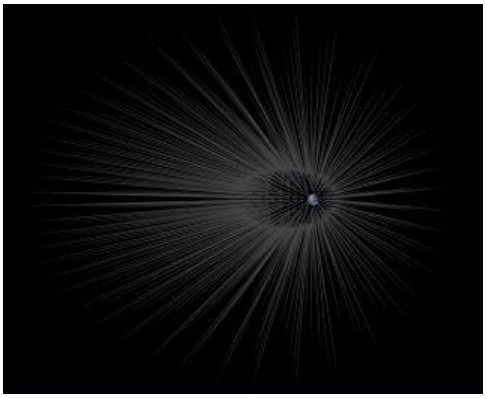
	**Ellipticals**, which account for about one-third of all galaxies, vary from nearly circular to very elongated. They possess comparatively little gas and dust, contain older stars and are not actively forming stars anymore. The largest and rarest of these, called giant ellipticals, are about 300,000 light-years across. Astronomers theorize that these are formed by the mergers of smaller galaxies. Much more common are dwarf ellipticals, which are only a few thousand light-years wide.
	**Spiral galaxies** appear as flat, blue-white disks of stars, gas and dust with yellowish bulges in their centers. These galaxies are divided into two groups: normal spirals and barred spirals. In barred spirals, the bar of stars runs through the central bulge. The arms of barred spirals usually start at the end of the bar instead of from the bulge. Spirals are actively forming stars and comprise a large fraction of all the galaxies in the local universe.
	**Irregular galaxies**, which have very little dust, are neither disk-like nor elliptical. Astronomers often see irregular galaxies as they peer deeply into the universe, which is equivalent to looking back in time. These galaxies are abundant in the early universe, before spirals and ellipticals developed.

Aside from these 3 classic categories, astronomers have also identified many unusually shaped galaxies that seem to be in a transitory phase of galactic development. These include those in the process of colliding or interacting, and those with active nuclei ejecting jets of gas.

In short, tell about the differences between different kinds of galaxies.

Task 9. Read the text and answer:

1. Is it necessary to know about Dark Matter?
2. What Is Dark Matter? Can you explain?



In the late 1970s, astronomer Vera Rubin made the surprising discovery of dark matter. She was studying how galaxies spin when she realized *the vast spiral* Andromeda Galaxy seemed to be rotating strangely. In *an apparent violation* of Newton and Kepler's Laws, the material at the galaxy's edges was moving just as fast as the material near the center, even though most of the mass she could see was concentrated at the center. Some extra *non-visible mass*, dubbed dark matter appeared to be holding the galaxy together. She soon discovered that *a huge halo of dark matter* was present in galaxy after galaxy that she examined.

This detailed view of our galactic next-door neighbor, the Andromeda galaxy, contains over 100 million *resolved stars* and thousands of *star clusters*. The panorama sweeps from the galaxy's central bulge across lanes of stars and dust to *the sparser outer disk.*

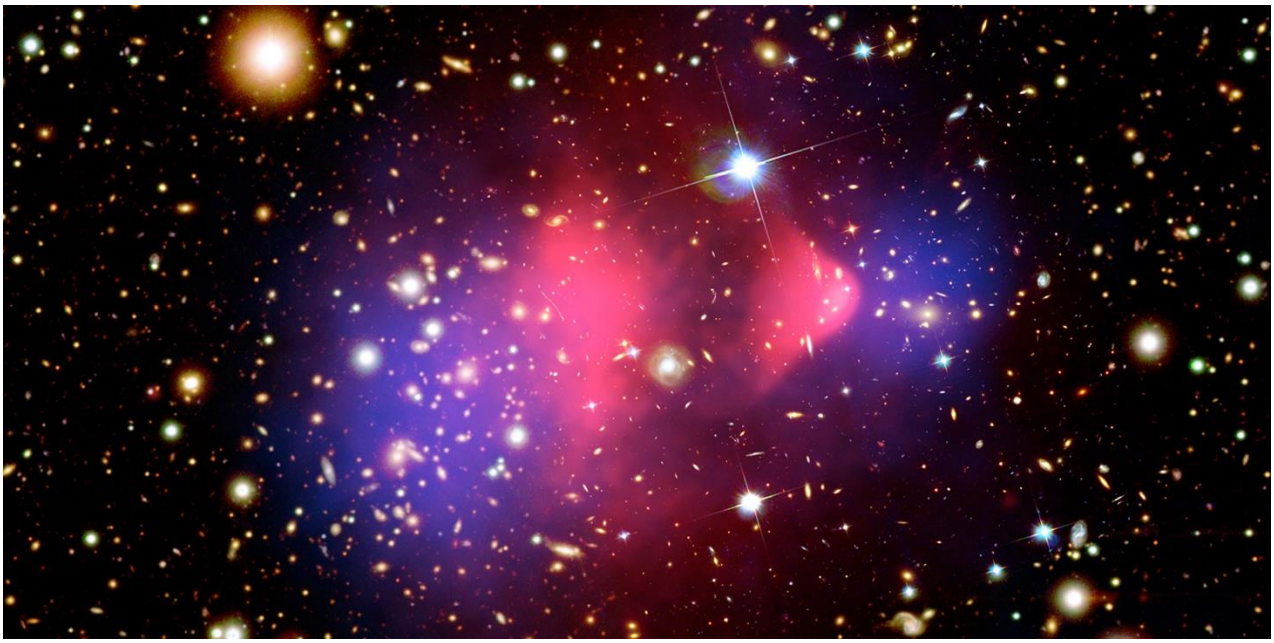
Nearly half a century later, scientists still don't know what dark matter is. They do know, however, that dark matter comprises some 84 % of the universe's material. Its *invisible and ubiquitous presence* affects how stars move within galaxies, how galaxies tug on each other and how matter clumped together in the early universe.

Some of the best evidence for the existence of dark matter comes from galaxy cluster 1E 0657-556, also known as the Bullet Cluster. This cluster was formed after the collision of two large clusters of galaxies, the most energetic event known in the universe since the big bang. Because the major components of the cluster pair – stars, gas and the apparent dark matter – behave differently during collision, scientists were able to study them separately.

The galaxies' stars, which the Hubble and Magellan telescopes observed in visible light, were mostly unaffected by the collision, and passed right through. The hot

gas from the two colliding clusters, seen in X-ray *wavelengths* by the Chandra X-ray Observatory, contains most of the cluster pair's normal matter. Because the gases interact electromagnetically, the gases of both clusters slowed down much more than the stars. The third element in this collision, the dark matter, was detected indirectly by *the gravitational lensing* of background objects.

The dark matter by definition does not interact electromagnetically (i.e., with light) – it's dark! So during the collision, the dark matter clumps from the two clusters slide quietly past one another, just like the stars, leaving the hot gas (most of the normal matter) behind. The gravitational lensing stayed with the dark matter and not the gas. If hot gas was the most massive component in the clusters, such an effect would not be seen. Instead, the observations appear to be the first direct proof of dark matter.



The Bullet Cluster was formed after the collision of two large clusters of galaxies. Hot gas detected by Chandra in X-rays is seen as two pink clumps in the image and contains most of the "normal," or baryonic, matter in the two clusters.

The bullet-shaped clump on the right is the hot gas from one cluster, which passed through the hot gas from the other larger cluster during the collision. An optical image from the Hubble and Magellan telescopes shows the galaxies in orange and white. The blue areas in this image depict where astronomers find most of the mass in the clusters. Most of the matter in the clusters (blue) is clearly separate from the normal matter (pink), giving direct evidence that nearly all of the matter in the clusters is dark. (Credit: X-ray: NASA/CXC/M.Markevitch et al.; Optical: NASA/STScI; Magellan/U.Arizona/D.Clowe et al.; Lensing Map: NASA/STScI; ESO WFI; Magellan/U.Arizona/D.Clowe et al)

https://hubblesite.org/science/galaxies

Task 9.1. Explain the highlighted words and phrases (you can consult with the dictionary)

Task 9.2. In groups of four draw a picture of two large clusters of galaxies collision and explain how it proceeds and the possible consequences.

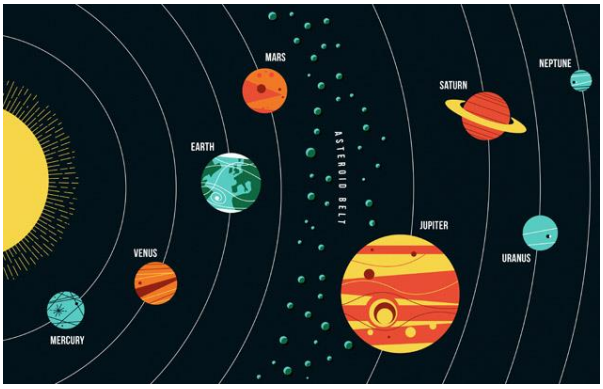
Task 10. Facts about space. Put True-false.

1) One million Earths could fit inside the sun – and the sun is considered an average-size star.

2) For years it was believed that the Earth was the only planet in our solar system with liquid water. More recently, NASA revealed its strongest evidence yet that there is intermittent running water on Venus, too!

3) Comets are leftovers from the creation of our solar system about 4.5 billion years ago – they consist of sand, water and carbon dioxide.

4) You wouldn't be able to walk on Jupiter, Saturn, Uranus or Neptune because they have no solid surface!



5) If you could fly a plane to Pluto, the trip would take more than 800 years!

6) Space junk is any natural object orbiting Earth that no longer serves a useful purpose. Scientists estimate there are about 500,000 pieces of space junk today, including fragments from rockets and satellites, and everyday items like spanners dropped during construction of the International Space Station!

7) An asteroid about the size of a car enters Earth's atmosphere roughly once a year – but it burns up before it reaches us. Phew!

8) The highest mountain known to man is on an asteroid called Vesta. Measuring a whopping 22km in height, it is three times as tall as Mount Everest!

9) There are less stars in the universe than grains of sand on all the beaches on Earth. That's at least a billion trillion!

10) The sunset on Mars appears red.

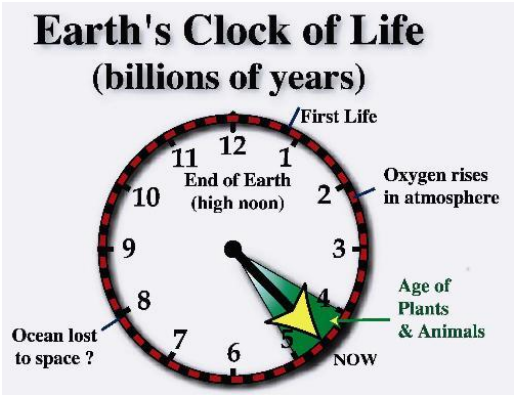
The end of life on Earth?

Task 11. Put the disasters in the correct groups.

natural disasters	disasters from space	manmade disasters

space junk collision
flood
nuclear accidents
hurricane
solar flare
oil spill
volcano eruption
meteor strike
global warming

Task 11.1. The end of life on Earth? Can you remember any natural disasters, which happened some years ago and could have stopped the life in the Earth?



It weighed about 10,000 tons, entered the atmosphere at a speed of 64,000km/h and exploded over a city with a blast of 500 kilotons. But on 15 February 2013, we were lucky. The meteorite that showered pieces of rock over Chelyabinsk, Russia, was relatively small, at only about 17 metres wide. Although many people were injured by falling glass, the damage was nothing compared to what had happened in Siberia nearly one hundred years ago. Another relatively small object (approximately 50 metres in diameter) exploded in mid-air over a forest region, flattening about 80 million trees. If it had exploded over a city such as Moscow or London, millions of people would have been killed.

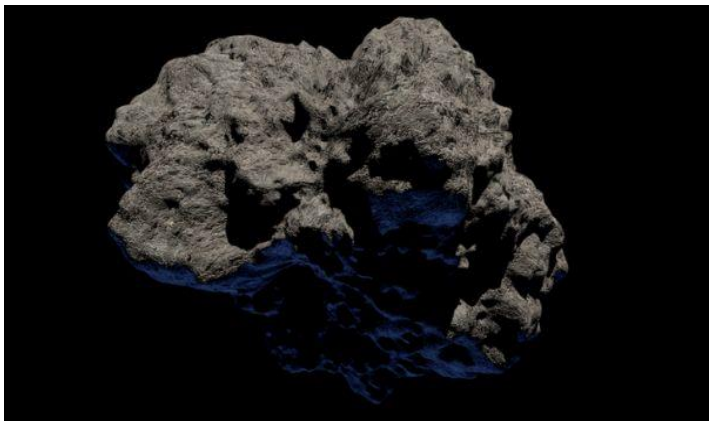
By a strange coincidence, the same day that the meteorite terrified the people of Chelyabinsk, another 50m-wide asteroid passed relatively close to Earth. Scientists

were expecting that visit and know that the asteroid will return to fly close by us in 2046, but the Russian meteorite earlier in the day had been too small for anyone to spot.

Most scientists agree that comets and asteroids pose the biggest natural threat to human existence. It was probably a large asteroid or comet colliding with Earth, which wiped out the dinosaurs about 65 million years ago. An enormous object, 10 to 16km in diameter, struck the Yucatan region of Mexico with the force of 100 megatons. That is the equivalent of one Hiroshima bomb for every person alive on Earth today.

Many scientists, including the late Stephen Hawking, say that any comet or asteroid greater than 20km in diameter that hits Earth will result in the complete destruction of complex life, including all animals and most plants. As we have seen, even a much smaller asteroid can cause great damage.

The Earth has been kept safe for the last 65 million years by good fortune and the massive gravitational field of the planet Jupiter. Our cosmic guardian, with its stable circular orbit far from the sun, sweeps up and scatters away most of the dangerous comets and asteroids which might cross Earth's orbit. After the Chelyabinsk meteorite, scientists are now monitoring potential hazards even more carefully but, as far as they know, there is no danger in the near future.



Researchers have discovered never-before-seen types of crystal hidden in tiny grains of perfectly preserved meteorite dust. The dust was left behind by a massive space rock that exploded over Chelyabinsk, Russia

Task 11.2. Types of space rocks. Match the names to the definitions.

Comet	what a meteoroid is called when it hits Earth.
Asteroid	a part of a comet.
Meteoroid	a rock a few feet to several kms in diameter. Unlike comets, they have no tail. Most are too small to cause any damage and burn up in the atmosphere. They appear to us as 'shooting stars'.
Meteorite	a ball of rock and ice that sends out a tail of gas and dust behind it. Bright ones only appear in our visible night sky about once every ten years.

Task 11.3. The end of life on Earth?

Choose the correct option to complete the sentences.

1. The damage caused by the Russian meteorite ___.
could have been much worse……
was huge
was greatly reduced by the early warning system
was much worse than the one in Siberia one hundred years ago

2.The Siberian meteorite ……..
hit a forest
hit a big city
caused glass to shower over people
damaged trees when it exploded

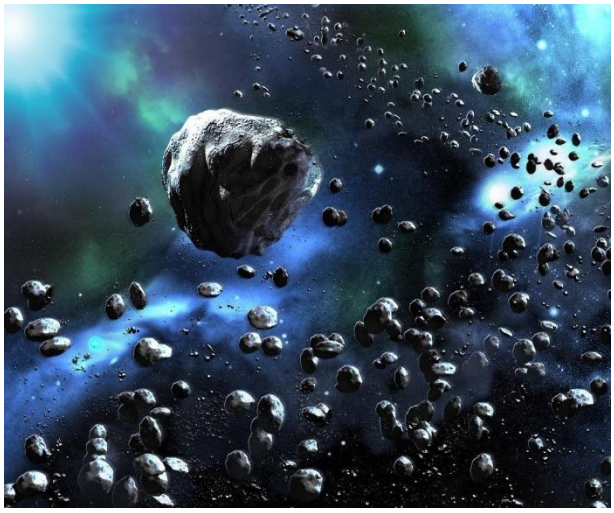
3. On the same day as the meteorite exploded over Chelyabinsk…….
there was another, related, asteroid event
there was another, unrelated, asteroid event
scientists realized that an even bigger asteroid could hit Earth
scientists issued a warning for 2046

4. The Russian meteorite……...
had been predicted by scientists
came as a surprise
was too small to worry about
will come close to Earth again in the future

5. Experts say that comets and asteroids could ……....
wipe out all animal life, leaving only plants
kill a significant proportion of the Earth's human population
put an end to all plant and animal life on Earth
cause as much damage as the Hiroshima bomb

6. A small asteroid …….
can still cause a lot of damage
is not a problem if it is spotted early
cannot cause any significant harm
is actually more dangerous than a larger one

7. Earth has been relatively safe thanks to……...
pure luck
luck and the protective force of another planet from our solar system
early warning systems set up by NASA
luck and our position in relation to the sun



8. Scientists say ……...
it is impossible to monitor all the potential hazards
we are not in any danger for the moment
a meteorite is likely to hit Earth sooner or later
their early warning systems will protect us

Task 11.4. Read the sentences and fill in the blanks with the words from the box below.

When the meteorite exploded on 15 February 2013, many people were (1…..) by falling glass.

The explosion of another small object (2…..) many trees.

Scientists weren't expecting the Russian meteorite because it had been too small for anyone to (3…).

It was probably a large asteroid colliding with Earth that (4…) the dinosaurs.

65 million years ago, an enormous object (5……) the Yucatan region of Mexico with a force of 100 megatons.

Even a much smaller asteroid can (6…) a lot of damage.

Jupiter protects Earth by diverting away the dangerous comets and asteroids that might (7…) Earth's orbit.

Scientists will now (8…..) potential hazards even more carefully.

made extinct, observe or check regularly over a period of time, do hurt, hit, made flat, pass from one side to the other of, see or notice

Task 11.5. Find synonyms with the words below.

1. Injured –
2. Flattened –
3. Spot –
4. wiped out –
5. struck –
6. cause -
7. cross –
8. monitor –

Task 12. Read the following article. While reading, try to guess the correct forms of passive.

Примечание: глаголы в английском языке обладают такой грамматической категорией, как *залог*. Залог глагола в английском языке нужен для того, чтобы показать отношение к действию. Есть два варианта:
- человек или предмет совершает действие сам. То есть конкретное лицо производит действие над объектом. В таком случае это называется активный залог (active voice) или действительный: *Я сломал свою машину. – I broke my car;*
- на первый план выходит не действующее лицо, а объект. И действие совершается непосредственно над объектом. То есть сам объект действие не совершает, а подвергается влиянию извне (причем объектом в предложении может быть и человек, и предмет). Такое явление носит название пассивный залог (passive voice) или страдательный.
Машина была сломана. – The car was broken (Appendix, p. 163)

Ten risky places by Mark Monmonier

Hazards of different types affecting areas of varying size are not easily **1..... (compare).** Even so, the research experience makes it easy to identify ten typical risky places–areas to which I would be reluctant to move. Almost any place in California, for various reasons: In addition to earthquakes, wildfire, landslides, the state has volcanically active areas in the north, around Mt. Shasta and other major volcanoes, as well as in the east, where the Long Valley Caldera shows signs of renewed activity. Even beyond its infamous seismic zones, California's shoreline is vulnerable to tsunamis (seismic sea waves) from submarine earthquakes throughout the Pacific.

More recent additions to this smorgasbord of hazards are smog, freeway snipers, urban riots, oil spills, and (looking ahead a few decades) severe water shortages. **2..... (locate)** only 70 miles from Mt. Rainier and Glacier Peak, which the U.S. Geological Survey considers active volcanoes, Seattle, Washington is also vulnerable to severe earthquakes. Unlike Californians, long aware of the risk, Washingtonians have only recently begun to plan for a seismic disaster.

Coastal Alaska and Hawaii are especially susceptible to tsunamis, huge waves **3..... (whip up)** by submarine earthquakes in the Ring of Fire encircling the Pacific Ocean. Alaska's Pacific coast is seismically active, and the Hawaiian Islands can generate their own tsunamis: deposits on Lanai suggest past run-ups as high as three thousand feet, and geophysicists fear a similar disaster were the southeast side of the Big Island (the island named Hawaii) to slide suddenly into the sea.

Tropical hurricanes pose a less catastrophic but more frequent danger to the Atlantic Coast, particularly to North Carolina's Outer Banks, a long, thin barrier island, from which evacuation is difficult. Since the seventeenth century, infrequent but fierce storms have carved new inlets, filled old channels, and move the shoreline westward at a rate of 3 to 5 feet per year. Moreover, if forecasts of a 250-foot rise in sea level because of global warming prove correct, current settlements on the Outer Banks could **4..... (wipe out)** in the next century or so. Inadequate building codes, shoddy construction, low elevation, and level terrain make areas south of Miami especially vulnerable to high winds and flooding from storms like Hurricane Andrew, which caused over 20 billion dollars damage there in August 1992.

The Louisiana coast is also vulnerable to multiple hazards: winds and storm surge from tropical hurricanes, unnaturally high levees along the lower Mississippi River, and air and groundwater pollution from poorly regulated chemical industries concentrated along the state's Gulf Coast. Cancer mortality is extraordinarily high here as well.

The floodplains of the Mississippi and other main stem rivers, which drain vast areas, are vulnerable to prolonged high water **5.....(cause)** by persistent weather systems. The costly floods of summer 1993 demonstrated the shortsightedness of flood forecast models based on limited hydrologic data. Humans play a dangerous game of hydrologic roulette by building homes, factories, and sewage-treatment plants in low-lying areas along rivers.

Because warm weather is attractive to affluent retirees and housebreakers, property crime is especially high in the south, where a warm climate favors year-round burglary. And urban areas with many young males, newly arrived or unemployed are notorious for violent crime. Growing southern cities such as San Diego, Los Angeles, Phoenix, El Paso, and Miami, **6……(report)** to be especially hazardous, although risk varies greatly with neighborhood and time of day.

The neighborhoods of nuclear plants are risky areas of a different sort. More worrisome than the poor design and mismanagement underlying the 1979 Three Mile Island incident, near Harrisburg, Pennsylvania, is the specter of terrorism: a nuclear facility is an enormously attractive target for organized terrorists. Security **can 7…..(breach)** with a vehicle bomb. Over four million people live within the ten-mile

emergency planning zones around America's atomic power plants, and Chernobyl indicated clearly that radiological accidents can have a lethal reach much longer than ten miles.

http://www.press.uchicago.edu/Misc/Chicago/534189.html

Task 12.1. Work in groups and discuss the following questions

1. Which of the 10 risky places do you consider the riskiest?
2. Name all types of natural disasters mentioned in the article, choose one and try to explain its origin and cause.
3. Is there anything that can be done in order to prevent natural disasters?
4. How are natural disasters related to climate change?
5. Place the 10 risky places on the map of the USA

Task 12.2. Watch the video and make some comments about this volcano.

https://www.youtube.com/watch?v=2iRJb15W-14

a) Location b) Type c) Reasons of regular eruptions d) Consequences e) Predictions	

Task 12.3. For fun and profit

What do you know about the sky? Here are ABC-statements from the field of astronomy. Some of them are true and some are not. Discuss the answers with your group mates.

a) The Earth is about half the size of the Sun.
b) Jupiter circles the Sun once every 12 years.
c) A true star is a sphere of white-hot gas.
d) Stars shine by their own light.
e) The stratosphere is airless.

f) Stars are all bright red.

g) Most stars are sharp pointed

h) There are exactly 5, 483, 601 stars.

i) About half of the stars can be seen without the telescope.

j) 22 planets have been discovered in the Solar system now

k) Gravity holds the Earth in its orbit around the Sun.

l) Saturn like the Earth has only one moon.

m) The Sun's rays strike the Earth at different angles during different seasons of the year.

n) The Sun is the second nearest star to the Earth.

o) Jupiter is much nearer to the Sun than Mercury.

p) Stars twinkle because of our atmosphere.

q) The Sun's corona can be seen best during an eclipse.

r) The North Star is the only heavenly body that remains still.

s) Some stars are 600,000 times brighter than our Sun.

t) Rainbows are formed by sunlight passing through drops of water.

u) The Sun is 1 mln miles away from the Earth.

v) Some stars are more than 400 times as large as the Sun.

w). Stars sometimes explode.

x). The Sun moves across the sky at 12 miles per second.

y). Sirius is the brightest star in the sky.

z). Astronomy is thought to be the oldest science.

Task 12.4. What do you know about the Moon? Give any facts you know.

1. There are many forests on the Moon.
2. Clouds often hide the surface of the Moon.
3. Millions of meteors strike the Moon.
4. A day on the Earth is twice as long as a day on the Moon.
5. Stars can be seen in the daytime on the Moon.
6. The sky looks blue from the Moon.
7. Your hearing will be sharper on the Moon.
8. The Moon is 3 mln. miles away from the Earth.
9. Moonlight is really reflected by sunlight.
10. The Moon circles the Earth once every week.
11. The Earth weighs about 80 times as much as the Moon.
12. It is very noisy on the Moon.

Task 12.5. Presentations (Appendix, p. 146)

Presentation №1

Think about risky places in the world. What are they and what is the threat? Are there any ways to prevent such risks? Do some research on this subject and prepare a presentation.

Presentation №2

Make a short presentation on the most threatening environmental issue. Try to think of the causes, solutions and consequences.

Presentation №3

Choose one continent, which is the most endangered. Make a presentation introducing the state of the problem and suggest possible solutions.

https://learnenglishteens.britishcouncil.org/skills/reading/upper-intermediate-b2/end-life-earth

MODULE 2. THE GEOSCIENCES

Task 1. Watch the video «Careers in the Geosciences» and tell why a career in the Earth sciences is important: https://geology.com/articles/what-is-geology.shtml

Task 2. Can you name any of the geo sciences? What do they study?

The geosciences embrace a wide variety of well-defined scientific disciplines – specially developed avenues of precise inquiry into the nature of the Earth. They are **geography, geology, seismology, volcanology, oceanography, tectonics, geomagnetism an**d others.

Model: Mineralogists study minerals. Or Mineralogy studies minerals.

Task 3. Read and find new information about these sciences.

One of the geosciences most important to understanding Earth is *geology*. By studying rock formations, differentiations in rocks, and rock development, scientists can, with increasing accuracy, date the earth, explain phenomena that affect the earth structure – such as identifying meteors that hit the earth, and make predictions about the further development of the earth and how it may impact human, animal, and plant life. More specific applications of geology may examine the operation of systems like plate tectonics or the way in which volcanoes operate, called *volcanology*. Additional studies may include learning more about minerals through the field of *mineralogy*.

The geosciences also comprise specific disciplines that study the atmosphere and how it changes. Of these, the most commonly known is *meteorology*, which studies and predicts weather systems. *Climatology* examines weather patterns over long periods of time and also evaluates how humans may impact climate, such as the human use of fossil fuels that is creating global warming. *Paleoclimatology* poses theo-

ries about prehistoric weather systems, largely by examining glacier materials. *Atmospheric chemistry* examines the chemical values that compose the earth's atmosphere, and forms another branch of study in the geosciences.

The geosciences also rely on the study of plants and animals, *biology*. Specializations in fields of biology include *paleontology*, examinations of fossil life forms which can help identify relationships between prehistoric plants, animals, and their environment. *Biogeography* evaluates the location of species on Earth, and studies how geographic changes in the earth impact plant and animal populations. *Geomicrobiology* evaluates tiny organisms or parts or organisms and their interaction with things that are not organic, such as rocks and minerals.

In the geosciences, life is not only evaluated on the ground, but is also evaluated as it exists in ocean environments. *Oceanography* and *marine biology* evaluate living systems in the ocean, and subsets of these fields may evaluate fossil records of previous ocean life or look at the way rocks and minerals form in ocean settings. Consideration is also given to the attempt to map the ocean floor, which is not completely possible at this point, given that the depths of most oceans are often inaccessible to both humans and machines.

https://www.wise-geek.com/what-are-the-geosciences.htm

Task 4. Are the geosciences for you?

Do you:
> enjoy grappling with the biggest social and environmental challenges of our age?
> enjoy working in a fast-moving discipline and learning new skills?
> enjoy heading out into the field in all weathers?
> enjoy working in the lab and analyzing data with state-of-the-art methodologies?
> enjoy working as part of multidisciplinary teams?
> see the bigger picture of how different knowledge and skills can be used together to solve issues in society, the built and the natural environment?

Tsk 5. Related Career Titles. Read and try to pronounce them properly.

Economic Geologist	Environmental Geologist	Geochemist
Geomorphologist	Glaciologist	Hydrologist
Mineral Geologist	Mineralogist	Petrologist
Paleontologist	Petroleum Geologist	Sedimentologist
Stratigrapher	Volcanologist	Geophysicist
Seismologist	Climate Modeler	Meteorologist
Astronomer	Astrophysicist	Planetary Geologist
Geo-sample Collector	Engineering Technologist	Biological Oceanographer

Task 6. Related Major Skills. What skills and abilities should scientists of different fields have?

Knowledge of geologic history of local region	Ability to communicate effectively in writing
Ability to tell a story / oral scientific communication skills	Ability to develop and structure research projects
Ability to identify basic rock-forming minerals	Knowledge of interconnectedness of different "spheres"
Recognizing different types of natural hazards	Understanding of how and why to sample rocks and fossils
Data management	Knowledge of the basic field and laboratory safety techniques
Ability to read and construct topographic maps	Understanding plate tectonic processes
	Sense of geologic time
Ability to create visualizations	

Unit 1. Geology

What Is Geology? – What Does a Geologist Do?

1. What a geology as a science mean?
2. What Does a Geologist Do?
3. What does he study?
4. What can he make? (instructions, bulletins, maps, whatever)

Task 1. Read and check your answers.

Definition of Geology:

Geology is the study of the Earth, the materials of which it is made, the structure of those materials, and the processes acting upon them. It includes the study of organisms that have inhabited our planet. An important part of geology is the study of how Earth's materials, structures, processes and organisms have changed over time.

What Does a Geologist Do?

Geologists work to understand the history of our planet. The better they can understand Earth's history, the better they can foresee how events and processes of the past might influence the future. Here are some examples:

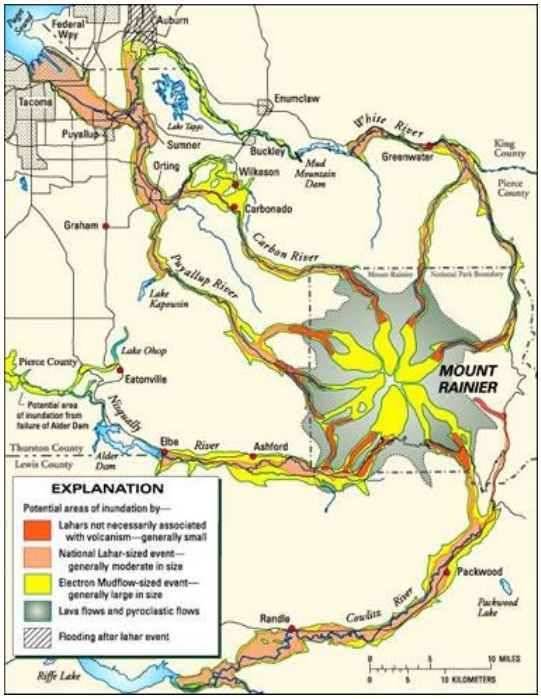
Geologists study:

Earth processes: Many processes such as landslides, earthquakes, floods, and volcanic eruptions can be hazardous to people. Geologists work to understand these processes well enough to avoid building important structures where they might be damaged. If geologists can prepare maps of areas that have flooded in the past, they can prepare maps of areas that might be flooded in the future. These maps can be used to guide the development of communities and determine where flood protection or flood insurance is needed.

Geologists study Earth materials: People use Earth materials every day. They use oil that is produced from wells, metals that are produced from mines, and water that has been drawn from streams or

from underground. Geologists conduct studies that locate rocks that contain important metals, plan the mines that produce them and the methods used to remove the metals from the rocks. They do similar work to locate and produce oil, natural gas, and groundwater.

Geologists study Earth history: Today we are concerned about climate change. Many geologists are working to learn about the past climates of Earth and how they have changed across time. This historical geology news information is valuable to understand how our current climate is changing and what the results might be.



Task 2. Volcanic Hazards Map

What do you need to prepare such map?

Volcanic Hazards Map: Geologists prepared this volcanic hazards map to communicate the location of hazardous areas to citizens, government agencies, and businesses. To prepare a map like this requires an understanding of volcanoes, an ability to recognize volcanic deposits in the field, an ability to prepare a map, and an ability to communicate. All geological tasks require a diversity of skills. This is why students who are interested in geology are encouraged to do well in all of their courses and to seek advanced training in Earth science, chemistry, physics, math, computers, and communication skills. USGS image.

Task 3. Geology as a Career

Geology can be a very interesting and rewarding career. Geologists work in a variety of settings. These include: natural resource companies, environmental consulting companies, government agencies, non-profit organizations, and universities. Many geologists do field work at least part of the time. Others spend their time in laboratories, classrooms or offices. All geologists prepare reports, do calculations and use computers.

Task 3.1. Answer the questions.

1. Is geology an interesting career?
2. Where can a geologist work?

Task 3.2. Translate the international words into Russian.

Geology, biological resources, physics, atmosphere, conservation, rational, scale, planet, solar system, spherical mass, gravitation, distance, rotation, temperature, fluctuation, process of erosion, constantly, topographical forms, chemical composition, volcanic action, seismic, physical activity, to orient, mineral, to indicate

Task 3.3. Translate the word combinations.

The study of the earth crust, the upper mantel of the earth crust, moderate temperatures, to power the Hydrologic Cycle, the surface of the planet, the geology of the beds, sufficient gravitational attraction, the interior of the earth, on a vast scale, substantial atmosphere, relatively minor fluctuations, subsidence of the parts.

Task 4. Watch the movie «The Relevance of Geology – Union College Geosciences (C03) » and tell about the relevance of Geology nowadays. https://geology.com/articles/what-is-geology.shtml

Task 5. Can you answer any of these questions?

1. What is the focus of an earthquake?
   A. Based on amplitudes of the largest seismic waves.
   B. The point on the Earth's surface directly above the focus.
   C. The place within the Earth where energy is released.
   D. Transmitted through solids and liquids.

2. What is the focus of the epicenter?
   A. The point on the Earth's surface directly above the focus.
   B. Vibrational energy waves that travel outward in all directions from the focus. They can be measured on a seismograph.
   C. Data from 3 seismic statins is used to triangulate the location of the epicenter.
   D. The place within the Earth where energy is released.

3. What is the difference in intensity between earthquakes with Richter magnitudes of 5 and 8?
   A. The place within the Earth where energy is released.
   B. Based on amplitudes of the largest seismic waves.
   C. Data from 3 seismic statins is used to triangulate the location of the epicenter.
   D. An increase of 1 fold increase of 1 on the scale =10 fold increase in intensity

4. What is the difference in energy released?

A. Based on amplitudes of the largest seismic waves.

B. A = 30 fold increase in energy released.

C. The place within the Earth where energy is released.

D. An increase of 1 fold increase of 1 on the scale =10 fold increase in intensity

5. What is the fastest type of seismic wave?

A. Richter Scale

B. Secondary waves

C. Primary waves

D. 3 Seismic Stations

6. Where do most earthquakes occur?

A. Along Plate Boundaries

B. Oceanic divergent boundaries

C. Landslides

D. Liquefaction

7. Where do you find the deepest focus earthquakes?

A. Subduction zones

B. Oceanic divergent boundaries

C. Continental rifts, collision zones and transforms

D. All of the above

8. How many seismographs are required to determine the location of the epicenter of an earthquake?

A. 3

B. 2

C. 4

D. 9

9. What are the major characteristics of P and S waves?

A. Compressional wave, slower seismic waves 6km per second, transmitted through only solids: Shear wave, fastest-3.5 km per second, transmitted through solids and liquids.

B. Shear wave, slower-3.5 km per second, transmitted only through solids.

C. Compressional wave, the fastest seismic waves 6km per second, transmitted through solids and liquids

D. Compressional wave, fastest seismic waves 6km per second, transmitted through solids and liquids: Shear wave, slower-3.5 km per second, transmitted only through solids.

10. Which type of seismic wave is responsible for causing the most damage?
    A. Surface Wave
    B. Primary Wave
    C. Secondary Wave
    D. Seismic Wave

11. What is a seismic gap?
    A. Based on amplitudes of the largest seismic waves.
    B. No reliable method
    C. Areas known to be under strain that have not produced earthquakes.
    D. Shear wave, slower-3.5 km per second, transmitted only through solids.

12. All of the following are several examples of earthquake hazards EXCEPT:
    A. Ground Motion
    B. Fire
    C. Tornado
    D. Tsunamis

REMEMBER:

How to Understand a Word Without Using a Dictionary

1. **Read the entire sentence.** It can be very frustrating to have your reading interrupted by an unknown word. If you are in the middle of an exam or an assignment for school or work, it can also be very stressful. If you can't reach for a dictionary, take other steps to figure out what the word means.
2. **Identify words you do understand.** You can often use other words in the sentence to help you define the unknown word. Think about what else is happening in the sentence. Hopefully, this will help you figure out whether the unknown word is a noun, verb, or adjective.
3. **Look for illustrative examples.** Once you have examined the other words in that sentence, you can move on. Start looking at the sentences that follow the unknown word. An author will often give descriptions that can help you figure out the meaning of an unknown word
4. **Think logically.** Sometimes, the context clues will not be as clear. You will have to use logic to figure out the word. You can also use experience, or prior knowledge, of the topic
5. **Use other context clues.** Sometimes an author will offer other types of clues. Look for restatement. This is where the meaning of the word is restated in other words.

Task 6.

6.1. Read the text. Try to understand the terms without using a dictionary.

Rocks and Their Classification

Rocks are formed by the action of the most various geological factors. Some of these agents are concealed in the earth's interior and are known as endogenous or initial agents; others are called exogenous or external agents and develop their activities on the surface of the lithosphere, their main source of energy being sunlight. Endogenous factors include, for instance, volcanic phenomena, forces causing the formation of mountains etc., whereas exogenous factors are water, wind, etc. Endogenous agents cause the formation of rocks, resulted from the cooling of magma as, for instance, granites, porphyries, etc. As their formation is connected with magma and the processes occurring there in, they have been termed magmatic or igneous rocks. Magmatic rocks are initial material from which all other rocks are derived. Exogenous agents affect the destruction of rocks and changes in their composition and structure, which result in the formation of the so-called sedimentary rock – sands, sandstones, clays, lime stones, etc. Finally, by coming into contact with molten magma or by being transferred into the interior regions of the lithosphere where they are subjected to the effect of high temperatures and pressures, rocks may completely or partially change their composition and texture. This may occur as the result of the penetration into the rocks of some certain chemical substances, and chiefly of the internal re-arrangement of their constituents. These rocks are known as metamorphic rocks and include gneisses, mica, schists, etc.

6.2. Find English equivalents to the following words and word combinations in the text.

1. различные геологические факторы
2. недра земли
3. главный источник энергии
4. остывание магмы
5. контактируя с расплавленной магмой
6. разрушение пород
7. подвергаться высоким температурам
8. частично изменять состав и текстуру
9. внутреннее перераспределение составляющих
10. первичный материал

6.3. a) Match the synonyms.

1. to include	a) to call
2. chiefly	b) to happen
3. to occur	c) to contain
4. for instance	d) substance
5. material	e) for example
6. to derive	f) to form
7. to term	g) mainly

b) Match the opposites.

1. external	a) destruction
2. concealed	b) exterior
3. formation	c) heating
4. interior	d) exposed
5. cooling	e) internal

6.4. Word building.

a) Form the verbs from the nouns. Translate them. E.g. calculation – to calculate (вычисление – вычислять)

Arrangement, destruction, penetration, formation, composition, constitution, inclusion, affection.

b) Translate into Russian the following groups of words.

1. formation – deformation
2. construction – destruction
3. to place – to displace
4. to connect – to disconnect
5. to appear – to disappear
6. to charge – to discharge
7. to agree – to disagree
8. to solve – to dissolve

6.5. Answer the questions.

1. How are rocks formed?
2. What agents do we call endogenous?
3. What agents do we call exogenous?
4. What do endogenous factors include?
5. What do we mean by exogenous factors?
6. What do exogenous agents affect?
7. What do we call igneous rocks?
8. What sedimentary rocks do you know?
9. When do rocks change their composition and texture?
10. What rocks are known as metamorphic rocks?

6.6. Translate the following sentences into English

1. Образование гор является результатом вулканического воздействия.

2. Породы из остывшей магмы образованы эндогенными агентами.

3. Все остальные породы происходят из магматических пород.

4. Во внутренних областях литосферы породы подвергаются высоким температурам и давлению.

5. Различные геологические факторы формируют породы.

6. Породы, образованные из остывшей магмы, называются магматическими или вулканогенными породами.

7. К осадочным породам относятся известняки, песчаники, глины и т.д.

8. Под влиянием давления и высоких температур, породы могут частично или полностью изменить свой состав и текстуру.

9. Метаморфические породы включают гнейс, слюду, сланцы.

10. Внешние факторы разрушают породу.

11. Эндогенные факторы скрыты в недрах земли и включают вулканические явления.

12. Основным источником энергии внешних агентов является солнечный свет.

13. Магматические породы – первоначальный материал, из которого произошли все остальные породы.

14. Метаморфические породы – это результат химического воздействия на породу, а также результат внутреннего изменения составляющих породы.

15. К метаморфическим породам относятся гнейс, слюда, аспидный сланец.

Task 7. Make a short presentation on the topic of your summer practice during your study at the university.

1. Location
2. Purpose
3. Findings
4. Feelings about it

Task 8. Translate the sentences into Russian paying attention to the use of Infinitives.

Примечание: Инфинитив / **Infinitive** – это неличная форма глагола, которая обозначает действие, но не показывает, кто его совершает, то есть не изменяется по лицам и числам. Эта начальная, или, как её ещё называют, неопределённая форма глагола отвечает на вопросы «что делать?», «что сделать?». Показатель инфинитива в английском языке – частица to. Для сравнения: в русском языке показатель инфинитива – суффикс -ть. **to play** – играть. **Appendix, p.136)**

a) To extract oil and natural gas from reservoirs, exploration and production companies must locate reservoirs and drill wells into the earth to bring the products to the surface.

b) Oil production in ancient times was too small to be of real economic interest.

c) Analyses of sediments of sandstones and of porous limestone were carried out to know more about the structure of the pay and the movements of fluids in its pore space.

d) Even small and middle-sized oil companies own or share a computer with a special library of software to do work in a reasonable time and without error.

e) In order for petroleum to form, the organic matter in the rocks must be exposed to the right pressure and temperature over a long period.

f) Modern methods and computer technology are necessary to obtain the best possible information about interesting exploration areas.

g) The crust of our earth is not transparent enough to allow any prediction on quantities of natural resources, which we cannot see, estimate, or calculate.

h) Magnetic measurements can be used to determine the thickness and distribution of the rocks in the earth's crust.

i) Three conditions must be present for oil reservoirs to form: a rich source rock, a migration conduit and a trap (seal) that forms the reservoir.

j) Some wells (secondary wells) may be used to pump water, steam and acids or various gas mixtures.

k) Tertiary oil recovery reduces the oil's viscosity to increase oil production.

l) Secondary oil recovery uses various techniques to aid in recovery oil from depleted or low-pressure reservoir.

m) Occasionally detergents are used to decrease oil viscosity.

n) In order to provide the conduit for the petroleum to flow to the surface, a hole must be drilled to the petroleum-bearing formation.

o) Something must be known of the character of the formations to be penetrated in reaching the producing horizon in order to select the proper drilling system.

Task 9. Translate the sentences into Russian. Pay attention to modal verbs and their equivalents.

Примечание: Модальные глаголы (modal verbs) – это особая группа глаголов. Они обозначают возможность, вероятность, необходимость или способность совершить какое-то действие. Есть модальные глаголы, используя которые, вы можете рассказать об умениях человека (can/could), запретить или приказать кому-либо что-то делать (must), дать совет (should). Модальные глаголы не выражают конкретных процессов (действий), а показывают лишь отношение говорящего к действию, оценку действия, т. е. возможность, необходимость, предположительность, долженствование, разрешение и т. д. **Appendix, p. 175)**

1. During the earliest times petroleum may have been used for firebrands and fire darts only.
2. Not only geophysical but also geological methods had to be improved to fit the requirements of drilling site and oil field geology.
3. Theoretical results from laboratories had to be applied to the fieldwork and could be controlled by the results of production.
4. If the rock is very porous it may store big quantities of petroleum in its pores and so form a reservoir.
5. The degree of magnetism varies from one type of rock to another, and the variations can be measured with highly sensitive instruments.
6. Crude oil may contain metallic elements.
7. Isotropic analysis of oil tars showed that they are of Mesozoic age and must have come from Mesozoic sediments that were lying above the metamorphic rocks before.
8. A pay is a porous and permeable formation, which is able to gather and to produce petroleum hydrocarbons.
9. A good pay for producing oil should have porosity higher than 20% and permeability of more than 300 millidarcy. (единица дарси) и миллидарси (мд или мД) представляют собой единицы из проницаемости, названные в честь Генри Дарси. Это не единицы СИ, но они широко используются в нефтяной инженерии и геологии.)
10. Natural gases may be called sweet or sour, dry or wet.
11. For the exploitation it is much more important to know which types of reservoir are to be expected in a certain basis or major structure and how they may be found by geologic and geophysical methods.
12. The results are to be shown in a tabular form.
13. They ought to apply a computer for solving these problems.
14. Oilmen are to overcome a lot of difficulties while developing this oilfield.
15. Geologists will be able to use a new make of field computers.

Unit 2. Geography

Task 1. Answer the questions, then read and check.

14. What is geography?
15. What do geographers explore?
16. What else do they examine?
17. What do they try to understand?

Geography is the study of places and the relationships between people and their environments. Geographers explore both the physical properties of Earth's surface and the human societies spread across it. They also examine how human culture interacts with the natural environment and the way those locations and places can have an impact on people. Geography seeks to understand where things are found, why they are there, and how they develop and change over time.

Task 2. Read and correct the information below.

Ancient Geographers. Do you know anything about the history of geography?

The term "geography" comes to us from the ***ancient Greeks***, who needed a word to describe the writings and maps that were helping them make sense of the world in which they lived. In Greek, *geo* means "earth" and *-graphy* means "to write." Using geography, Greeks developed an understanding of where their homeland was located in relation to other places, what their own and other places were like, and how people and environments were distributed. These concerns have been central to geography ever since.

Of course, the Greeks were not the only people interested in geography. Throughout human history, most societies have sought to understand something about their place in the world, and the people and environments around them.

Indeed, mapmaking probably came even before writing in many places. But ancient Greek geographers were particularly influential. They developed very detailed maps of areas in and around Greece, including parts of Europe, Africa, and Asia. More importantly, they also raised questions about how and why different human and natural patterns came into being on Earth's surface, and why variations existed from place to place. The effort to answer these questions about patterns and distribution led

them to figure out that the world was round, to calculate Earth's circumference, and to develop explanations of everything from the seasonal flooding of the Nile River to differences in population densities from place to place.

During ***the Middle Ages,*** geography ceased to be a major academic pursuit in Europe. Advances in geography were chiefly made by scientists of the Muslim world, based around ***the Arabian Peninsula and North Africa.*** Geographers of this Islamic Golden Age created the world's first rectangular map based on a grid, a map system that is still familiar today. Islamic scholars also applied their study of people and places to agriculture, determining which crops and livestock were most suited to specific habitats or environments.

In addition to the advances in ***the Middle East, the Chinese*** empire in Asia also contributed immensely to geography. Until about 1500, China was the most prosperous civilization on Earth. The Chinese were scientifically advanced, especially in the field of astronomy. Around 1000, they also achieved one of the most important developments in the history of geography: They were the first to use the compass for navigational purposes. In the early 1400s, the explorer Cheng Ho embarked on seven voyages to the lands bordering the China Sea and the Indian Ocean, establishing China's dominance throughout Southeast Asia.

1) The term "geography" comes to us from the ***ancient Englishmen***, who needed a word to describe the writings and maps that were helping them make sense of the world in which they lived.

2) Indeed, mapmaking probably came even before writing in many places. But ancient Greek geographers were particularly influential. They developed very detailed maps of areas in and around Greece, including parts of Europe, Africa, and Australia.

3) Geographers of this Islamic Golden Age created the world's first square map based on a grid, a map system that is still familiar today.

4) Until about 1500, China was the most prosperous civilization on Earth. The Chinese were scientifically advanced, especially in the field of algebra.

Task 3. Read the text and choose the best title for it.

1. Age of Marco Polo
2. Age of Discovery
3. Age of geography as an academic discipline.

Through the 13th-century travels of the Italian explorer Marco Polo, Europeans learned about the riches of China. Curiosity was awakened; a desire to trade with

wealthy Asian cultures motivated a renewed interest in exploring the world. The period of time between the 15th and 17th centuries is known in the West as the Age of Exploration or the Age of Discovery.

With the dawn of the Age of Discovery, the study of geography regained popularity in Europe. The invention of the printing press in the mid-1400s helped spread geographic knowledge by making maps and charts widely available. Improvements in shipbuilding and navigation facilitated more exploring, greatly improving the accuracy of maps and geographic information.

Greater geographic understanding allowed European powers to extend their global influence. During the Age of Discovery, European nations established colonies around the world. Improved transportation, communication, and navigational technology allowed countries such as the United Kingdom to successfully govern colonies as far away as the Americas, Asia, Australia, and Africa.

Geography was not just a subject that made colonialism possible, however. It also helped people understand the planet on which they lived. Not surprisingly, geography became an important focus of study in schools and universities.

Geography also became an important part of other academic disciplines, such as chemistry, economics, and philosophy. In fact, every academic subject has some geographic connection. Chemists study where certain chemical elements, such as gold or silver, can be found. Economists examine which nations trade with other nations, and what resources are exchanged.

REMEMBER:

Key tips

1) Vocabulary – Summary completion questions are all about vocabulary. You need to be able to recognize a wide range of synonyms and also paraphrasing to score highly.

2) Answer order – The answers are usually in the same order in the text as the order of the missing words. On the rare occasions that they aren't, the key words will help you to easily spot this.

3) Words from text questions – Take careful note of how many words you should write for your answer.

4) List of words questions – There will be more words in the list than there are gaps in the summary to fill so you won't need them all. Your task is to select the correct ones.

There will probably be some words in the list that you can eliminate immediately as clearly being incorrect. This could be because of their meaning or their grammar form. Cross them through in pencil so you don't waste time considering them.

5) Prediction – When you read the summary, try to predict the type of word you'll need to fill each gap from the context of the sentence. Is it an adjective, a noun, a verb, etc.? Doing this will make it much easier to spot the correct word because you'll have a big clue as to what you're looking for.

6) Use other clues – If you are able to predict the word form, e.g. an adjective, look for the adjective closest to the key word in the text. This will probably be the word you need or a synonym of it. I'll illustrate this when we come to the example exercise.

7) Time management – If you're struggling to find a specific missing word, take an educated guess and move on. It's not worth losing too much time on it. Focus on getting the easier marks and come back to it later if you have time.

8) Check grammar – When you've entered your answer, check the sentence to ensure that it is grammatically correct. If it isn't, your answer is wrong.

9) Don't read it all – You don't need to read the whole text in detail, just the part that is summarized.

The Strategy

1. Carefully read the instructions taking particular note of where you should get the missing words from – a word list or the text. If it's the text, note the word limit for your answer, e.g. no more than two.

2. Skim read the summary to get a general understanding of what it's about.

3. Next, read the summary in more detail and try to predict the type of word needed to fill each gap, e.g. verb, noun, adjective, and what that word might be. Don't spend too long on this but it will save you time later if you do it.

4. If the question includes a list of words, see if you can guess any answers. You may be able to narrow it down to 2 or 3. There will be others that will obviously be wrong.

5. The summary will normally relate to one section of the text, probably 2-3 paragraphs. Your next job is to identify this.

Pick out a few key words from the summary to scan for. Names, numbers, places or dates are ideal if there are any in the summary as these will be easy to spot. Remember that synonyms could be used. When you've made your selection, scan the text for them.

6. Read the first sentence of the summary with a gap in it. Try to work out what form of word will fit, e.g. an adjective, the past tense of a verb, a countable noun. You may even be able to predict the missing word itself or a synonym.

7. Identify one or two key words and scan the section of text for them, watching out for synonyms and paraphrasing.

8. When you've found the part of the text with the answer in, read it in detail to identify the word you need, either in the text itself or from the word list.

9. Check your answer to ensure that the sentence is grammatically correct.

10. Repeat this process for the rest of the missing words.

Task 4. Read the text and fill in the summary with the necessary phrases below.

Emergence of Modern Geography

What distinguishes geography is that it approaches the study of diverse topics in a particular way (that is, from a particular perspective). Geography asks spatial questions – how and why things are distributed or arranged in particular ways on Earth's surface. It looks at these different distributions and arrangements at many different

scales. It also asks questions about how the interaction of different human and natural activities on Earth's surface shape the characteristics of the world in which we live.

Geography seeks to understand where things are found and why they are present in those places; how things that are located in the same or distant places influence one another over time; and why places and the people who live in them develop and change in particular ways. Raising these questions is at the heart of the "geographic perspective."

Exploration has long been an important part of geography. But exploration no longer simply means going to places that have not been visited before. It means documenting and trying to explain the variations that exist across the surface of Earth, as well as figuring out what those variations mean for the future.

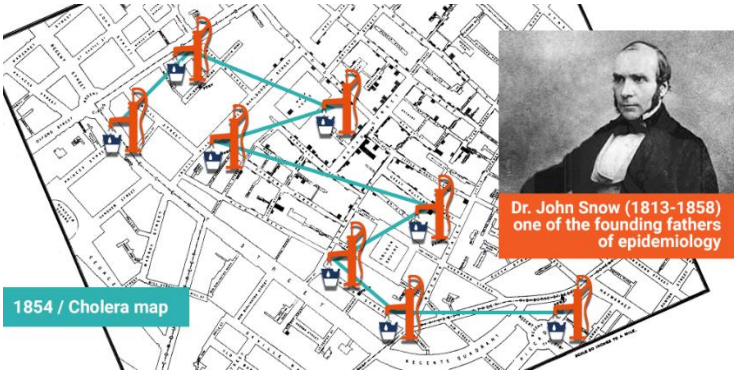
The age-old practice of mapping still plays an important role in this type of exploration, but exploration can also be done by using images from satellites or gathering information from interviews. Discoveries can come by using computers to map and analyze the relationship among things in geographic space, or from piecing together the multiple forces, near and far, that shape the way individual places develop.

Applying a geographic perspective demonstrates geography's concern not just with where things are, but with "the why of where"–a short, but useful definition of geography's central focus.

The insights that have come from geographic research show the importance of asking "the why of where" questions. Geographic studies comparing physical characteristics of continents on either side of the Atlantic Ocean, for instance, gave rise to the idea that Earth's surface is comprised of large, slowly moving plates – plate tectonics.

Studies of the geographic distribution of human settlements have shown how economic forces and modes of transport influence the location of towns and cities. For example, geographic analysis has pointed to the role of the U.S. Interstate Highway System and the rapid growth of car ownership in creating a boom in U.S. suburban growth after World War II. The geographic perspective helped show where Americans were moving, why they were moving there, and how their new living places affected their lives, their relationships with others, and their interactions with the environment.

Geographic analyses of the spread of diseases have pointed to the conditions that allow particular diseases to develop and spread. Dr. John Snow's cholera map stands out as a classic example. When cholera broke out in London, England, in 1854, Snow represented the deaths per household on a street map. Using the map, he was able to trace the source of the outbreak to a



water pump on the corner of Broad Street and Cambridge Street. The geographic perspective helped identify the source of the problem (the water from a specific pump) and allowed people to avoid the disease (avoiding water from that pump).

Investigations of the geographic impact of human activities have advanced understanding of the role of humans in transforming the surface of Earth, exposing the spatial extent of threats such as water pollution by manmade waste. For example, geographic study has shown that a large mass of tiny pieces of plastic currently floating in the Pacific Ocean is approximately the size of Texas. Satellite images and other geographic technology identified the so-called "Great Pacific Garbage Patch."

These examples of different uses of the geographic perspective help explain why geographic study and research is important as we confront many 21st century challenges, including environmental pollution, poverty, hunger, and ethnic or political conflict.

Because the study of geography is so broad, the discipline is typically divided into specialties. At the broadest level, geography is divided into ***physical geography, human geography, geographic techniques, and regional geography.***

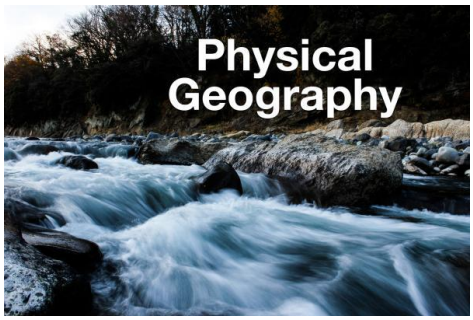
Summary

Geography is deeply interested in……And it seeks to understand…….. Exploration has long been an important part of geography, but it doesn't mean going to unknown places. It means…….. The age-old practice of mapping still plays an important role in this type of exploration, but exploration can also be done by …….. Geographic studies comparing physical characteristics of continents on either side of the Atlantic Ocean, for instance, gave rise to the idea that……. Studies of the ……have shown how economic forces and modes of transport influence the location of towns and cities. Geographic analyses of the spread of diseases have pointed……Dr. John Snow's cholera map stands out as a classic example. Investigations of the ……..have advanced understanding of the role of humans in transforming the surface of Earth, exposing the spatial extent of threats such as water pollution by manmade waste. These examples of different uses of the geographic perspective help explain why……..

Read in details and think what parts of the text were omitted and why. What rules of summary making are used here? (Appendix, p.143)

Task 5. Read about different branches of geography and give the short survey of them.

Physical Geography



The natural environment is the primary concern of physical geographers, although many physical geographers also look at how humans have altered natural systems. Physical geographers study Earth's seasons, climate, atmosphere, soil, streams, landforms, and oceans. Some disciplines within physical geography include geomorphology, glaciology, pedology, hydrology, climatology, biogeography, and oceanography.

Geomorphology is the study of landforms and the processes that shape them. Geomorphologists investigate the nature and impact of wind, ice, rivers, erosion, earthquakes, volcanoes, living things, and other forces that shape and change the surface of the Earth.

Glaciologists focus on the Earth's ice fields and their impact on the planet's climate. Glaciologists document the properties and distribution of glaciers and icebergs. Data collected by glaciologists has demonstrated the retreat of Arctic and Antarctic ice in the past century.

Pedologists study soil and how it is created, changed, and classified. Soil studies are used by a variety of professions, from farmers analyzing field fertility to engineers investigating the suitability of different areas for building heavy structures.

Hydrology is the study of Earth's water: its properties, distribution, and effects. Hydrologists are especially concerned with the movement of water as it cycles from the ocean to the atmosphere, then back to Earth's surface. Hydrologists study the water cycle through rainfall into streams, lakes, the soil, and underground aquifers. Hydrologists provide insights that are critical to building or removing dams, designing irrigation systems, monitoring water quality, tracking drought conditions, and predicting flood risk.

Climatologists study Earth's climate system and its impact on Earth's surface. For example, climatologists make predictions about El Nino, a cyclical weather phenomenon of warm surface temperatures in the Pacific Ocean. They analyze the dramatic worldwide climate changes caused by El Nino, such as flooding in Peru, drought in Australia, and, in the United States, the oddities of heavy Texas rains or an unseasonably warm Minnesota winter.

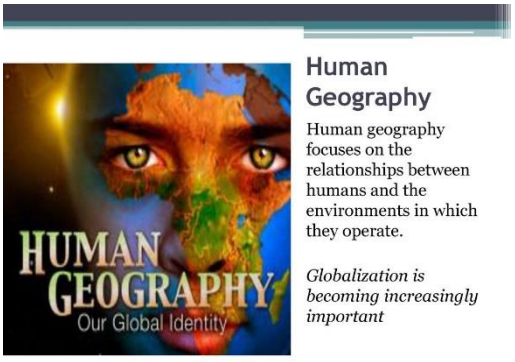
Bio geographers study the impact of the environment on the distribution of plants and animals. For example, a bio geographer might document all the places in the world inhabited by a certain spider species, and what those places have in common.

Oceanography, a related discipline of physical geography, focuses on the creatures and environments of the world's oceans. Observation of ocean tides and currents constituted some of the first oceanographic investigations. For example, 18th-century mariners figured out the geography of the Gulf Stream, a massive current flowing like a river through the Atlantic Ocean. The discovery and tracking of the Gulf Stream helped communications and travel between Europe and the Americas.

Today, oceanographers conduct research on the impacts of water pollution, track tsunamis, design offshore oil rigs, investigate underwater eruptions of lava, and study all types of marine organisms from toxic algae to friendly dolphins.

Human Geography

Human geography is concerned with the distribution and networks of people and cultures on Earth's surface. A human geographer might investigate the local, regional, and global impact of rising economic powers China and India, which represent 37 percent of the world's people. They also might look at how consumers in China and India adjust to new technology and markets, and how markets respond to such a huge consumer base.



Human geographers also study how people use and alter their environments. When, for example, people allow their animals to overgraze a region, the soil erodes and grassland is transformed into desert. The impact of overgrazing on the landscape as well as agricultural production is an area of study for human geographers.

Finally, human geographers study how political, social, and economic systems are organized across geographical space. These include governments, religious organizations, and trade partnerships. The boundaries of these groups constantly change.

The main divisions within human geography reflect a concern with different types of human activities or ways of living. Some examples of human geography include urban geography, economic geography, cultural geography, political geography, social geography, and population geography. Human geographers who study geographic patterns and processes in past times are part of the sub discipline of historical geography. Those who study how people understand maps and geographic space belong to a sub discipline known as behavioral geography.

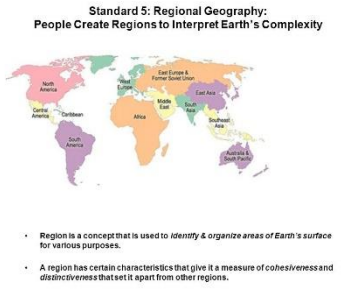
Many human geographers interested in the relationship between humans and the environment work in the sub disciplines of cultural geography and political geography.

Cultural geographers study how the natural environment influences the development of human culture, such as how the climate affects the agricultural practices of a region. Political geographers study the impact of political circumstances on interactions between people and their environment, as well as environmental conflicts, such as disputes over water rights.

Some human geographers focus on the connection between human health and geography. For example, health geographers create maps that track the location and spread of specific diseases. They analyze the geographic disparities of health-care access. They are very interested in the impact of the environment on human health, especially the effects of environmental hazards such as radiation, lead poisoning, or water pollution.

Regional Geography

Regional geographers take a somewhat different approach to specialization, directing their attention to the general geographic characteristics of a region. A regional geographer might specialize in African studies, observing and documenting the people, nations, rivers, mountains, deserts, weather, trade, and other attributes of the continent. There are different ways you can define a region. You can look at



climate zones, cultural regions, or political regions. Often regional geographers have a physical or human geography specialty as well as a regional specialty.

Regional geographers may also study smaller regions, such as urban areas. A regional geographer may be interested in the way a city like Shanghai, China, is growing. They would study transportation, migration, housing, and language use, as well as the human impact on elements of the natural environment, such as the Huangpu River.

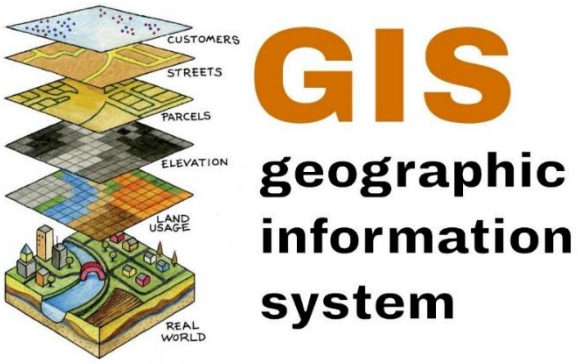
Whether geography is thought of as a discipline or as a basic feature of our world, developing an understanding of the subject is important. Some grasp of geography is essential as people seek to make sense of the world and understand their place in it. Thinking geographically helps people to be aware of the connections among and between places and to see how important events are shaped by where they take place. Finally, knowing something about geography enriches people's lives–promoting curiosity about other people and places and an appreciation of the patterns, environments, and peoples that make up the endlessly fascinating, varied planet on which we live.

Geographic information science

Specialists in geographic techniques study the ways in which geographic processes can be analyzed and represented using different methods and technologies. Mapmaking, or cartography, is perhaps the most basic of these. Cartography has been instrumental to geography throughout the ages.

As early as 1500 BC, Polynesian navigators in the Pacific Ocean used complex maps made of tiny sticks and shells that represented islands and ocean currents they would encounter on their voyages. Today, satellites placed into orbit by the U.S. Department of Defense communicate with receivers on the ground called global positioning system (GPS) units to instantly identify exact locations on Earth.

Today, almost the entire surface of Earth has been mapped with remarkable accuracy, and much of this information is available instantly on the internet. One of the most remarkable of these websites is Google Earth, which "lets you fly anywhere on Earth to view satellite imagery, maps, terrain, 3D buildings, from galaxies in outer space to the canyons of the ocean." In essence, anyone can be a virtual Christopher Columbus from the comfort of home.



Technological developments during the past 100 years have given rise to a number of other specialties for scientists studying geographic techniques. The airplane made it possible to photograph land from above. Now,

there are many satellites and other above-Earth vehicles that help geographers figure out what the surface of the planet looks like and how it is changing.

Geographers looking at what above-Earth cameras and sensors reveal are specialists in remote sensing. Pictures taken from space can be used to make maps, monitor ice melt, assess flood damage, track oil spills, predict weather, or perform endless other functions. For example, by comparing satellite photos taken from 1955 to 2007, scientists from the U.S. Geological Survey (USGS) discovered that the rate of coastal erosion along Alaska's Beaufort Sea had doubled. Every year from 2002 to 2007, about 45 feet per year of coast, mostly icy permafrost, vanished into the sea.

Computerized systems that allow for precise calculations of how things are distributed and relate to one another have made the study of geographic information systems (GIS) an increasingly important specialty within geography. Geographic information systems are powerful databases that collect all types of information (maps, reports, statistics, satellite images, surveys, demographic data, and more) and link each piece of data to a geographic reference point, such as geographic coordinates. This data, called geospatial information, can be stored, analyzed, modeled, and manipulated in ways not possible before GIS computer technology existed.

The popularity and importance of GIS has given rise to a new science known as geographic information science (GISci). Geographic information scientists study patterns in nature as well as human development. They might study natural hazards, such as a fire that struck Los Angeles, California, in 2008. A map posted on the internet showed the real-time spread of the fire, along with information to help people make decisions about how to evacuate quickly. GIS can also illustrate human struggles from a geographic perspective, such as the interactive online map published by the New York Times in May 2009 that showed building foreclosure rates in various regions around the New York City area.

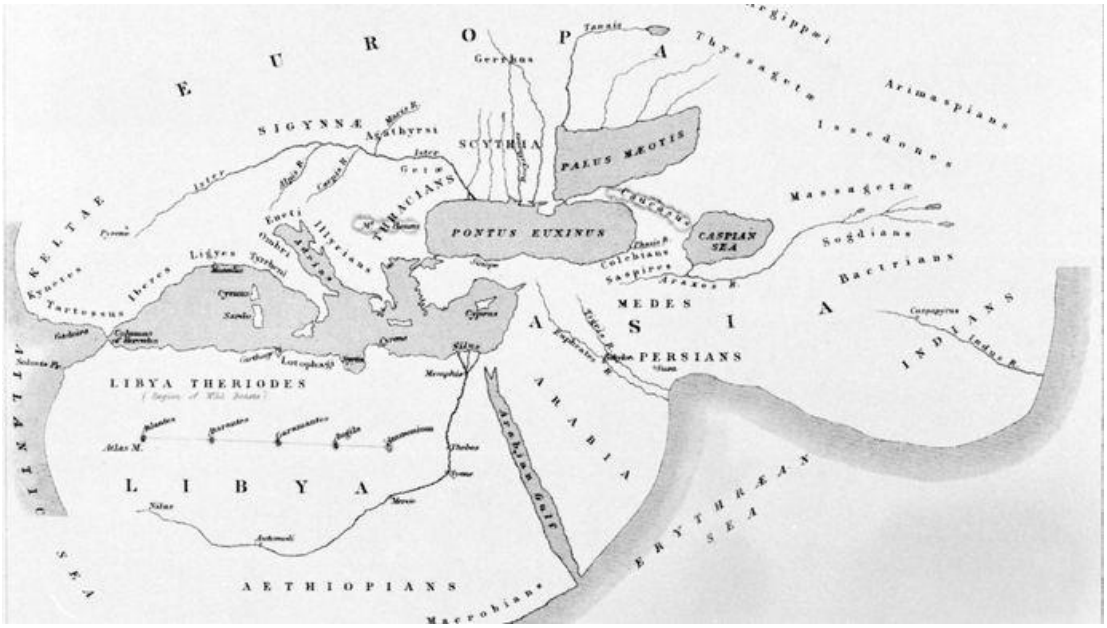
The enormous possibilities for producing computerized maps and diagrams that can help us understand environmental and social problems have made geographic visualization an increasingly important specialty within geography. This geospatial information is in high demand by just about every institution, from government agencies monitoring water quality to entrepreneurs deciding where to locate new businesses.

What branch of geography are you interested in and why? Make up a short story about it.

Task 6. The emergence of geography: exploration and mapping. Read and answer the questions.

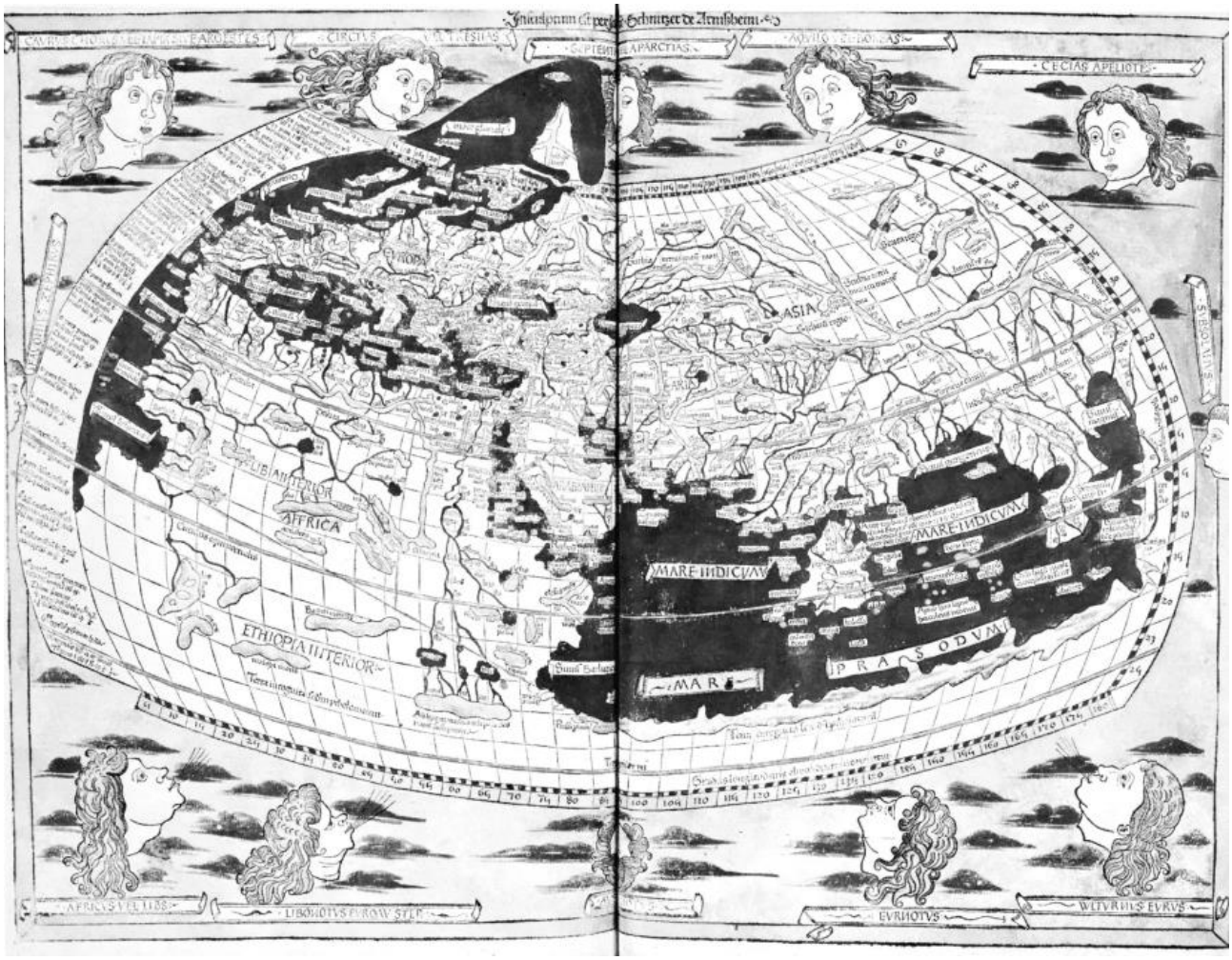
1. Who was Herodotus?
2. What was written in his book *Geographica?*
3. What did Ptolemy collate?
4. What did the Greeks and Romans accumulate?
5. How did Crusades help develop geography?
6. What term did Gerardus Mercator introduce?
7. What are James Cook and Georges-Louis Leclerc, comte de Buffon famous for?

As people travel, they encounter different environments and peoples. Such variations are intellectually stimulating: Why do people and places differ? Stores of knowledge were built up about such new and exotic places, as demonstrated by the Greek philosopher and world traveler Herodotus in the 5th century BC. That knowledge became known as geography, a term first used as the title of Eratosthenes of Cyrene's book *Geographica* in the 3rd century BC. Such was the volume of knowledge compiled thereafter that Strabo's *Geography*, published three centuries later, comprised 17 volumes. Its first two provided a wide-ranging review of previous writings, and the other 15 contained descriptions of particular parts of what was then the known world. Soon thereafter Ptolemy collated a large amount of information about the latitude and longitude of places in his seminal work.



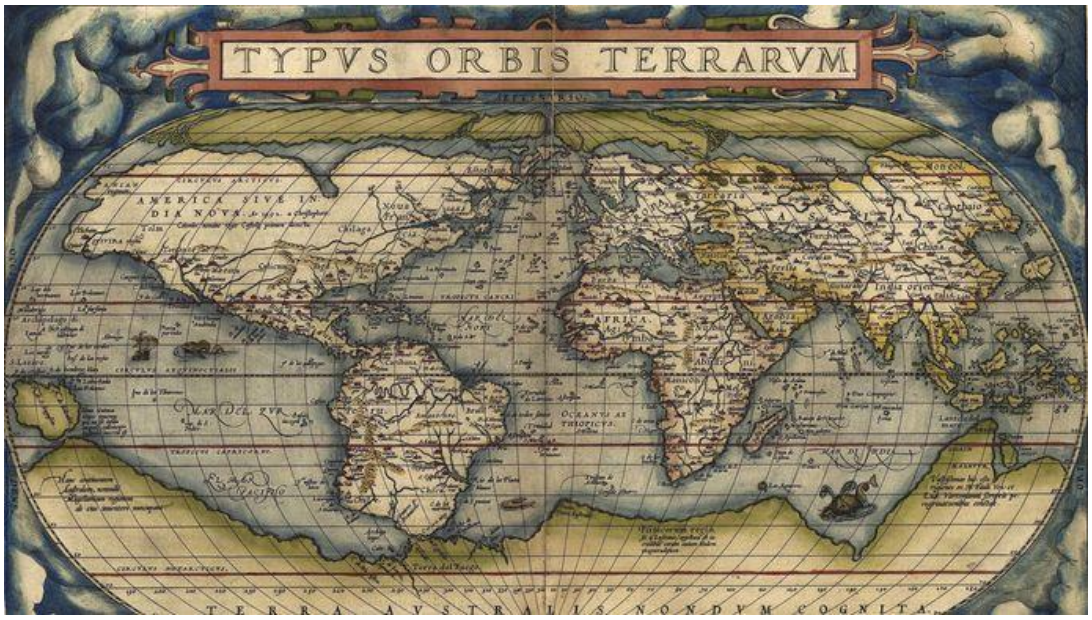
World according to Herodotus
Map of the world, based on the description given by Herodotus (5th century BC).
Library of Congress, Washington, D.C.

The Greeks and Romans not only accumulated a great body of knowledge about Earth but also developed the sciences of astronomy and mapmaking, which helped them accurately locate places. However, during western Europe's Migration period (Dark Ages), much of that wisdom was lost, but the study of geography–notably cartography–was nurtured in the Arab world. This material became known to western Europeans during medieval times, partly through their contacts with the Muslim world during the Crusades. As the Europeans linked this new material with what they could rediscover in ancient Greek and Roman work, they frequently stressed misinformation derived from the latter, notably in Ptolemy's inaccurate maps. From then on, as Europeans explored more of the world, increasing numbers of scholars collated new information and transmitted it to wider audiences.



Ptolemy: world map
Ptolemy's map of the world, as printed at Ulm, 1482.
Library of Congress, Washington, D.C.

Map from Abraham Ortelius's Theatrum orbis terrarum



World map from *Theatrum orbis terrarum* ("Theatre of the World") by Abraham Ortelius, 1570.
Geography and Map Division/The Library of Congress, Washington D.C.

Meanwhile, collections of maps were assembled and published in atlases, a term first used by the 16th-century Flemish surveyor and cartographer Gerardus Mercator (Gerhard de Cremer) for his collection of maps of northern Europe, published in 1595; the first collection of maps of the world, *Epitome of the Theatre of the World* (1570), was produced by Mercator's contemporary, the Belgian cartographer Abraham Ortelius. The science of surveying was employed to make detailed large-scale maps of the land surface; notable was the work of the Cassini family, in France, spanning more than a century, which was the basis for the world's first national atlas, published in 1791.

Many expeditions, such as those of James Cook in the second half of the 18th century, conducted scientific experiments that enabled advances in navigation and cartography and collected samples of flora and fauna that were used to classify knowledge about the natural world–as in the pioneering work of the 18th-century French naturalist Georges-Louis Leclerc, comte de Buffon. These links between geography, exploration, cartography, and astronomy have been maintained, appearing as the first sections of many contemporary atlases (with maps of the heavens along with terrestrial phenomena such as climate). As information accumulated, a new branch of geography was established by the late Middle Ages, called chorography (or chorology).

Since 1945, while retaining its focus on people, places, and environments, the discipline has expanded and changed considerably. Geography is one of the few academic disciplines, particularly in Europe, to have been established in universities as a

result of pressure to produce people who could teach it in schools. As the demand for geographical information increased, more people required a foundation of geographical knowledge. There was also growing recognition of the role geography could play in creating national identities, making people aware of their particular situations through contrasts with environments and peoples elsewhere.

Task 7. Find examples of the Passive Voice in the text.

Примечание: залог (voice) – это одна из категорий английского глагола. Активный залог (active voice) в предложении указывает на то, что подлежащее совершает действие само. Пассивный, или страдательный, залог (passive voice) говорит о том, что действие совершено над подлежащим.

He writes articles. – Он пишет статьи.

В этом предложении He – подлежащее, и он совершает действие – writes articles (пишет статьи). Поэтому мы используем глагол в активном залоге.

These articles are written by him. – Эти статьи написаны им.

В пассивном залоге дополнение (articles) становится подлежащим, которое само по себе никакого действия не совершает. Наоборот, действие произведено над статьями – они написаны (are written). Таким образом, страдательный залог смещает акцент с человека на его статьи.

Geography after 1945

For the first half of the 20th century, therefore, the core of European and American geographical scholarship involved identifying and describing areal variations of the Earth's environments and their exploitation by human societies and, to a lesser extent, accounting for the creation of distinctive places. This knowledge was valuable for general education and was deployed in the two World Wars for military purposes. Geographers' skills in interpreting cartographic and aerial photographic information were also substantially employed. In the Soviet Union and the countries of eastern Europe, the direction of research in geography–as in other disciplines–was subordinated to state priorities. There physical geography became dominant, and for several decades links with the West were limited.

Geography as a science: a new research agenda

There was also a growing belief that the methods for defining regions were out of line with the scientific approaches characterizing other disciplines. Some felt that geographers had not contributed well to the war effort: Edward A. Ackerman, a professor of geography at the University of Chicago from 1948 to 1955 (and later head of the Carnegie Foundation), claimed that those working in the U.S. government's intelligence service had only a weak understanding of their material and portrayed them as "more or less amateurs in the subjects on which they published." He argued that geographers should follow not only the natural sciences but also most of the social sciences

and should adopt more-rigorous research procedures. The success of those promoting change was assisted by the expansion of higher education.

Task 8. Read the text and try to understand the meaning of the terms without dictionaries.

Physical geography and physical systems

Because of these changes, physical geography moved away from inductive accounts of environments and their origins and toward analysis of physical systems and processes. Interest in the physiography of the Earth's surface was replaced by research on how the environment works.

The clearest example of this shift came in geomorphology, which was by far the largest component of physical geography. There were three other main groups of physical geographers, two of whose work was also much influenced by the concepts of evolution. Workers in biogeography studied plants and, to a lesser extent, animals. The geography of plants reflects environmental conditions, especially climate and soils; bio geographical regions are characterized by those conditions and their floral assemblages, which produce patterns based on latitude and elevation. The study of soils, or pedology, was concerned with the thin mantle of weathered material on the Earth's surface that sustains plant and animal life. World regions were identified based on underlying rocks and the operative physical and chemical weathering processes. Climatic conditions were important influences on soil types, with local variations reflecting differences in surface deposits and topography. As with landforms and plant communities, it was assumed that soils evolve toward a steady state, as weathering proceeds and characteristic soil profiles emerge for each region.

Finally, there was climatology, or the study of major world climatic systems and their associated local weather patterns in space and time. Much of the work was descriptive, identifying major climatic regions and relating them to solar and earth geometry. Others investigated the generation of seasonal and local weather patterns through the movements of weather systems, such as cyclones and anticyclones.

Hurricane Catarina

Hurricane Catarina, as viewed from the International Space Station, 2004.

National Aeronautics and Space Administration (NASA)(Image Number: ISS008-E-19646).

Match the terms to their definitions

physiography	the study of the distribution of species and ecosystems in geographic space and through geological time
geomorphology	a coordinate that specifies the north–south position of a point on the surface of the Earth or another celestial body.
biogeography	the study of the forms and features of land surfaces.
latitude	the height of a place above the level of the sea
elevation	the scientific study of the origin and evolution of topographic and bathymetric features created by physical, chemical or biological processes operating at or near Earth's surface.
pedology	the branch of natural science which deals with the processes and patterns in the natural environment such as the atmosphere, hydrosphere, biosphere, and geosphere.
topography	the scientific study of Earth's climate, typically defined as weather conditions averaged over a period of at least 30 years
climatology	a discipline within soil science which focuses on understanding and characterizing soil formation, evolution, and the theoretical frameworks for modeling soil bodies, often in the context of the natural environment

Task 9. Read and tell what changes in the development of Physical geography happened.

Physical geography

Since the reorientation after 1970 of physical geography to the study of systems of natural environmental processes, there have been major changes in both research and teaching. The importance of water in erosion plus the transport and deposition of sedimentary materials is reflected by work in geographical hydrology. This relative emphasis on water in contemporary physical geography undoubtedly indicates the concentration of English-speaking geographers working in temperate latitudes. There is also substantial work in glaciology, reflecting ice's role in creating many current temperate environments, as well as – especially in the case of polar ice – in contemporary climatic change. Similarly, much work is being done on dry land areas, a consequence of political as well as intellectual interest in desertification and land degradation.

Melting glacial ice, San Rafael Glacier, Chile.

Task 10. Read and tell what these branches of geography study.

Economic geography has a long pedigree. Its traditional focus has been the distribution of various productive activities–with subdivisions into, for example, the geography of agriculture, industrial geography, and the geography of services–and patterns

of trade such as transport geography. Such concentrations were strengthened by the move into spatial analysis

Political geography also has a considerable pedigree, although it attracted little attention during the mid-20th century. Its main concerns are with the state and its territory–with states' external relations and the relationships between governments and citizens. The geography of conflict incorporates both local conflicts, over such matters as land use and environmental issues, and international conflicts, including the growth of nationalism and the creation of new states.

Social geography concentrates on divisions within society, initially class, ethnicity, and, to a lesser extent, religion; however, more recently others have been added, such as gender, sexual orientation, and age. Mapping where different groups are concentrated is a common activity, especially within urban areas, as is investigating the related inequalities and conflicts. Such mappings are complemented by more-detailed studies of the role of place and space in social behaviour–as with studies of the geography of crime and of educational provision–and in how mental representations of those geographies are created and transmitted.

https://www.britannica.com/science/geography/The-geography-of-contemporary-geography

Task 11. Transform these sentences into Passive or Active voice.

1. They make Rolls Royce cars in England.
2. Rice is grown in China.
3. The telephone was invented by Bell in 1876.
4. Thieves have stolen 2 pictures from the museum last night.
5. The factory will produce 10,000 cars next year.
6. She was given this watch by her aunt.
7. British policemen don't carry guns.
8. Periodic Table was devised by Mendeleev.
9. They will publish the news tomorrow.
10. They were doing this experiment yesterday at 9am

Task 12. Translate the sentences paying attention to the Passive Voice.

1. Mathematics is loved by many, disliked by a few, admired and respected by all.
2. Facts alone are wanted in life.
3. These parts are made of steel throughout.
4. At this point the material under examination is fed.
5. The treatment of this theory was modified.
6. The possibilities under consideration will be discussed in detail.
7. The initiative was supported by everybody.
8. As far as this theory is concerned there are different views.
9. The machine was tried under severe conditions.
10. No stage of the design can be completed in the absence of a complete specification of the system under design.
11. This requirement must be met.
12. Little was known about subsequent negotiations except that no agreement was reached.
13. Under these conditions the requirements involved are only partially met.
14. Significant variance reductions can be effected by these procedures.
15. The incompatibility of "this is good" and "this is not good" is preserved.
16. The intellect is involved into action.
17. Such acts are forbidden by law.
18. The number of degrees of freedom is reduced by the number of imposed constraints.
19. The importance of this phenomenon was underestimated.
20. What is written without effort is in general read without pleasure.
21. The work was considered important and is under way to be completed.

Task 13. For Fun and Profit. Do the quiz.

1. Name four countries or colonies where Portuguese is the major official language.
2. For each of the six inhabited continents, name one country where English is a major language.
3. Name four countries where Islam is a major religion.
4. Name four countries that have large deserts. BONUS: Make them four countries on four different continents.
5. Assume that it is now 3:00 P.M. in Washington, D.C. (and New York, Miami, Boston, Atlanta, etc.) Name five cities where it is not 3:00 P.M., and give the time in each. Only one of the cities you name may be in the U.S.

6. Name four countries where there are rain forests.

7. Name four countries with high birth rates, high death rates, and low life expectancy.

8. Name four countries with low birth rates, low death rates, and high life expectancy.

9. Name four countries, which are major manufacturers of automobiles.

10. Name four countries, which are major producers of petroleum. BONUS: Make them four countries on four different continents.

Task 14. Do you agree that you need to study more geography if you think that…

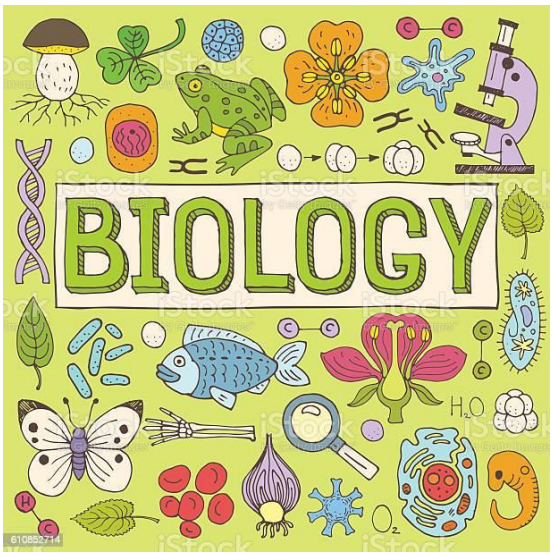
Andes is an after dinner mint
The Balkans are an alien people on Star Trek
The English Channel is a TV sitcom about Charles and Di
The United Kingdom is a cultural theme park
The Tropic of Cancer is a sunscreen lotion
The $10,000 Pyramid is in Egypt
The Gaza Strip is a Middle Eastern folk dance
The Bermuda Triangle is a percussion instrument in a reggae band
The Cumberland Gap gives out a pair of clogs with every set of jeans sold
The International Dateline is a new cable TV network
The Equator is a cartoon action figure
The Continental Shelf is a specialty section of the supermarket
An archipelago is a food stabilizer
The Dust Bowl is Granny's old favorite dish
A fault is what you find in other people
A fjord is a Norwegian car
A mantle is what goes over your fireplace
Tide is a laundry detergent
You can do a research paper to find out who killed the Dead Sea

https://www.upjs.sk/public/media/3499/English-for-Students-of-Geography-and-Ecology.pdf

Tsk 15. Chose any of the departments on the Geography faculty at the university and tell your group mates about its activity.

Unit 3. Biology

1. Can you give the definition to the subject?
2. What are the related subjects?
3. What branches of biology do you know?



Biology, study of living things and their vital processes. The field deals with all the physicochemical aspects of life. The modern tendency toward cross-disciplinary research and the unification of scientific knowledge and investigation from different fields has resulted in significant overlap of the field of biology with other scientific disciplines. Modern principles of other fields – chemistry, medicine, and physics, for example – are integrated with those of biology in areas such as biochemistry, biomedicine, and biophysics.

Biology is subdivided into separate branches for convenience of study, though all the subdivisions are interrelated by basic principles. Thus, while it is custom to separate the study of plants (botany) from that of animals (zoology), and the study of the structure of organisms (morphology) from that of function (physiology), all living things share in common certain biological phenomena – for example, various means of reproduction, cell division, and the transmission of genetic material.

Earliest biological records

Task 1. Read the text and answer the questions.

1. Which countries of the ancient period are known to have studied biology?
2. Give the names any of the ancient scientist who were engaged in studying biology.
3. What were their investigations?
4. Can we say now, that their discovery in this field were of great importance?

Biological practices among Assyrians and Babylonians.

Much of the earliest recorded history of biology is derived from Assyrian and Babylonian bas-reliefs showing cultivated plants and from carvings depicting veterinary medicine. Illustrations on certain seals reveal that the Babylonians had learned that the date palm reproduces sexually and that pollen could be taken from the male

plant and used to fertilize female plants. Although a precise dating of those early records is lacking, a Babylonian business contract of the Hammurabi period (*c.* 1800 BC) mentions the male flower of the date palm as an article of commerce, and descriptions of date harvesting extend back to about 3500 BC.

Biological knowledge of Egyptians, Chinese, and Indians

Papyri and artifacts found in tombs and pyramids indicate that the Egyptians also possessed considerable medical knowledge. Their well-preserved mummies demonstrate that they had a thorough understanding of the preservative properties of herbs required for embalming; plant necklaces and bas-reliefs from various sources also reveal that the ancient Egyptians were well aware of the medicinal value of certain plants. An Egyptian compilation known as the Ebers papyrus (*c.* 1550 bce) is one of the oldest known medical texts.

Ebers papyrus

Ebers papyrus prescription for asthma treatment.

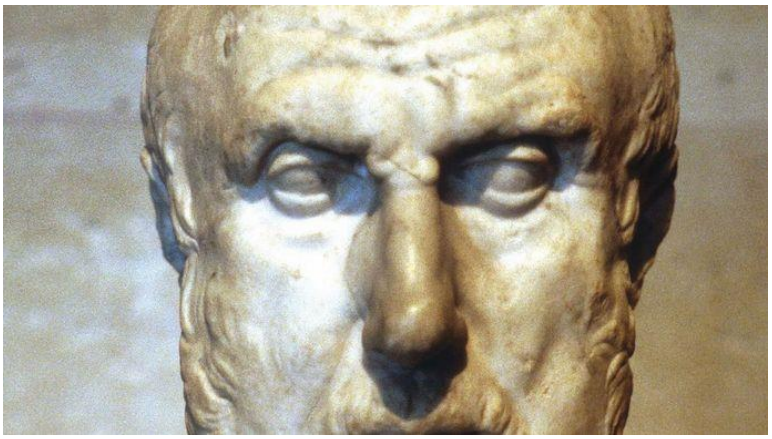
In ancient China, three mythical emperors–Fu Xi, Shennong, and Huangdi–whose supposed ruling periods extended from the 29th to the 27th century BC, were said to possess medical knowledge. According to legend, Shennong described the therapeutic powers of numerous medicinal plants and included descriptions of many important food plants, such as the soybean. The earliest known written record of medicine in China, however, is the *Huangdi neijing* (*The Yellow Emperor's Classic of Internal Medicine*), which dates to the 3rd century BC. In addition to medicine, the ancient Chinese possessed knowledge of other areas of biology. For example, they not only used the silkworm *Bombyx mori* to produce silk for commerce but also understood the principle of biological control, employing one type of insect, an entomophagous (insect-eating) ant, to destroy insects that bored into trees.

As early as 2500 BC the people of northwestern India had a well-developed science of agriculture. The ruins at Mohenjo-Daro have yielded seeds of wheat and barley that were cultivated at that time. Millet, dates, melons, and other fruits and vegetables, as well as cotton, were known to the civilization. Plants were not only a source of food, however. A document, believed to date to the 6th century BC, described the use of

about 960 medicinal plants and included information on topics such as anatomy, physiology, pathology, and obstetrics.

Around 600 BC there arose a school of Greek philosophers who believed that every event has a cause and that a particular cause produces a particular effect. That concept, known as causality, had a profound effect on subsequent scientific investigation. Furthermore, those philosophers assumed the existence of a "natural law" that governs the universe and can be comprehended by humans through the use of their powers of observation and deduction. Although they established the science of biology, the greatest contribution the Greeks made to science was the idea of rational thought.

Although the Greek physician Hippocrates, who established a school of medicine on the Aegean island of Cos around 400 BC, was not an investigator in the sense of Alcmaeon, he did recognize through observations of patients the complex interrelationships involved in the human body. He also contemplated the influence of environment on human nature and believed that sharply contrasting climates tended to produce a powerful type of inhabitant, whereas even, temperate climates were more conducive to indolence.



Hippocrates
Hippocrates, undated bust.

Hippocrates and his predecessors were concerned with the central philosophical question of how the cosmos and its inhabitants were created.

Around the middle of the 4th century BC, ancient Greek science reached a climax with Aristotle, who was interested in all branches of knowledge, including biology. Using his observations and theories, Aristotle was the first to attempt a system of animal classification, in which he contrasted animals containing blood with those that were bloodless. The animals with blood included those now grouped as mammals (except the whales, which he placed in a separate group), birds, amphibians, reptiles, and fishes. The bloodless animals were divided into the cephalopods, the higher crustaceans, the insects, and the testaceans, the last group being a collection of all the lower animals. His careful examination of animals led to the understanding that mammals have lungs, breathe air, are warm-blooded, and suckle their young. Aristotle was the

first to show an understanding of an overall systematic taxonomy and to recognize units of different degrees within the system.

Post-Grecian biological studies

With Aristotle and Theophrastus, the great Greek period of scientific investigation came to an end. The most famous of the new centres of learning were the library and museum in Alexandria. From 300 BC until around the time of Christ, all significant biological advances were made by physicians at Alexandria. One of the most outstanding of those individuals was Herophilus, who dissected human bodies and compared their structures with those of other large mammals. He recognized the brain, which he described in detail, as the centre of the nervous system and the seat of intelligence. On the basis of his knowledge, he wrote a general anatomical treatise, a special one on the eyes, and a handbook for midwives.

Muslim physician Avicenna was an outstanding scientist who lived during the late 10th and early 11th centuries; he was the true successor to Aristotle. His writings on medicine and drugs, which were particularly authoritative and remained so until the Renaissance, did much to take the works of Aristotle back to Europe, where they were translated into Latin from Arabic.

Development of botany and zoology

During the 12th century, the growth of biology was sporadic. Nevertheless, it was during that time that botany was developed from the study of plants with healing properties; similarly, from veterinary medicine and the pleasures of the hunt came zoology. Because of the interest in medicinal plants, herbs in general began to be described and illustrated in a realistic manner. Thomas Aquinas, who, like his mentor, endeavored to reconcile Aristotelian philosophy and the teachings of the church. Because Aquinas was a rationalist, he declared that God created the reasoning mind; hence, by true intellectual processes of reasoning, man could not arrive at a conclusion that was in opposition to Christian thought. Acceptance of this philosophy made possible a revival of rational learning that was consistent with Christian belief.

Resurgence of biology

Beginning in Italy during the 14th century, there was a general ferment within the culture itself, which, together with the rebirth of learning, is referred to as the Renaissance. Interestingly, it was the artists, rather than the professional anatomists, who were intent upon a true rendering of the bodies of animals, including humans, and thus were

motivated to gain their knowledge firsthand by dissection. No individual better exemplifies the Renaissance than Leonardo da Vinci, whose anatomical studies of the human form during the late 1400s and early 1500s were so far in advance of the age that they included details not recognized until a century later.

Throughout the 16th century, interest in botanical study also existed in other countries, including the Netherlands, Switzerland, Italy, and France. During that time there was a great improvement in the classification of plants, which had been described in ancient herbals merely as trees, shrubs, or plants and, in later books, were either listed alphabetically or arranged in some arbitrary grouping. The necessity for a systematic method to designate the increasing number of plants being described became obvious. Accordingly, using a binomial system very similar to modern biological nomenclature, the Swiss botanist Gaspard Bauhin designated plants by a generic and a specific name. Although affinities between plants were indicated by the use of common generic names, Bauhin did not speculate on their common kinship.

Task 2. Correct the mistakes.

1) The botany was developed in the 11 century.

2) In fact, it was the Italian doctor who attracts attention to the human body first.

3) Throughout the 16th century, interest in botanical study also existed in other countries, including the Netherlands, Switzerland, Italy, and Spain.

4) There was no any necessity for a systematic method to designate the increasing number of plants because it was obvious.

Advances to the 20th century

Seventeenth-century advances in biology included the establishment of scientific societies for the dissemination of ideas and progress in the development of the microscope, through which scientists discovered a hitherto invisible world that had far-reaching effects on biology. Systematizing and classifying, however, dominated biology throughout much of the 17th and 18th centuries, and it was during that time that the importance of the comparative study of living organisms, including humans, was realized. During the 18th century the long-held idea that living organisms could originate from nonliving matter (spontaneous generation) began to crumble, but it was not until after the mid-19th century that it was finally disproved by the French chemist and microbiologist Louis Pasteur, who demonstrated the self-replicating ability of microorganisms.

Biological expeditions added to the growing body of knowledge of plant and animal forms and led to the 19th-century development of the theory of evolution. The 19th century was one of great progress in biology: in addition to the formulation of

the theory of evolution, the cell theory was established, the foundations for modern embryology were laid, and the laws of heredity were discovered.

Task 3. Explain the meaning of the words.

a) dissemination
b) microscope
c) far-reaching effect
d) the long-held idea
e) nonliving matter
f) the self-replicating ability of microorganisms
g) the theory of evolution
h) the laws of heredity

Task 4. Read the text "The discovery of the circulation of blood" and answer the questions.

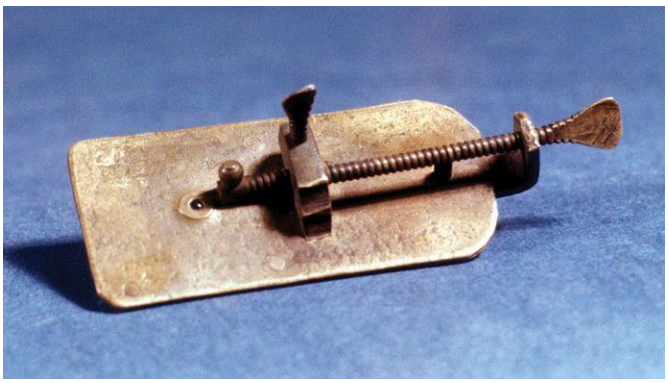
1. Do you agree that the discovery of the circulation of blood is of great importance for the development of science including biology?
2. *ex ovo Omnia* – how can you explain it in English?

In the early 17th century, the English physician William Harvey, who studied at Padua with one of Vesalius's students, became the first to describe the full circulation of the blood through the human body. Prior to Harvey, blood was supposed to be consumed by the body and produced anew rather than continually circulated. It had also been suggested that the blood flowed through pores between the two halves of the heart and that the heart produced a vital heat, which was tempered by the air from the lungs. In his own work, however, Harvey demonstrated that the heart expands passively and contracts actively. By measuring the amount of blood flowing from the heart, he concluded that the body could not continuously produce that amount. He also was able to show that blood is returned to the heart through the veins, postulating a connection (the capillaries) between the arteries and veins that was not to be discovered until later in the 17th century. Harvey was also interested in embryology, to which he made a significant contribution by suggesting that there is a stage (the egg) in the development of all animals during which they are undifferentiated living masses. A biological dictum, *ex ovo omnia*, is a summation of that concept.

Task 5. Read the text and continue the sentences.

The development of the microscope

The magnifying power of segments of glass spheres was known to the Assyrians before the time of Christ; during the 2nd century ce (current era), Claudius Ptolemy, an astronomer, mathematician, and geographer at Alexandria, wrote a treatise on optics in which he discussed the phenomena of magnification and refraction as related to such lenses and to glass spheres filled with water. Despite that knowledge, however, glass lenses were not used extensively until around 1300 (an anonymous person invented spectacles for the improvement of vision probably in the late 1200s). That invention aroused curiosity concerning the property of lenses to magnify, and in the 16th century several papers were written about such devices. Then, in the late 16th century, the Dutch optician Hans Jansen and his son Zacharias invented the compound microscope. The utility of that instrument in the biological sciences, however, was not realized until the following century.



Microscope by Antonie van Leeuwenhoek
Microscope made by Antonie van Leeuwenhoek.
Photos.com/Thinkstock

1. Claudius Ptolemy, an astronomer, mathematician, and geographer at Alexandria, wrote a treatise on optics in which he discussed ……

2. Then, in the late 16th century, the Dutch optician Hans Jansen and his son Zacharias…….

3. The utility of that instrument in the biological sciences…….

The use of structure for classifying organisms

Two systematists of the 17th and 18th centuries were the English naturalist John Ray and the Swedish naturalist and explorer Carolus Linnaeus. Ray, who studied at Cambridge, was particularly interested in the work of the ancient compilers of herbals, especially those who had attempted to formulate some means of classification. Recognizing the need for a classification system that would apply to both plants and animals, Ray employed in his classification schemes extremely precise descriptions for genera

and species. By basing his system on structures, such as the arrangement of toes and teeth in animals, rather than colour or habitat, Ray introduced a new and very important concept to taxonomic biology.

Task 6. Read the summary and fill in the blanks with the necessary words.

Примечание: Summary представляет собой пересказ какого-либо объемного материала. Это сжатое изложение материала либо обобщение информации, которая изложена в каком-ни-будь источнике. Также это:
– краткая выжимка основных идей/главного содержания;
– уход от излишней детализации и ненужных подробностей;
– упражнение, развивающее письменную речь в английском языке.

Two scientists of the 17th and 18th centuries were the _____John Ray and the Swedish _____ Carolus Linnaeus. Ray was particularly interested in the work of the ancient compilers of_____, especially those who had formulated some means of_____. Realizing the necessity of a classification system that would apply to both_____, Ray introduced extremely precise descriptions for_____. Having based his system on the arrangement of _____in animals, rather than_____, Ray brought a new and very important concept to taxonomic biology.

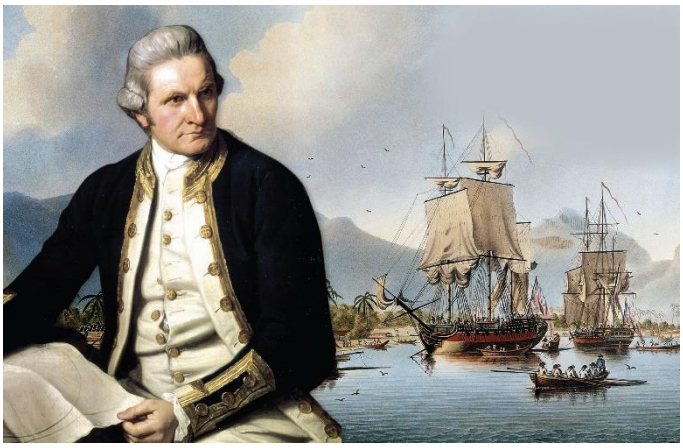
Plants and animals, naturalist and explorer, colour or habitat, genera and species, herbals, classification, English naturalist, toes and teeth.

Task 7. Answer the questions:

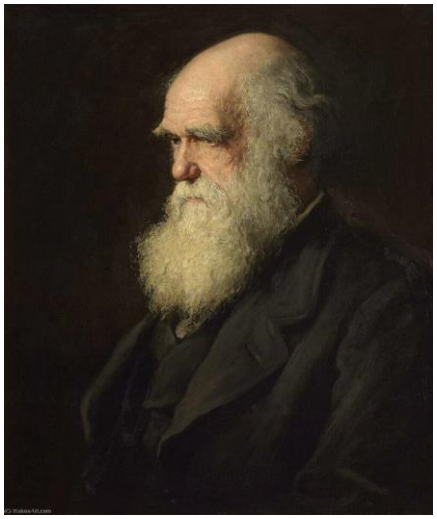
1. What do you know about any of biological expeditions? Can you name any of the greatest captains or naturalist and explorers who travelled with the scientific purposes?
2. Read three short texts and tell the group that you have learnt about these great people.

Biological expeditions

Although a number of 16th- and 17th-century travelers provided much valuable information about the plants and animals in Asia, America, and Africa, most of that information was collected by curious individuals rather than trained observers. In the 18th and 19th centuries, however, such information was collected increasingly in the course of organized scientific expeditions, usually under the auspices of a particular government. The most notable of those efforts were the voyages of the ships known as the *Endeavour*, the *Investigator*, the *Beagle*, and the *Challenger*, all sponsored by the English government.



Capt. James Cook sailed the *Endeavour* to the South Pacific islands, New Zealand, New Guinea, and Australia in 1768; the voyage provided the British naturalist and explorer Joseph Banks with the opportunity to make a very extensive collection of plants and notes, which helped establish him as a leading biologist. Another expedition to the same area in the *Investigator* in 1801 included the Scottish botanist Robert Brown, whose work on the plants of Australia and New Zealand became a classic; especially important were his descriptions of how certain plants adapt to different environmental conditions. Brown is also credited with discovering the cell nucleus and analyzing sexual processes in higher plants.



One of the most-famous biological expeditions of all time was that of the *Beagle* (1831–36), on which Charles Darwin served as naturalist. Although Darwin's primary interest at the time was geology, his visit to the Galápagos Islands aroused his interest in biology and caused him to speculate about their curious insular animal life and the significance of isolation in space and time for the formation of species. During the *Beagle* voyage, Darwin collected specimens of and accumulated copious notes on the plants and animals of South America and Australia, for which he received great acclaim on his return to England.

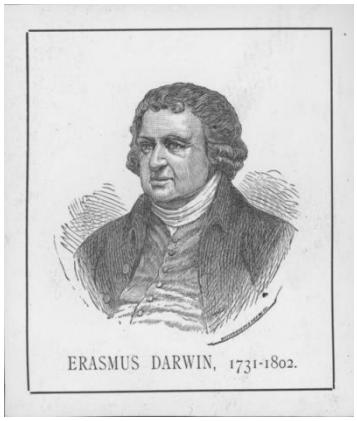
The voyage of the *Challenger* from 1872 to 1876 was organized by the British Admiralty to study oceanography, meteorology, and natural history. Under the leadership of the Scottish naturalist Charles Wyville Thomson, vast collections of plants and animals were made, the importance of plankton (minute free-floating aquatic organisms) as a source of food for larger marine organisms was recognized, and many new planktonic species were discovered. A particularly significant aspect of the *Challenger* voyage was the interest it stimulated in the new science of marine biology.

The theory of evolution

As knowledge of plant and animal forms accumulated during the 16th, 17th, and 18th centuries, a few biologists began to speculate about the ancestry of those organisms, though the prevailing view was that promulgated by Linnaeus–namely, the immutability of the species. Among the early speculations voiced during the 18th century, the British physician Erasmus Darwin (grandfather of Charles Darwin), concluded that species descend from common ancestors and that there is a struggle for existence among animals. The French biologist Jean-Baptiste Lamarck, among the most important of the 18th-century evolutionists, recognized the role of isolation in species formation; he also saw the unity in nature and conceived the idea of the evolutionary tree.

Why were the only few biologists who could speculate about the ancestry of the organisms? What is your opinion?

Mendelian laws of heredity


ERASMUS DARWIN, 1731-1802.

The fame of Gregor Mendel, the father of genetics, rests on experiments he did with garden peas, which possess sharply contrasting characteristics–for example, tall versus short; round seed versus wrinkled seed. When Mendel fertilized short plants with pollen from tall plants, he found the offspring to be uniformly tall. But if he allowed the plants of that generation to self-pollinate (fertilize themselves), their offspring (the second filial generation) exhibited the characters of the grandparents in a rather consistent ratio of three tall to one short. Furthermore, if allowed to self-pollinate, the short plants always bred true–they never produced anything but short plants. From those results Mendel developed the concept of dominance, based on the supposition that each plant carried two trait units, one of which dominated the other. Nothing was known at that time about chromosomes or meiosis, yet Mendel deduced from his results that the trait units, later called genes, could be a kind of physical particle that was transmitted from one generation to another through the reproductive mechanism. Mendel's findings were ignored for 35 years, probably for two reasons. Because the distinguished Swiss botanist Karl Wilhelm von Nägeli failed to recognize the significance of the work after Mendel sent him the results, he did nothing to encourage Mendel. Nägeli's great prestige and the lack of his endorsement indirectly weighed against widespread


Gregor Mendel

recognition of Mendel's work. Moreover, when the work was published, little was known about the cell, and the processes of mitosis and meiosis were completely unknown. Mendel's work was finally rediscovered in 1900, when three botanists independently recognized the worth of his studies from their own research and cited his publication in their work.

Task 8. Answer the questions.

1) How could Mendel developed the concept of dominance?
2) What did he think of genes?
3) Was he supported by the other scientists in his discovery? Why?

Biology in the 20th and 21st centuries

Just as the 19th century can be considered the age of cellular biology, the 20th and 21st centuries were characterized primarily by developments in molecular biology.

Important conceptual and technological developments

By utilizing modern methods of investigation, such as X-ray diffraction and electron microscopy, to explore levels of cellular organization beyond that visible with a light microscope–the ultrastructure of the cell–new concepts of cellular function were produced. As a result, the study of the molecular organization of the cell had tremendous impact on biology during the 20th and 21st centuries. It also led directly to the convergence of many different scientific disciplines in order to acquire a better understanding of life processes.

This computerized image of anthrax shows the various structural relationships of seven units within the protein and demonstrates the interaction of a drug (shown in yellow) bound to the protein to block the so-called lethal factor unit. Bioinformatics plays an important role in enabling scientists to predict where a drug molecule will bind within a protein, given the individual structures of the molecules.

University of Oxford/Getty Images

The 20th and 21st centuries also saw major advances in areas of biology dealing with ecosystems, the environment, and conservation. In the 20th century, scientists realized that humans are as dependent upon Earth's natural resources as are other animals. However, humans were contributing to the progressive destruction of the en-

vironment, in part because of an increase in population pressure and certain technological advances. Lifesaving advances in medicine, for example, had allowed people to live longer and resulted in a dramatic drop in death rates (primarily in developed countries), contributing to an explosive increase in the human population. Chemical contaminants introduced into the environment by manufacturing processes, pesticides, automobile emissions, and other means seriously endangered all forms of life. Hence, biologists began to pay much greater attention to the relationships of living things to each other as well as to their biotic and abiotic environments.

Task 9. Match the words to their definitions

ecosystem	a substance that makes something less pure or makes it poisonous
environment	a community of plants and animals interacting with each other in a given area, and also with their non-living environments
conservation	a chemical substance used to kill harmful insects, small animals, wild plants, and other unwanted organisms
population	the protection of plants and animals, natural areas, and interesting and important structures and buildings, especially from the damaging effects of human activity
contaminants	all the people living in a particular country, area, or place
pesticides	all living and non-living things occurring naturally

Task 10. Find all interdisciplinary subjects and tell what they study.

By the 21st century, there were many important categories in the biological sciences and hence numerous specialties within fields. Botany, zoology, and microbiology dealt with types of organisms and their relationships with each other. Such disciplines had long been subdivided into more-specialized categories–for example, **ichthyology**, the study of……, and **algology**, the study of….. Disciplines such as embryology and physiology, which dealt with the ……., were divided further according to the kind of organism studied–for example, **invertebrate embryology ,** that is**……..and mammalian physiology** which studies…….. Many developments in physiology and embryology had resulted from studies in cell biology, biophysics, and biochemistry. Likewise, research in cell physiology and **cytochemistry**, along with ultrastructural studies, helped scientists ……. Ecology, which focused on ……., included both the physical features of the environment and other organisms that may compete for food and shelter. Emphasis on different environments and certain features of organisms resulted in the subdivision of the field into a range of specialties, such as **freshwater ecology, marine ecology, and population ecology** which study…….

https://www.britannica.com/science/biology/Biology-in-the-20th-and-21st-centuries

Task 11. What do these sciences study?

botany	
population ecology	freshwater ecology, marine ecology
zoology	cell biology,
microbiology,	biophysics,
ichthyology,	biochemistry
embryology	ecology
physiology	

Task 12. Translate into English using the dictionaries in appendix.

1. В наши дни насчитывается такое множество биологических дисциплин, что один человек не может изучить их все.

2. Студенты должны изучить основы четырех главных разделов биологии: зоологии, ботаники, молекулярной биологии и генетики.

3. Генетика изучает законы наследственности и то, как живые существа приспосабливаются к окружающим условиям.

4. Выпускникам биологических факультетов предоставляется множество возможностей для карьерного роста.

5. Медицине нужны талантливые ученые, которые могли бы вести исследования в областях генной терапии, вирусных инфекций и пр.

6. Человечество переживает период климатических изменений, и задача ученых – предсказать возможные последствия этих процессов.

7. Экология изучает окружающую среду и то, каким образом растения, животные и люди существуют вместе и влияют друг на друга.

Task 13. Read the text and answer the questions.

1. What do we call tissues?
2. What are the five types of tissues?
3. What is matrix?
4. In what kind of tissues there is a large amount of intercellular substance?
5. In what kind of tissue it is difficult to determine the shape of the cell?
6. What tissue is widely distributed throughout the body? Where can we find it?
7. What are the characteristic features of the muscular tissue?
8. What is the structure of the nervous tissue? What does a nerve cell consist of?

Task 13.1. Pre-reading task.

Practise the pronunciation of the following words:

organize [ˈɔ:gənaɪz] adjoin[əˈdʒɔɪn]
extremely [ikstˈri:mli] determine [diˈtɜ:min]
nevertheless [ˈnevəðəles] fluid [ˈflu:id]
epithelial[epiˈθi:liəl] blood [blʌd]
vascular [ˈvæskjulə] plasma [ˈplæzmə]
muscular [ˈmʌskjulə] bind [baind]
nervous [ˈnɜ:vəs] fibrous [ˈfaɪbrəs]
specialize[ˈspeʃəlaɪz] impulse [ˈimpʌls]
major[ˈmeɪdʒə] indistinct [indiˈstiŋkt]

Task 13.2. Reading task.

Tissues

The cells, which comprise the body of many-celled animals, are organized into groups called tissues. The man, like many other animals, is known to be an extremely complex organism. Nevertheless, his whole body consists of only five fundamentally different tissues: epithelial, vascular, connective, muscular and nervous.

These five different tissues represent groups of specialized cells, that is, they are modified in structure for the performance of particular function. In some cases, as for example, in bone, a material is secreted by cells. This material is intercellular substance; it constitutes the major part of the tissue.

Epithelial tissues have one surface bordering a space, and the other adjoining an underlying membrane. It lines the body surface and the surfaces of organs, cavities, and tubes. This kind of tissue is found to have a very small amount of intercellular substance. Its cell membrane is usually indistinct, which often makes it difficult to determine the shape of the cell.

Vascular tissues are circulatory fluid tissues, which are known to include blood and lymph. Both consist of the plasma and cells of different types.

Connective tissues are widely distributed throughout the body, they are used to bind and support parts. It includes bone, car tillage, fat tissue, and flood. There are many types of connective tissues.

Muscle tissues are characterized by their ability to contract when stimulated. They form no intercellular substance and are held together by fibrous connective tissues and moves the body or body parts.

Nervous tissue is composed of nerve cells, which must be able to bind together and interact specifically with one another and structures, which support them. A nerve cell consists of a central portion, the cell body, from which numerous processes of two kinds extend: those, which carry impulses into the cell body, and those, which carry impulses away, thus enabling quick communication between different body parts.

Active Words

tissue, n. – ткань,
secrete, v. – выделять, ,
comprise, v. – включать, составлять,
surface, n. – поверхность,
nevertheless, adv. – тем не менее
amount n. – количество,
distinct, a. – ясный, определенный,
fluid, n. – жидкость,
vascular, a. – сосудистый,
blood, n. – кровь,
muscular, a. – мышечный,
distribute, v. – распределять,
ability, n. – способность,
performance, n. – выполнение,
fibrous, a. – волокнистый,
impulse, n. – возбуждение, толчок.
bone, п. – кость,

Task 13.3. After reading tasks.

Give Russian equivalents to the groups of words:

1) to apply methods, to secrete materials, to repair smth, to injure the skin, to constrict the protoplasm, to increase the amount, to comprise the body;

2) injured surface, increased amount, distributed material, covered surface, applied methods, secreted material;

3) nervous cells, fibrous tissues, distinct interval, definite method, certain amount, vascular tissue, single opportunity, small projection, pliable membrane.

Task 13.4. Continue the sentences from the text using the phrases below.

Connective tissue adds 1……. It includes 2……...
Epithelial tissue lines 3…….
Muscle tissue moves 4……
Nerve tissue 5……To work effectively, cells making up a tissue must be able 6……..

f) to bind together and interact specifically with one another.
g) the body or body parts.
h) support and structure to the body
i) enables quick communication between different body parts.
j) the body surface and the surfaces of organs, cavities, and tubes
k) bone, car tillage, fat tissue, and flood.

Task 13.5. Translate the text into English:

Ткани

Органы состоят из различных тканей. Ткань образована клетками, одинаковыми по строению и выполняющими в организме определенные функции. Между клетками тканей находится межклеточное вещество. Ткани нашего организма разнообразны. Их можно найти в любом органе. В эпителиальных тканях клетки находятся плотно друг к другу. Межклеточное вещество плохо развито и его трудно обнаружить. Часто эпителиальная ткань образуется многими слоями клеток. Такая ткань хорошо защищает расположенные под нею органы. Эпителиальные клетки погибают в больших количествах. Поэтому они обладают способностью к быстрому размножению. Мертвые клетки заменяются новыми.

Task 14. Translate the following sentences into Russian paying attention to Infinitive Constructions (Appendix, p.156, Grammar revision, p.165)

Примечание: конструкция **сложное дополнение** (объектный инфинитивный оборот, **Complex Object**, The Objective Infinitive Construction, The Objective-with-the-Infinitive Construction) представляет собой сочетание **существительного в общем падеже или личного местоимения в объектном падеже с инфинитивом**.
Конструкция **сложное подлежащее** (субъектный инфинитивный оборот, **Complex Subject**, The Subjective Infinitive Construction, The Nominative-with-the-Infinitive Construction) представляет собой сочетание **существительного в общем падеже или личного местоимения в именительном падеже**, выполняющего в предложении функцию подлежащего, **с инфинитивом**.)

A) 1. He is supposed to work in that laboratory. 2. She is thought to study at the University. 3. They are considered to have gone from Gorky. 4. This animal is considered to be a representative of Protozoa. 5. He is known to have graduated from our faculty last year.

B) 1. He wishes the work to be done at once. 2. I should like him to be invited to the conference. 3. I consider him to be a clever man. 4. I know them to have been quite right. 5. We know the opening of the conference to be fixed for the 15 th of December. 6. We suppose him to be working now in the field of organic chemistry.

C) 1. We consider all these elements to be quite essential. 2. We proved this theory to have been wrong. 3. They believe this scientist to have discovered a new compound. 4. Evald found this to be true to all reactions. 5. Connective tissue is known to be distributed over the whole organism

D) 1. Gold is found to occur in many regions of Russia. 2. Zink sulphide is found to have two principal crystalline modifications. 3. I found this book to be difficult. 4. Hydrogen is known to be the lightest element. 5. He was known to study abroad. 6. He seems to be tired today.

Task 15. Translate the sentences paying attention to the Infinitive Constructions.

1. Light and radio waves are said to be of similar nature.

2. First sputniks are known to have led the way into space for man.

3. The neutrons and protons of an atom are known to be linked together to form a compact nucleus.

4. Many proteins were found to be mixtures of several chemical compounds.

5. Carbon steel has been known to be the principal product of the steel industry.

6. The laser beam seems to have almost unlimited industrial possibilities.

7. These chemical changes appear to have been caused by heat.

8. The capacity of this aggregate proves to be increasing by and by from its starting.

9. This new approach to the problem discussed appears to be the most satisfactory.

10. Mobile atomic power stations are certain to be developed and maintained in our country.

11. These experiments are likely to have been made in suitable conditions.

12. The discovery of a laser is sure to be of great value.

13. The application of this device is unlikely to give better results.

14. Light is proved to travel in straight lines. 15. Light intensity proves to be measurable.

16. The speed of light in free space is proved to be a measured constant.

17. This property appears to have been mentioned frequently in the past.

18. They are likely to be familiar with this phenomenon. 19. Heat is known to be a form of energy.

20. This scientist is said to have been working on the problem of splitting atoms.

21. Coal is considered to be a valuable fuel.

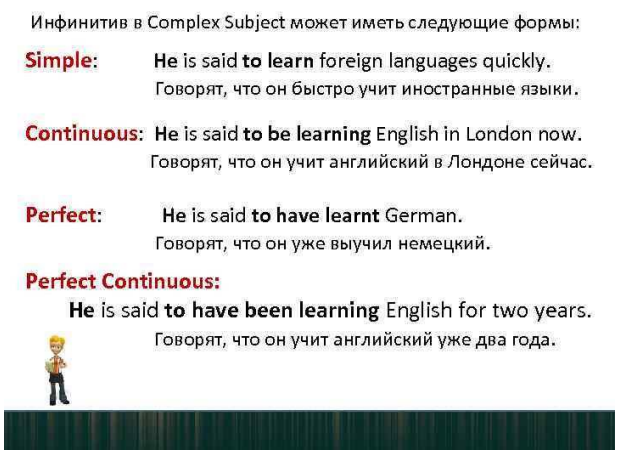
22. The electrolytes are known to change greatly when the current flows through them.

23. Copper and silver are considered to be the best conductors of electricity.

24. Many oxides are found to combine with acids to form salts and water.

25. Once the validity of a hypothesis has been tested by all possible experiments and is found to be in harmony with all the facts, it assumes the status of a theory.

26. The discovery of silicon was an important event in chemistry, for the properties of the element were found to be very close to those predicted by D. I. Mendeleyev on the basis of his periodic law.



Task 16. Translate the following texts without dictionaries paying attention to the use of the Infinitive.

Historical development of penicillin

The use of moulds to prevent infections has existed in folklore for a long time. A Costa Rican, Clodomiro Picardo Twight working at the Pasteur Institute in Paris was the first to record the action of the fungal genus *Penicillium sp.* on the growth of bacteria and the work was published in 1927. However, the discovery of penicillin is known to be attributed to the Scotsman Alexander Fleming.

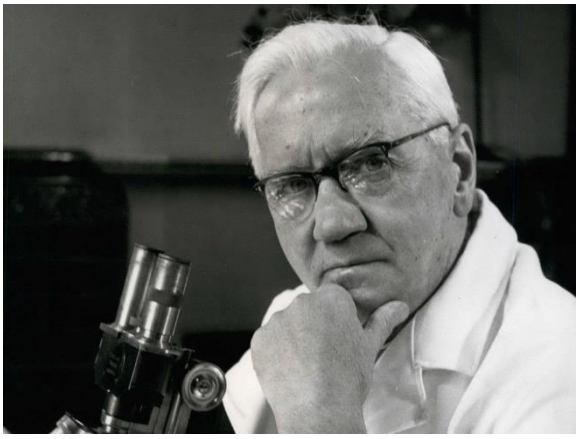
Fleming, a bacteriologist, was working with cultures of Staphylococcus aureus, a bacterium that causes boils and other types of infection. In 1928 he left an open petri dish containing one of the cultures in the laboratory while he went away on holiday. Upon his return, he noticed a mould to have developed and inhibited growth of the bacterium. He deduced the mould produced a compound (which he called penicillin) that inhibited the growth of bacteria. The discovery of penicillin is often quoted as an example of serendipity-the accidental discovery of something useful while looking for something else. In the 1950s, the structure of penicillin was determined, and this enabled chemists to synthesize different types of penicillin and other antibiotics

Antioxidants

Antioxidants are assumed to delay the onset of oxidation, or slow down the rate at which it occurs. Although some occur naturally, they are also added to extend the shelf life of food. Naturally, occurring antioxidants are known to include vitamin C, vitamin E, b- carotene, selenium. All of them are found to contain a phenolic group, and many contain a carbon atom bonded directly to three methyl groups, which is known as a tertiary butyl group. Both the phenolic group and the tertiary butyl group are considered to be free radical scavengers. They are shown to react with and remove the free radicals involved in the oxidation of food and thus prolong the shelf life. They are believed to enhance the health effects of other foods, and boost overall health and resilience. However, synthetic antioxidants which are classed as food additives need to be regulated by policies and legislation to ensure their safe use in food.

Catalysts

Catalysts are known to be used in a wide variety of industrial processes. Many catalysts are either transition metals or their compounds as they are able to show variable oxidation states. Although many other compounds are also found to posses catalytic properties.



We assume catalysts to work by providing an alternative reaction pathway with lower activation reaction than uncatalysed pathway.

In industry catalysts are chosen to maximise both yields and profits. Catalysts prove to become useless if they combine irreversibly with another substance so that the active sites become blocked .Such substances are known to be called catalytic poisons. Sulfur must be removed from crude oil before refining takes place as it has the ability to poison catalysts. Carbon monoxide and cyanide have also been observed to block the catalytic action

Research, development and testing of new pharmaceutical products

The research and development of new drugs is a long and costly process, but the financial rewards to pharmaceutical companies can be high. To test a new product it is necessary to isolate it from an existing species or synthesize it chemically and then subject to thorough laboratory and clinical pharmacological studies to demonstrate its effectiveness. It is tested on animals to determine the lethal dose required to kill 50 % of animal population. The effective dose required to bring about noticeable effect in 50 % of population is also obtained so that the safe dose to administer can be determined. Then the drug is likely to be used in initial clinical trial on humans. This is usually on consenting volunteers as well as patients, half of whom are given the drug and half of whom are given a similar-looking placebo. The volunteers do not know whether they have been taking the drug or placebo. This initial trial is closely monitored to establish the drug's safety and possible side effects.

Task 17. For Fun and Profit

Do you know that animal?

1) A _____'s tongue is twice the length of its body.

2) A _____ can learn to recognize itself in a mirror, but _____ can't.

3) A typical bed usually houses over 6 billion_____.

4) A _____ can peck twenty times a second.

5) _____ and _____ communicate with each other by squeaking, growling, moaning, and whistling. Most of them navigate by using "echolocation". The largest member of the _____ family is called an orca or_____.

6) The _____ gives birth under water and nurses its young in the river as well, though the young _____ do come up periodically for air.

7) At 188 decibels, the whistle of the _____ is the loudest sound produced by any animal.

8) A flute made of bone is the oldest playable musical instrument in the world. It's a flute carved from a _____ bone more than 9,000 years ago. The flute was discovered with other flutes at an ancient burial site in China.

9) The fastest_____, the greyhound, can reach speeds of up to 41.7 miles per hour. The breed was known to exist in ancient Egypt 6,000 years ago

10) A_____ sees about six times better than a human at night because of the tapetum lucidum, a layer of extra reflecting cells which absorb light.

11) An _____'s eye is bigger than its brain.

12) There are more than 1 000 chemicals in a cup of coffee. Of these, only 26 have been tested, and half caused cancer in_____.

Good Job!

Unit 4. Chemistry

Task 1. Work in groups of three or four students. Comment on the quotations employing the phrases useful to express opinion

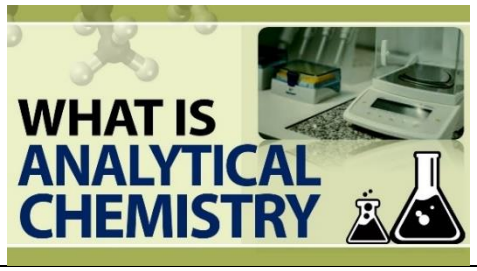
1. "The country which is in advance of the rest of the world in chemistry will also be foremost in wealth and in general prosperity". – William Ramsay.

2. "Engineering or technology is the making of things that did not previously exist, whereas science is the discovering of things that have long existed". – David Billington.

Task 2. Tell the group – what chemistry is and what it studies. In groups write the full definition and compare it with the other definition made by your group mates. Then read the definition given and compare it with your answers.

Use the verbs: *to be concerned with, to deal with, to be the base of, to study.*

Chemistry is the science that deals with the properties, composition, and structure of substances (defined as elements and compounds), the transformations they undergo, and the energy that is released or absorbed during these processes. Every substance, whether naturally occurring or artificially produced, consists of one or more of the hundred-odd species of atoms that have been identified as elements. Although these atoms, in turn, are composed of more elementary particles, they are the basic building blocks of chemical substances; there is no quantity of oxygen, mercury, or gold, for example, smaller than an atom of that substance. Chemistry, therefore, is concerned not with the subatomic domain but with the properties of atoms and the laws governing their combinations and how the knowledge of these properties can be used to achieve specific purposes.



Analytical chemistry

What is the importance of analytical chemistry?

Task 3. Read the text and explain the phrases: chemical identity, silver-white metal, affordable consumer goods, labour-saving technologies, waste disposal.

Most of the materials that occur on Earth, such as wood, coal, minerals, or air, are mixtures of many different and distinct chemical substances. Each pure chemical substance (*e.g.*, oxygen, iron, or water) has a characteristic set of properties that gives it its chemical identity. Iron, for example, is a common silver-white metal that melts at 1,535° C, is very malleable, and readily combines with oxygen to form the common substances hematite and magnetite. The detection of iron in a mixture of metals, or in a compound such as magnetite, is a branch of analytical chemistry called qualitative analysis. Measurement of the actual amount of a certain substance in a compound or mixture is termed quantitative analysis. The importance of analytical chemistry has never been greater than it is today. The demand in modern societies for a variety of safe foods, affordable consumer goods, abundant energy, and labor-saving technologies places a great burden on the environment. All chemical manufacturing produces waste products in addition to the desired substances, and waste disposal has not always been carried out carefully.

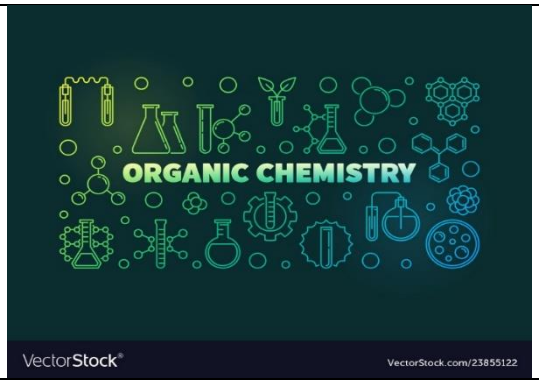
Inorganic chemistry

Task 4. Answer the questions and then read the text and find the answers there. What constitutes the discipline of inorganic chemistry? What is its fundamental concept? Why does the inorganic chemistry play a vital role?

Modern chemistry, which dates more or less from the acceptance of the law of conservation of mass in the late 18th century, focused initially on those substances that were not associated with living organisms. Study of such substances, which normally

have little or no carbon, constitutes the discipline of inorganic chemistry. Early work sought to identify the simple substances–namely, the elements–that are the constituents of all more complex substances. Some elements, such as gold and carbon, have been known since antiquity, and many others were discovered and studied throughout the 19th and early 20th centuries. Today, more than 100 are known. The study of such simple inorganic compounds as sodium chloride (common salt) has led to some of the fundamental concepts of modern chemistry, the law of definite proportions providing one notable example.

Many of the most interesting developments in inorganic chemistry bridge the gap with other disciplines. Organometallic chemistry investigates compounds that contain inorganic elements combined with carbon-rich units. Many organometallic compounds play an important role in industrial chemistry as catalysts, which are substances that are able to accelerate the rate of a reaction even when present in only very small amounts. Some success has been achieved in the use of such catalysts for converting natural gas to related but more useful chemical substances. Chemists also have created large inorganic molecules that contain a core of metal atoms, such as platinum, surrounded by a shell of different chemical units. Some of these compounds, referred to as metal clusters, have characteristics of metals, while others react in ways similar to biologic systems. Trace amounts of metals in biologic systems are essential for processes such as respiration, nerve function, and cell metabolism. Processes of this kind form the object of study of bioinorganic chemistry. Although organic molecules were once thought to be the distinguishing chemical feature of living creatures, it is now known that inorganic chemistry plays a vital role as well.

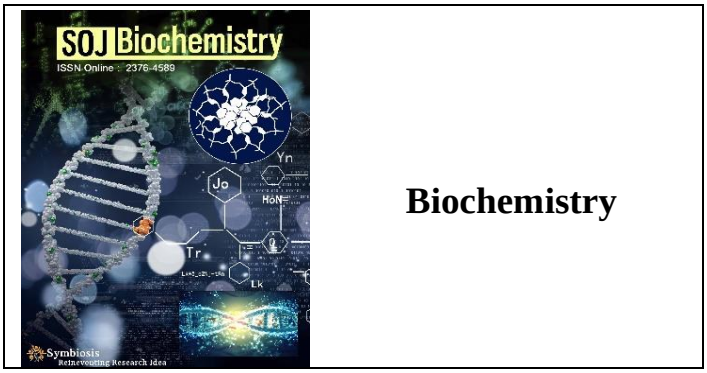


Organic chemistry

Task 5. Do you know what the major focus of organic chemistry is? Why is it considered the largest area of specialization among the various fields of chemistry?

Organic compounds are based on the chemistry of carbon. Carbon is unique in the variety and extent of structures that can result from the three-dimensional connections of its atoms. The process of photosynthesis converts carbon dioxide and water to oxygen and compounds known as carbohydrates. Both cellulose, the substance that gives

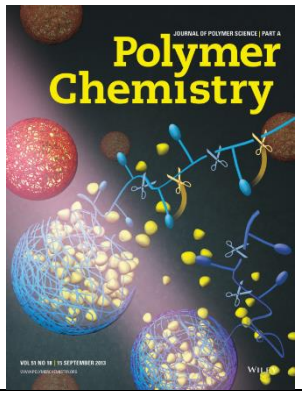
structural rigidity to plants, and starch, the energy storage product of plants, are polymeric carbohydrates. Simple carbohydrates produced by photosynthesis form the raw material for the myriad organic compounds found in the plant and animal kingdoms. When combined with variable amounts of hydrogen, oxygen, nitrogen, sulfur, phosphorus, and other elements, the structural possibilities of carbon compounds become limitless, and their number far exceeds the total of all nonorganic compounds. A major focus of organic chemistry is the isolation, purification, and structural study of these naturally occurring substances. The great abundance of organic compounds, their fundamental role in the chemistry of life, and their structural diversity have made their study especially challenging and exciting. Organic chemistry is the largest area of specialization among the various fields of chemistry.



Task 6. Answer the questions, give your ideas. What gave a rise to the discipline of biochemistry? What is an essential feature of molecular biology and biotechnology?

As understanding of inanimate chemistry grew during the 19th century, attempts to interpret the physiological processes of living organisms in terms of molecular structure and reactivity gave a rise to the discipline of biochemistry. Biochemists employ the techniques and theories of chemistry to probe the molecular basis of life. An organism is investigated on the premise that its physiological processes are the consequence of many thousands of chemical reactions occurring in a highly integrated manner. Biochemists have established, among other things, the principles that underlie energy transfer in cells, the chemical structure of cell membranes, the coding and transmission of hereditary information, muscular and nerve function, and biosynthetic pathways.

The molecular basis of biologic processes is an essential feature of the fast-growing disciplines of molecular biology and biotechnology. Chemistry has developed methods for rapidly and accurately determining the structure of proteins and DNA. In addition, efficient laboratory methods for the synthesis of genes are being devised. Ultimately, the correction of genetic diseases by replacement of defective genes with normal ones may become possible.

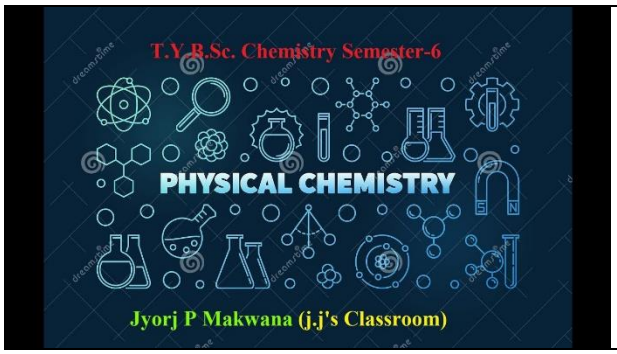


Polymer chemistry

Task 7. Read the text and answer the question: What are scientists working in this field of chemistry deal with?

Polymer chemists have designed and synthesized polymers that vary in hardness, flexibility, softening temperature, solubility in water, and biodegradability. They have produced polymeric materials that are as strong as steel yet lighter and more resistant to corrosion. Oil, natural gas, and water pipelines are now routinely constructed of plastic pipe. In recent years, automakers have increased their use of plastic components to build lighter vehicles that consume less fuel. Other industries such as those involved in the manufacture of textiles, rubber, paper, and packaging materials are built upon polymer chemistry.

Besides producing new kinds of polymeric materials, researchers are concerned with developing special catalysts that are required by the large-scale industrial synthesis of commercial polymers. Without such catalysts, the polymerization process would be very slow in certain cases.



Physical chemistry

Task 8. Read the text, divide in 4 groups and tell about branches of physical chemistry.

The oldest of these fields is physical chemistry, which seeks to measure, correlate, and explain the quantitative aspects of chemical processes. The Anglo-Irish chemist Robert Boyle discovered in the 17th century that at room temperature the volume of a fixed quantity of gas decreases proportionally as the pressure on it increases. Thus, for

a gas at constant temperature, the product of its volume *V* and pressure *P* equals a constant number–*i.e.*, *PV* = constant. Such a simple arithmetic relationship is valid for nearly all gases at room temperature and at pressures equal to or less than one atmosphere. The branch of physical chemistry that is largely devoted to this subject is theoretical chemistry. Theoretical chemists make extensive use of computers to help them solve complicated mathematical equations. Other branches of physical chemistry include chemical thermodynamics, which deals with the relationship between heat and other forms of chemical energy, and chemical kinetics, which seeks to measure and understand the rates of chemical reactions. Electrochemistry investigates the interrelationship of electric current and chemical change.

There are many other disciplines within physical chemistry that are concerned more with the general properties of substances and the interactions among substances than with the substances themselves. Photochemistry is a specialty that investigates the interaction of light with matter. Chemical reactions initiated by the absorption of light can be very different from those that occur by other means. Vitamin D, for example, is formed in the human body when the steroid ergo sterol absorbs solar radiation; ergo sterol does not change to vitamin D in the dark.

A rapidly developing sub discipline of physical chemistry is surface chemistry. It examines the properties of chemical surfaces, relying heavily on instruments that can provide a chemical profile of such surfaces. Whenever a solid is exposed to a liquid or a gas, a reaction occurs initially on the surface of the solid, and its properties can change dramatically as a result. Aluminum is a case in point: it is resistant to corrosion precisely because the surface of the pure metal reacts with oxygen to form a layer of aluminum oxide, which serves to protect the interior of the metal from further oxidation. Numerous reaction catalysts perform their function by providing a reactive surface on which substances can react.

What does physical chemistry seek?
What is theoretical chemistry?
What does thermodynamics study?
What does electrochemistry investigate?
What other branches of physical chemistry do you know?

REMEMBER:

How to make a plan for the text. (appendix, p.151)

1. Find and write down the key-words to each point of the plan. This should help you work out the main ideas you want to focus on and how you'll organize them. The outline doesn't have to be final–it's okay if your structure changes throughout the writing process.
2. Use bullet points or numbering to make your structure clear at a glance. Even for a short text that won't use headings, it's useful to summarize what you'll discuss in each paragraph. Identify the topic sentence in each paragraph.

Task 9. Philosophy of matter in antiquity. Read and make a plan for this text.

Indeed, the philosophers of antiquity could have had no notion that all matter consists of the combinations of a few dozen elements, as they are understood today. The earliest critical thinking on the nature of substances, as far as the historical record indicates, was believed to have been made by certain Greek philosophers beginning about 600 BC. Thales of Miletus, Anaximander, Empedocles, and others propounded theories that the world consisted of varieties of earth, water, air, fire, or indeterminate "seeds" or "unbounded" matter. Leucippus and Democritus propounded a materialistic theory of invisibly tiny irreducible atoms from which the world was made. In the 4th century BC, Plato (influenced by Pythagoreanism) taught that the world of the senses was but the shadow of a mathematical world of "forms" beyond human perception.

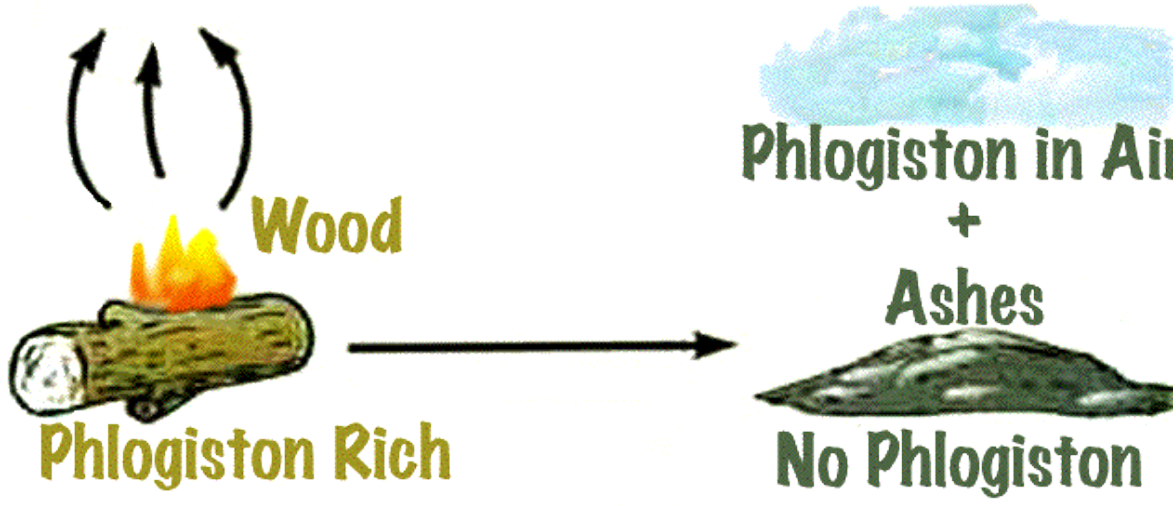
Alchemy

Three different sets of ideas and skills fed into the origin of alchemy. First was the empirical sophistication of jewelers, gold- and silversmiths, and other artisans who had learned how to fashion precious and semiprecious materials. Among their skills were smelting, assaying, alloying, gilding, amalgamating, distilling, sublimating, painting, and lacquering. The second component was the early Greek theory of matter, especially Aristotelian philosophy, which suggested the possibility of unlimited transformability of one kind of matter into another. The third of alchemy's roots consisted

of a complex combination of ideas derived from Asian philosophies and religions, Hellenistic mystery religions, and what became known as the Hermetic writings (a body of pseudonymous Greek writings on magic, astrology, and alchemy ascribed to the Egyptian god Thoth or his Greek counterpart Hermes Trismegistos). It is important to note, however, that Hellenistic Egypt is only one of several candidates for the homeland of alchemy; at about the same time, similar ideas were developing in Persia, China, and elsewhere.

The Renaissance saw even stronger interest in the science. The German-Swiss physician Paracelsus practiced alchemy, Kabbala, astrology, and magic, and in the first half of the 16th century he championed the role of mineral rather than herbal remedies. His emphasis on chemicals in pharmacy and medicine was influential on later figures, and lively controversies over the Paracelsian approach raged around the turn of the 17th century. Gradually the Hermetic influence declined in Europe, however, as certain celebrated feats of putative aurifaction were revealed as frauds.

Phlogiston theory



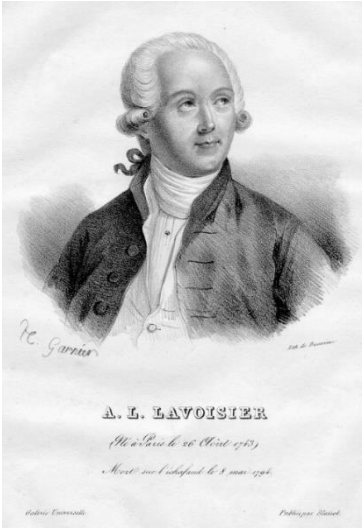
Phlogiston, in short, was thought to be a material substance that defined combustibility. When metallic iron becomes red rust, it loses its phlogiston, just as a burning log does. The ashes of the log and the red rust "ashes" (calx) of iron can no longer burn because they no longer contain the principle of combustibility, or phlogiston. However, iron calx can be converted back to the metal if it is strongly heated in the presence of a phlogiston-rich substance such as charcoal. The charcoal donates its phlogiston (becoming ashes itself), while the calx turns into molten metallic iron. Thus, smelting (reduction) of metallic ores could also be understood in phlogistic terms. Later phlogistonists added respiration to the number of phenomena that the theory could elucidate. An animal breathes air, emitting phlogiston in an analogy to a slow fire, fueled

by the phlogiston-rich food it consumes. Earth's atmosphere avoids excess accumulation of phlogiston because plants incorporate it into combustible plant tissues that can then be used as animal food. Combustion, calcination, or respiration eventually cease in an enclosed space because air has a limited capacity to absorb the phlogiston emitted from the burning, calcining, or respiring entity.

The phlogiston theory became popular both because of its great success in explaining phenomena and guiding further investigation and because of a certain Enlightenment predilection for materialistic physical theories (the putative fluid of heat became known as caloric, and there were other suggested fluids of electricity, light, and so on). This materialist-mechanist trend can also be seen in the diffuse but powerful influence of Newton and René Descartes on chemists of the 18th century.

Task 10. The chemical revolution. Do you know any chemists who are considered the genius of chemistry as a science? Give their names and their discoveries. Then read about some of them.

The new research on "airs" attracted the attention of the young French aristocrat Antoine-Laurent Lavoisier. Lavoisier commanded both the wealth and the scientific brilliance to enable him to construct elaborate apparatuses to carry out his numerous ingenious experiments. In the course of just a few years in the 1770s, Lavoisier developed a radical new system of chemistry, based on Black's methods and Priestley's dephlogisticated air.



Lavoisier first determined that certain metals and nonmetals absorb a gaseous substance from the air in undergoing calcination or combustion and, in the process, increase in weight. Initially, he thought that this gas must be Black's fixed air, for he knew of no other chemical species present in ordinary air; moreover, fixed air was known to be produced in smelting, so it seemed reasonable to think that it was present in the calx that was smelted. At this point (October 1774), Priestley communicated to Lavoisier his discovery of dephlogisticated air. Further experiments led Lavoisier to continuously modify his ideas, until it finally became clear to him that it was this new gas, and not fixed air, that was the active entity in combustion, calcination, and respiration. Moreover, he determined (or so he thought, at least) that this gas was contained in all acids. He renamed it oxygen, Greek for "acid producer."

Lavoisier's oxygen was in some respects the inverse of phlogiston. The keys to Lavoisier's success were twofold. First, he carefully accounted for all the substances, including gases, entering into and emerging from the chemical reactions he studied by

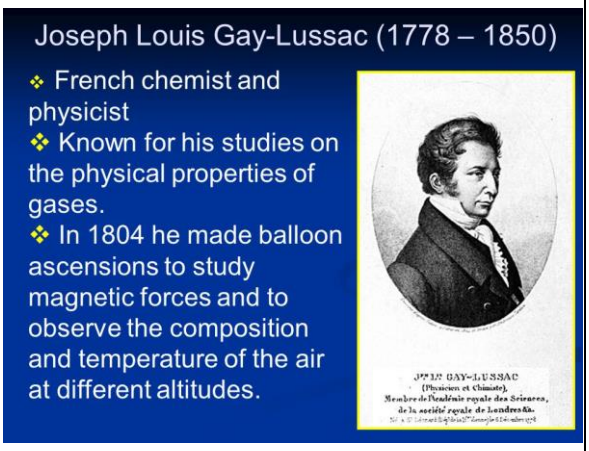
tracking their weights with the greatest possible precision. He knew to do this partly from Black's example, but he proceeded with a mastery that the science had never before seen. Second, he established a simple operational definition of a chemical element–namely, a substance that could not be reduced in weight as the result of any chemical reaction that it undergoes. Oxygen, carbon, iron, and sulfur were now regarded as elements, along with close to 30 other substances. Lavoisier wrote a textbook to promote the new oxygenist chemistry, *Traité élémentaire de chimie* (1789), which appeared in the same year the French Revolution began. He and his associates also developed a new nomenclature–essentially the one used today for inorganic compounds–along with a new journal. As an aristocrat of the ancien régime and an investor in a tax-collection agency, Lavoisier was executed in the Reign of Terror, but by that time (1794), the chemical revolution that he had started had largely succeeded in replacing phlogistonist chemistry.

Atomic and molecular theory

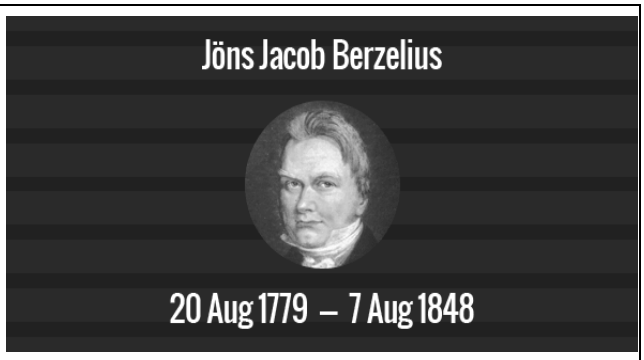
Lavoisier's set of chemical elements, and the new way of understanding chemical composition, proved to be invaluable for analytic and inorganic chemistry, but in a real sense the chemical revolution had only just begun. Around the turn of the century, the English Quaker schoolteacher John Dalton began to wonder about the invisibly small ultimate particles of which each of these elemental substances might be composed. He thought that if the atoms of each of the elements were distinct, they must be characterized by a distinct weight that is unique to each element. Although these atoms were far too small to weigh individually, he realized that he could deduce their weights relative to each other – the ratio of the weight of an atom of oxygen to one of hydrogen, for instance – by examining reacting weights of macroscopic quantities of these elements. In fact, the laws of stoichiometry (combining weights of elements) were just then being developed, and Dalton used these regularities to justify his inferences. His first discussion of these issues dates to 1803, and he presented his atomic theory in the multivolume *New System of Chemical Philosophy* (1808–27).

Dalton's atomic theory was a landmark event in the history of chemistry, but it had a crucial flaw. His procedure required that one know the formulas of the simple compounds resulting from the combination of the elements. For example, analytical data of that day indicated that water resulted from the combination of seven parts by weight of oxygen with one part of hydrogen. If the resulting water molecule was HO (one atom of each element combining to form a molecule of water), then the weight ratio of the atoms of these elements must be the same, seven to one. However, if the formula were H_2O, then the weight of an oxygen atom would have to be 14 times the weight of a hydrogen atom. There was simply no way to determine molecular formulas at that time, so Dalton made assumptions based on the simplicity of nature. He chose HO as his water formula and, therefore, seven as the relative atomic weight of oxygen.

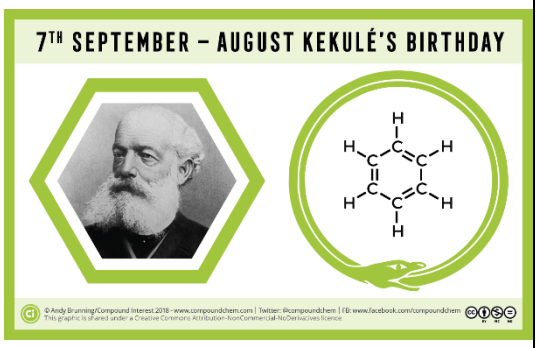
In 1808 the French chemist Joseph-Louis Gay-Lussac discovered that when gases combine chemically, they do so in small integral multiples by volume. Three years later the Italian physicist Amedeo Avogadro argued that this fact suggested that equal volumes of gases contain equal numbers of constituent particles (Avogadro's law), physical conditions being the same. This idea provided a physical method of determining certain molecular formulas. For instance, Gay-Lussac had pointed out that exactly two volumes of hydrogen combine with precisely one of oxygen to form water. If Avogadro was right, the formula for water had to be H_2O. But this line of reasoning also led to the uncomfortable notion that elementary gases had polyatomic molecules (O_2, H_2, and so on), and therefore many chemists rejected Avogadro's hypotheses.



By far the greatest of the early atomists was the Swede Jöns Jacob Berzelius, who accepted parts of Avogadro's ideas and developed an elaborate version of chemical atomism by 1826. It was Berzelius who in 1813 had proposed the alphabetic system for denoting elements, atoms, and molecular formulas, and the use of formulas as an aid for studying chemical composition and reactions began to blossom about 1830. However, different chemists were still making different assumptions regarding the formulas of simple compounds such as water, and so, for decades, various inconsistent systems of atomic weights and formulas were in use in the various European countries. Berzelius also developed a theory of chemical combination based on the electrochemical studies that the invention of the battery (1800) had spawned. He became convinced that all molecules were held together by the Coulomb force, the electrostatic attraction between oppositely charged objects. (Berzelius assumed that a molecule's constituent atoms or groups of atoms were not neutral, and he called these charged components radicals.)



In 1858 the young German theorist August Kekule then expanded this concept to carbon, not only proposing that carbon atoms were tetravalent but adding the idea that they could bond to each other to form chains, comprising a molecular "skeleton" to which other atoms could cling. Kekule's theory of chemical structure clarified the compositions of hundreds of organic compounds and served as a guide to the synthesis of thousands more. (The self-chaining of carbon atoms was independently developed by the Scottish chemist Archibald Scott Couper.) This theory experienced dramatic expansion when Kekule successfully applied it to aromatic compounds (after 1865) and after Jacobus Henricus van 't Hoff of the Netherlands and Joseph LeBel of France independently began to investigate molecular structures in three dimensions–later called stereochemistry.



Task 11. Correct the information and find the Infinitives in the sentences.

1. Lavoisier continued the study of the system of chemistry, based on Black's methods and Priestley's dephlogisticated air.
2. Lavoisier was the first to have determined that certain metals and nonmetals absorb a gaseous substance from the air in undergoing calcination or combustion and, in the process, decrease in weight.
3. Further experiments led Lavoisier to continuously modify his ideas, until it finally became clear to him that it was fixed air, that was the active entity in combustion, calcination, and respiration.
4. He and his associates also developed a new nomenclature–essentially the one used today for organic compounds.
5. Around the turn of the century, the American Quaker schoolteacher John Dalton began to wonder about the invisibly small ultimate particles of which each of these elemental substances might be composed.
6. Dalton's atomic theory was a landmark event in the history of chemistry, it is considered to be absolutely correct.
7. In 1808 the French chemist Joseph-Louis Gay-Lussac discovered that when solids combine chemically, they do so in small integral multiples by volume.
8. Three years before the Italian physicist Amedeo Avogadro argued that this fact suggested that equal volumes of gases contain equal numbers of constituent particles (Avogadro's law), physical conditions to be the same.
9. But this line of reasoning also led to the uncomfortable notion that elementary gases had polyatomic molecules (O_2, H_2, and so on), many chemists thought Avogadro's hypotheses to be correct.
10. Berzelius was the scientist to have proposed the figure system for denoting elements, atoms, and molecular formulas, and the use of formulas as an aid for studying chemical composition and reactions that began to blossom about 1830.
11. Berzelius assumed a molecule's constituent atoms or groups of atoms to be neutral, and he called these charged components radicals.
12. Kekule's theory of chemical structure clarified the compositions of hundreds of inorganic compounds and is admitted to be a guide to the synthesis of thousands more.
13. This theory experienced dramatic fall when Kekule applied it to aromatic compounds and after Jacobus Henricus van 't Hoff of the Netherlands and Joseph LeBel of France independently began to investigate molecular structures in four dimensions–later called stereochemistry.

Was this information new for you?

Yes, it was…….. No, it wasn't because……..

Task 12. Grammar revision
Translate into Russian paying attention to the use of Infinitive.

1. Robert Boyle was one of the first scientists to work with gases.
2. John Dalton was the first to deduce scientifically an atomic theory from the experiment.
3. The English philosopher Francis Bacon (1561-1626) was the first to propose the scientific method and tried to make sense from the observations.
4. Further physical evidence to support Bohr's description of electron energy levels can be seen from ionization energies.
5. A nice example to illustrate how one ligand can be replaced by another is the addition of ammonia to an aqueous solution of copper (II) sulphate.
6. Some of the most satisfying problems to solve in chemistry consort in interpreting the data obtained for some compound from several different analytical techniques to arrive at only one possible structural formula.
7. Friedrich Kekule (1829-1896) was the first to show that benzene could be written in a cyclic or ring form using alternate double and single bonds between the carbon atoms.
8. Glassware to be used in chemical analysis must be chemically pure.
9. The experiment to be carried is described in this article.
10. Copper was one of the first metals to be used by man.
11. The barometer is the device to measure pressure.
12. Another area to be explored is the use of photosynthetic organisms to nitrogen fixation
13. Steps to overcome this problem were taken.

Dmitri Mendeleev

Russian chemist Dmitri Mendeleev arranged the 63 known elements into a periodic table based on atomic mass, which he published in *Principles of Chemistry* (1869).

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The widespread adoption of a single reformed set of atomic weights for the 60-odd known elements appears to have prompted renewed speculation on the relationships of the elements to each other, and various proposals for systems of classification were developed in the 1860s. By far the most successful of these systems was that of the Russian chemist Dmitry Mendeleev. In 1869 he announced that when the elements were arranged horizontally according to increasing atomic weight, and a new horizontal row was begun below the first whenever similar properties in the elements reappear, then the resulting semi-rectangular table revealed consistent periodicities. The vertical columns of similar elements were called groups or families, and the entire array was called the periodic table of the elements. Mendeleev demonstrated that this manner of looking at the elements was more than mere chance when he was able to use his periodic law to predict the existence of three new elements, later named gallium, scandium, and germanium, which were discovered in the 1870s and '80s.

Task 13. Fill in the blanks with the words from the text.

Russian chemist Dmitri Mendeleev arranged the 63 known elements into a periodic table based on……., which he published in the scientific magazine.

The widespread adoption of a single reformed set of atomic weights for the 60-odd known elements caused great discussion on the……of the elements to each other, and different systems of classification were developed in the 1860s. The most successful was that of Dmitry Mendeleev. In 1869 he announced that when the elements were arranged…… according to increasing atomic weight, and a new horizontal row was begun below the first whenever similar properties in the elements reappear, then the resulting…… table revealed consistent periodicities. The…… columns of similar elements were called…….., and the entire array was called the periodic table of the elements. Mendeleev proved that he was able to use his periodic law to predict the existence of …… elements, later named…….., which were discovered later.

Task 14. Find key sentence in each passage and combine them into a summary. Writ it and then compare it with your partner.

Biochemistry, polymers, and technology

Organic chemistry, of course, looks not only in the direction of physics and physical chemistry but also, and even more essentially, in the direction of biology. The brilliant German chemist Emil Fischer determined the nature and structure of many carbohydrates and proteins. But the most dramatic discovery in the history of 20th-century biochemistry was surely the structure of DNA (deoxyribonucleic acid), revealed by American geneticist James Watson and British biophysicist Francis Crick in 1953–the famous double helix. The new understanding of the molecule that incorporates the genetic code provided an essential link between chemistry and biology, a bridge over which much traffic continues to flow. The individual "letters" that make the code–four nucleotides named adenine, guanine, cytosine, and thymine–were discovered a century ago, but only at the close of the 20th century could the sequence of these letters in the genes that make up DNA be determined en masse.

Empirical work on polymers had long predated Staudinger's contributions, though. Nitrocellulose was used in the production of smokeless gunpowder, and mixtures of nitrocellulose with other organic compounds led to the first commercial polymers: collodion, xylonite, and celluloid. Great effort was also devoted to develop artificial substitutes for rubber–a natural resource in especially short supply during wartime. Already by World War I, German chemists had substituted materials, though

many were less than satisfactory. The first highly successful rubber substitutes were produced in the early 1930s and were of great importance in World War II.

During the interwar period, the leading role for chemistry shifted away from Germany. This was largely the result of the 1914–18 war, which alerted the Allied countries to the extent to which they had become dependent on the German chemical industries. Dyes, drugs, fertilizers, explosives, photochemicals, food chemicals (such as chemicals for food additives, food colouring, and food preservation), heavy chemicals, and *strategic materiel* of many kinds had been supplied internationally before the war largely by German chemical companies, and, when supplies of these vital materials were cut off in 1914, the Allies had to scramble to replace them.
Strategic materiel – technical equipment, hardware, machinery

Chemistry in the 21st century

Two more innovations of the late 20th century deserve at least brief mention, especially as they are special focuses of the chemical industry in the 21st century. The phenomenon of superconductivity (the ability to conduct electricity with no resistance) was discovered in 1911 at temperatures very close to absolute zero (0 K, −273.15 °C, or −459.67 °F). In 1986 two Swiss chemists discovered that lanthanum copper oxide doped with barium became superconducting at the "high" temperature of 35 K (−238 °C, or −397 °F). Since then, new superconducting materials have been discovered that operate well above the temperature of liquid nitrogen–77 K (−196 °C, or −321 °F). In addition to its purely scientific interest, much research focuses on practical applications of superconductivity. Today, chemists can maneuver atoms one by one with a scanning tunneling microscope, and other techniques of what has become known as nanotechnology are in rapid development. The history of chemistry is an extraordinary story.

https://www.britannica.com/science/chemistry/Biochemistry-polymers-and-technology

Task 15. Can we say that everything in chemistry has already been discovered and developed? In groups discuss and give your opinion.

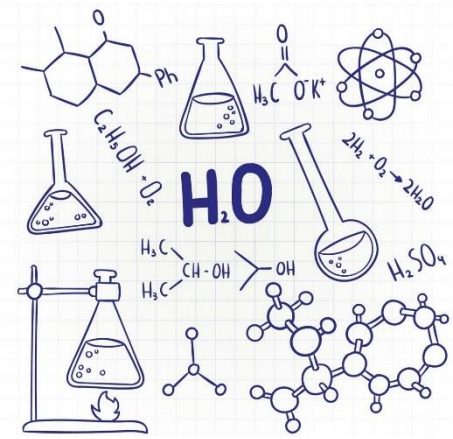
Task 16. Grammar Revision

Task 16.1. Find passive sentences in the text and transform them into active.

The Fourth State of Matter

here are three classic states of matter: solid, liquid, and gas; however, plasma is considered by some scientists to be the fourth state of matter. The plasma state is not related to blood plasma, the most common usage of the word; rather, the term has been

used in physics since the 1920s to represent an ionized gas. Lightning is commonly seen as a form of plasma. Plasma is found in both ordinary and exotic places. When an electric current is passed through neon gas, it produces both plasma and light. Lightning is a massive electrical discharge in the atmosphere that creates a jagged column of plasma. Part of a comet's streaming tail is plasma from gas ionized by sunlight and other unknown processes. The Sun is a 1.5-millionkilometer ball of plasma. It is heated by nuclear fusion. Scientists study plasma for practical purposes. In an effort to harness fusion energy on Earth, physicists are studying devices that create and confine very hot plasmas in magnetic fields. In space, plasma processes are largely responsible for shielding Earth from cosmic radiation, and much of the Sun's influence on Earth occurs by energy transfer through the ionized layers of the upper atmosphere



https://www.upjs.sk/public/media/3499/English-for-Chemists.pdf

Task 16.2. Translate the sentences, paying special attention to predicates in the passive voice.

1. In his book emphasis is placed on the localization problem. 2. Reference was made of his earlier publication. 3. Mention is made of an improved version of this method. 4. An important contribution was made to the study of this phenomenon. 5. Care must be taken to assure that an even number of logical inversions occur. 6. An attempt was made to redefine the previous year's budget. 7. In their discussion no account was taken of the environmental conditions. 8. Advantage is often taken of the effect of temperature on solubility. 10. In deriving these formulas no allowance was made for temperature increase. 11. In the following notice is chiefly taken of the former point. 12. Special attention has been called to the research work. 13. Steps are taken to diminish friction. 8. The point of equilibrium however is tremendously influenced by the temperature. 9. The results were affected by the presence of impurities. 10. This phenomenon has been dealt with by several researchers. 11. In ethers and similar solvents the frequency was unaffected. 12. No difficulties were met at all. 13. The reaction was followed by measuring temperature. 14. The experiment will be followed by testing the end product. 15. This usage is not followed in carbohydrate chemistry. 16. Hamilton's discovery was quickly followed by other new algebras. 17. No amount of selected examples, however convincing, can be relied upon. 18. What is watched or waited for seems too long in coming. 19. As far as other compounds of this series are concerned they will be dealt with in another chapter. 20. While such special cases are rather easily dealt with the general problem is considerably more difficult.

Task 16.3. Translate the following sentences, paying attention to the forms of the passive voice:

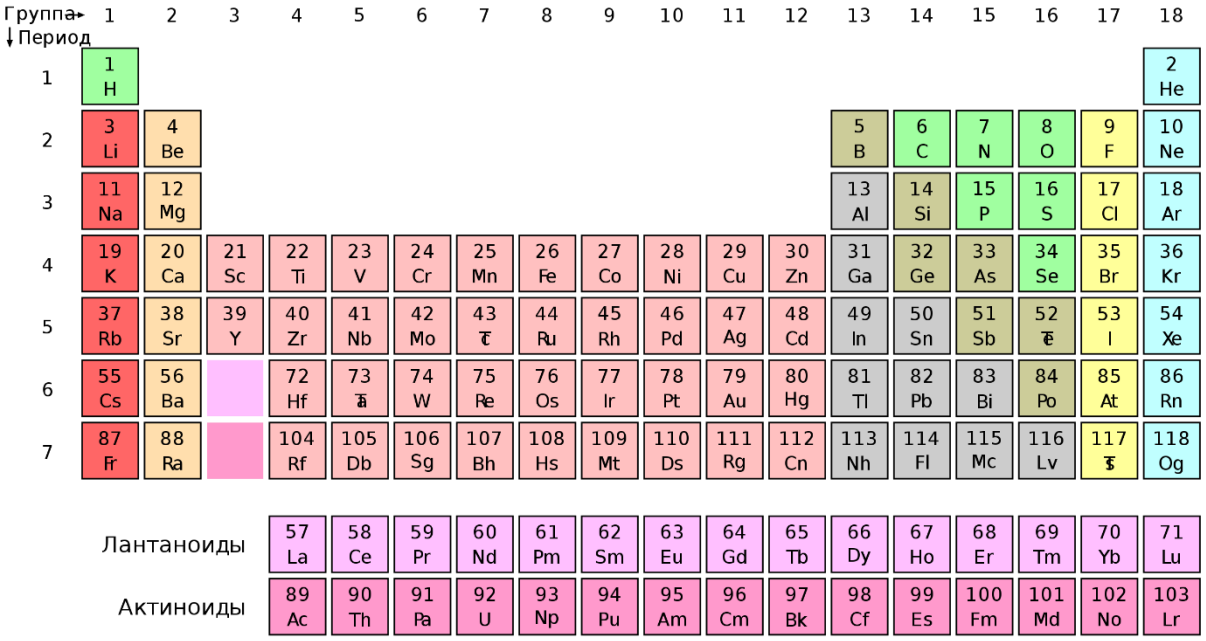
a) 1. Never ask pardon before you are accused. 2. Little thieves are hanged, but great ones escape. 3. What may be done at any time will be done at no time. 4. Nature is often hidden; sometimes overcome; seldom extinguished (F. Bacon). 5. Goodness of an object is defined by its relation to other objects. 6. This is rooted in instinct. 7. A mechanical method was substituted for an electric one. 8. For the estimations use will be made of a hypothetical reference model. 9. The distinction between cause and effect cannot be established or altered by any authority, external or internal. 10. The decision is reached by balancing pleasures against pain. 11. From now on it is assumed that the machines under consideration are strongly connected. 12. Many materials now commonly used were not even thought of thirty years ago. 13. Biological methods of purifying water are given much attention to by scientists. 14. The range of application of gas chromatography is wide and most substances boiling under 300°C can be dealt with readily. 15. Their defeat was utter and awful. Mercy was not thought of. 16. In gaseous reactions the equilibrium position is largely influenced by pressure. 17. The qualitative examination of an organic compound is followed by a quantitative analysis. 18. Questions can be asked and answered, but unfortunately the questions asked and those answered are frequently not the same.

b) Difficult cases of passive voice translation:

1. The question of the laws of resistances in circuits may now be turned to. 2. Many materials now commonly used were not even thought of thirty years ago. 3. Biological methods of purifying water are given much attention to by scientists. 4. When the molecules of even a good insulator are acted upon by an electric field, there is a motion of electrons due to this field. 5. The range of application of gas chromatography is wide and most substances boiling under 300 °C can be dealt with readily. 6. Political and economic penetration was soon followed by outright annexation. 7. Newton's "Particle Theory" is sometimes referred to as the "Corpuscular Theory" since corpuscles are very small particles. 8. Their defeat was utter and awful. Mercy was not thought of. 9. In the reactions with acid chlorides the zinc became coated with a dark oil. 10. The book was terribly bad, it was just a chance that it got published. 11. Mathematics, astronomy and physics were the first sciences to get organized and defined. 12. Every breach of rules was dealt with as a breach of the law and punishment was proportionally severe. 13. In statics, whether of solids, liquids or gases, and in heat, the bodies which are dealt with have no accelerations, and Newton's second law is not required. 14. When exposed to a beam of light this movement becomes oriented in the direction of the beam, and on a vertical surface it becomes directed by gravity. 15. The

speed with which arithmetic operations are performed is affected by a number of factors. 16. In gaseous reactions the equilibrium position is largely influenced by pressure. 17. The qualitative examination of an organic compound is followed by a quantitative analysis. 18. For detecting excessively low address release time the procedure given below can be followed. 19. Questions can be asked and answered, but unfortunately the questions asked and those answered are frequently not the same.

Task 17. Work in groups of two to three students. Make the presentation on one of the topics listed below. (Appendix, p. 146)



Ancient chemistry

1. Phlogiston chemistry
2. The chemical revolution (17-18 century)
3. Chemistry in the 21st century.

Task 18. Comment on the following statement.

“What the ocean was to the child, the Periodic Table is to the chemist.” – Karl Barry Sharpless.

The Periodic Table and the Periodic Law

The story of how D. I. Mendeleyev established the Periodic System of Elements has long been a matter of great interest to research workers.

When Mendeleyev began to teach at St. Petersburg University, chemistry was still far from being the well-ordered[2] and harmonious branch of science that we know today.

The great majority of scientists were firmly convinced that atoms of different elements were in no way connected with each other, and that they were quite independent particles of nature. Only a few advanced scientists realized that there must be a general system of laws, which regulates the behavior of atoms of each element. However, the few attempts made by Beguyer de Chancourtois, Newlands, Lother Meyer and others to find a system of laws controlling the behavior of atoms were unsuccessful and exercised no influence on Mendeleyev, the future founder of the Periodic System of Elements.

"Mendeleyev was a man who could not bear any kind of disorder and chaos," writes Academician A. A. Boikov. "This is why at the beginning of his course in chemistry at St. Petersburg University, where he had been appointed to the department of chemistry, D. I. had to establish the order in the chemical elements."

By comparison of chemical properties of different elements, researchers had long ago discovered that elements could be placed in several groups according to similarity in their properties.

Mendeleyev applied in his system the principles that he developed and included in his table the listing of the elements according to increasing weights.

Because he had the insight to s**ee** that many elements had not yet been discovered, he left open spaces in the Periodic Table. For example, he predicted that an unknown element with atomic weight of 44 would be found for the space following calcium. And in 1879 the Swedish chemist Lars Fredric Nilson discovered scandium.

Mendeleyev's table developed into the modern Periodic Table is one of the most important tools in chemistry. The vertical columns of the modern Periodic Table are called groups and the horizontal rows are called periods. The atomic number of an element is the number of protons in the nucleus of the atom of that element. The modern Periodic Table not only clearly organizes all the elements, it lucidly illustrates that they form "families" in rational groups, based on their characteristics.

Task 18.1. Look through the text again and find the sentences where the author describes the following facts:

1. Mendeleyev could foresee the existence of new elements because he was very gifted.
2. Scientists of Mendeleyev's time didn't believe that elements are connected with each other.
3. Mendeleyev’s character made him order the elements.
4. Mendeleyev’s work on the Periodic Table and the Periodic Law has long interested scientists.

5. There were some scientists' attempts to find a system to order the elements but they failed.

6. Thanks to Mendeleyev modern chemistry uses the clearly developed Periodic System as the main instrument.

Task 18.2. Answer the following questions choosing the correct answer out of the given ones:

1. Where did Mendeleyev start ordering the elements?
   1. at school;
   2. at St. Petersburg University;
   3. abroad.

2. Why did Mendeleyev turn to ordering the elements? Because:
   1. other scientists' attempts failed;
   2. he had a talent;
   3. he didn't like disorder.

3. What did the researchers try to do to find some order of the elements?
   1. they compared different properties;
   2. they read scientific literature;
   3. they denied the earlier attempts of the scientists.

4. How did Mendeleyev list the elements?
   1. according to their names;
   2. according to their atomic weights;
   3. according to their chemical symbols.

5. What did scientists of Mendeleyev's time think about atoms of different elements?
   1. they were independent particles of nature;
   2. they were closely connected;
   3. they belonged to a well-ordered system.

Task 18.3. Answer the questions.

1. Why is the Periodic Law considered the basis for the Natural System of Elements?

2. What is the modern wording for the Periodic Law?

3. What is the reason for periodic dependence of the properties of elements and their compounds upon the charge of an atomic nucleus?

APPENDIX

PART 1. Glossary

science – естественная или точная наука (физика, химия, математика, психология и т.д.), т.е. такая в которой превалирующую роль играет эксперимент. **scientific** – научный (но относящийся к области естественных или точных наук) **scientist** – ученый (работающий в области естественных или точных наук) **STEM (fields / disciplines)** – точные науки (сокр. от science, technology, engineering and mathematics) **humanities / humane studies / (the) arts / soft sciences / scholarship / schol** – гуманитарные науки **humanitarian** – гуманитарный **scholar** – ученый (работающий в области гуманитарных наук); эксперт в какой-то области. **theory** – теория **theoretical** – теоретический **applied** – прикладной **doctrine** – доктрина, учение **hypothesis, hyp** – гипотеза	**principle** – принцип **method** – метод (предполагает следование строгим правилам) **methodology** – методология **methodic** – методика **approach** – подход **research** – исследование **to research** – исследовать **to invent** – изобрести **to discover** – открыть **analysis** – анализ **to analize** – анализировать **experiment** – эксперимент **experimental** – экспериментальный **to carry (out) / conduct / perform / make / run an experiment** – проводить эксперимент **to test** – испытывать **testing** – испытание **to develop** – разрабатывать **result, outcome** – результат (исследования)

Names of Sciences and Humanities

Sciences	
anatomy – анатомия	**zoologist** – зоолог
anatomic – анатомический	**logic** – логика
anatomist – анатом	**logical** – логический
astronomy – астрономия	**logician** – логик
astronomical – астрономический	**medicine** – медицина
astronomer – астроном	**medical** – медицинский
biology – биология	**mathematics** – математика
biological – биологический	**mathematical** – математический
biologist – биолог	**mathematician** – математик
botany – ботаника	**education science / pedagogics / pedagogy; paedagogy** – педагогика
botanical – ботанический	**programming** – программирование
botanist – ботаник	**programmer** – программист
geography – география	**psychology** – психология
geographical – географический	**psychological** – психологический
geographer – географ	**psychologist** – психолог
geology – геология	**sociology** – социология
geological – геологический	**sociological** – социологический
geologist – геолог	**sociologist** – социолог
petroleum geologist – нефтяник	**physics** – физика
zoology – зоология	**physical** – физический
zoological – зоологический	**ecological** – экологический
physicist – физик	**ecologist** – эколог
chemistry – химия	**economics** – экономика
chemical – химический	**economical** – экономический
chemist – химик	**economist** – экономист
ecology – экология	

Studies

study – научный труд **work** – научная работа **monograph** – монография **article, paper** – статья **thesis** – диссертация **Phd thesis** – докторская / кандидатская диссертация **master thesis** – магистерская диссертация **graduation work / paper / graduate work / разг. graduate research** – дипломная работа, проект, ВКР, ВАР и т.п. **course work / coursework / term thesis / term paper** – курсовая работа, курсовой проект **report / proceedings / contributions** – доклад, сообщение (на конференции) **collection of scientific / humanity / research**	**articles / papers** – сб. научных статей **collection of scientific / humanity / research works / studies** – сб.н. тр. **scientific review / academic journal / scientific journal / scientific magazine** – научный журнал **citation index** – индекс цитирования **title** – заголовок, название (статьи) **keywords** – ключевые слова **abstract** – аннотация **IMRaD** – основные части научной статьи (скоращение от **introduction, methods, results, and discussions**) **introduction** – введение **body** – основная часть (научного труда) **results –** результаты **conclusion** – заключение **references** – ссылки, список источников

Degrees

degree – ученая степень **title** – ученое звание **PhD** – кандидат или доктор наук **assosiate professor** – адъюнкт-профессор, примерно соответствует званию доцента **professor** – профессор	**assistant professor –** примерно соответствует должности старшего преподавателя **academic** – академик **Bachelor of Arts** – бакалавр **Master of Arts** – магистр **person defending a phd thesis** – диссертант

Scientific terms in English

Mathematics	
algebra – алгебра	**plane** – плоскость
geometry – геометрия	**difference** – разница
point – точка	**quantity** – величина
circle – круг	**infinity** – бесконечность
square – квадрат	**line** – линия
triangle – треугольник	**segment** – отрезок
diagonal – диагональ	**mathematical single** – математический знак
diameter – диаметр	**fraction** – дробь
radius – радиус	**root** – корень
angle – угол	**power** – степень
parallel – параллель	**equation** – уравнение
area – площадь	**solve** – решить
perimeter – периметр	
Physics	
analysis – анализ	**direction** – направление
study – исследование	**inertia** – инерция
assumption – предположение	**mass** – масса
energy – энергия	**power** – сила
atom – атом	**resistance** – сопротивление
particle – частица	**stress** – напряжение
electron – электрон	**acceleration** – ускорение
neutron – нейтрон	**frequency** – частота
proton – протон	**properties** – свойства
charge – заряд	**relative** – относительный
electric – электрический	**nuclear** – ядерный
current – ток	**radiation** – радиация
direct – постоянный	
Astronomy	
space – космос	**black hole** – черная дыра
asteroid – астероид	**nebula** – туманность
meteorite – метеорит	**pulsar** – пульсар
comet – комета	**quasar** – квазар
flare – вспышка	**orbit** – орбита

planet – планета **planetoid** – малая планета **satellite** – спутник **star** – звезда **constellation** – созвездие **cluster** – звездное скопление **galaxy** – галактика **local group** – местная группа галактик	**eclipse** – затмение **astronaut** – астронавт **observatory** – обсерватория **telescope** – телескоп **space exploration** – космические исследования **escape velocity** – космическая скорость **light-year** – световой год
Geography	
map – карта **city** – город **country** – страна **continent** – континент **ocean** – океан **sea** – море **lake** – озеро **river** – река **island** – остров **north** – север **south** – юг **east** – восток **west** – запад	**degree of latitude** – градус широты **degree of longitude** – градус долготы **time zone** – часовой пояс **hemisphere** – полушарие **equator** – экватор **landform** – форма рельефа **coast** – побережье **bay** – бухта **canyon** – каньон **desert** – пустыня **dale** – долина **cliff** – утес
Biology	
biosphere – биосфера **ecosystem** – экосистема **diversity** – разнообразие **species** – вид **bacteria** – бактерия **virus** – вирус **embryo** – эмбрион **cell** – клетка **dermis** – дерма **tissue** – ткань **DNA** – ДНК **genome** – геном **receptor** – рецептор	**plasma** – плазма **organelle** – органелла **chromosome** – хромосома **absorption** – поглощение **excretion** – выделение **respiration** – дыхание **atrophy** – атрофия **life cycle** – жизненный цикл **instinct** – инстинкт **evolution** – эволюция **mutation** – мутация **extermination** – уничтожение

Chemistry	
chemistry – химия **science** – наука **analysis** – анализ **aggregate state** – агрегатное состояние **relative atomic mass** – относительная атомная масса **valency** – валентность **ion** – ион **metal** – металл **nonmetal** – неметалл **atom** – атом **molecule** – молекула **symbol of element** – символ элемента **chemical bond** – химическая связь	**chemical equation** – химическое уравнение **chemical equilibrium** – химическое равновесие **chemical element** – химический элемент **chemical properties** – химические свойства **chemical reaction** – химическая реакция **chemical formula** – химическая формула **substance** – вещество **simple substance** – простое вещество **complex substance** – сложное вещество **synthesis** – синтез **periodic law** – периодический закон **periodic table** – периодическая таблица
Geology	
geological relevance – геологическая значимость **geometallurgy –** геометаллургия **groundwater –** подземные воды **high technology applications применение –** высокотехнологичных отраслях **land distortions –** деформации поверхности (Земли) **Layer geology –** геология / геологическое строение пластов **mining environment –** горная промышленность **stiffness of the rock –** жесткость породы **local capacity –** местные возможности	**volcanic field –** вулканическое поле **unrisked resources** – доказанные запасы **brittle crust** – хрупкая земная кора **calcarious deposits** – известковые отложения **competent formation** – устойчивый пласт **continental drift** – дрейф материков **Earth Sciences** – науки о Земле **earthquake fault line** -линия тектонического сброса **eccentricity azimuth** -азимут большой оси **iron minerals** – железосодержащие минералы **iron occurring in the bedrock** – Залежи железа в коренных породах

Discussion Phrases

1. Starting your discussion

Let's begin/start with …
Shall I start? / Yeah, go on.
Shall I go first? / Of course, go ahead.
Is it okay if I start? / Sure, no problem.
Bob, I think you know a lot about [topic]. What's your opinion on it?
Would you like to go first? / Yes, why not?
Would you like to begin?
Which one shall we start with?
What do you think, Bob?

2. Expressing your opinion

As for me / As to me, …
As far as I'm concerned,…
I believe/think that…
I am of the opinion that …
I have the feeling that …
I have no doubt that …
I hold the view that
I think / consider / find / feel / believe / suppose / presume / assume that …
I guess that …
I suppose…
I would say that…
It seems to me that…
It goes without saying that …
I am under the impression that …
In my opinion,…
In my view…
If you ask me,…
My own feeling on the subject is that …
From my point of view, …
The way I see it,…
To my mind, …

3. Moving to the Next Item/ Changing the subject

Ah, that connects with the next topic.
As for + one of the options
As to + one of the options
As regards + one of the options
How do you feel about that one?
In relation to + one of the options
I wonder if we can compare [current topic] to [new topic]?
Regarding the question of the task,

Shall we move onto [topic] now?
So what about [topic]?
[Topic] is pretty similar to the last one – maybe we can skip it for now?
We still need to discuss [topic].
What about this one? [pointing to topic]What do you think about this idea?
We're running out of time, so let's move on.
With regard to + paraphrased question

4. Ending Your Turn/ asking for your partner's your opinion/asking for clarification

Don't you agree?
Do you have anything to say about that?
Do you have anything to add to that?
Do you think…?
Do you believe that…?
Did I forget anything?
«statement», don't you think/agree?
«statement», wouldn't you say so?
«statement», wouldn't you agree?
«statement», right?
How about…?
What about…?
What's your take on…?
What do you think?
What do you think about…?
What's your opinion?
What do you reckon?
Do you get what I am saying?
Where do you stand on this?

5. Interrupting

Excuse me, May I please interject
Excuse me, May I please add
I'm sorry, but …
I'm sorry to interrupt, but…
I don't mean to intrude
Just a second…
Sorry to interrupt but…
Can/May I add something?
While that is an important point its also important to add

6. Phrases to keep a discussion going

Let's get back to …
As we just heard …
Where were we?

7. Agreeing

I am at one with you on that point.
I guess so!
I fully agree.
I couldn't agree more.
I was just thinking that!
I was just going to say that!
I (totally) agree with you.
I see it that way, too.
I think so, too.
I have no objection.
I have come to the same conclusion.
I hold the same opinion.
I share your view.
I suppose so!
Exactly!
Fair enough!
Good point.
That's just what I was thinking.
That's (absolutely) true.
That's a great idea.
That's just it!
You're totally right.
You're dead right.
You're (absolutely) right.
Yes, I see what you mean.
Yes, of course.
Why not!
You hit the nail on the head!
Spot on!

8. Disagreeing

I think it would be better to…
I'm not so keen on that.
I don't really agree with you there.
I don't share your view.
I don't think that's quite right.
I'm sorry, but I don't agree.
I'm afraid I don't see it the same way.
I am afraid that is not quite true.
I'm sorry but I have to disagree.
I'm with you on that, however…
I think otherwise.
I guess not
I suppose not
I see what you're saying, but I suppose
I would add that…
Of course not
Definitely not
You may be right, but I have a different view.
Yeah, but, the thing is…
Maybe, but what about…?
May I also suggest that…
For one thing…[reason 1] And for another… [reason 2]

That might be true, but I'm not sure I agree with you.
The problem with what you said is…
Weeeeeell maybe, but…
To be honest…
Fair enough, but…
I see your point… but

9. Reaching a Decision/ Concluding the discussion

Are we both in favor of [topic]?
For these reasons,
I guess you think we should choose [topic]?
I don't think we're going to agree on this!
I believe we have an agreement, don't we?
In conclusion
In a nutshell,
Let's agree to disagree!
Okay, so we agree.
So then, what do you think is the best one?
So, do we have an agreement?
Shall we stick to…?
Shall we agree on..?
Thus,
To sum up
The bottom line is…
Well, I think it's definitely not [topic]We can eliminate [topic] right away. Don't you think?

10. Conversation fillers

I've never really thought about that, but I suppose…
Let's me consider this for a moment, it's quite complicated…
to be honest that's not a question I've ever thought about before…

Summary and Review

Summary – краткое изложение в письменном виде содержания текста. При этом материал излагается с позиции автора оригинала и не содержит элементов интерпретации или оценки.

Целью реферата является замена первоисточника, чтобы у читателя появилась возможность сберечь время при знакомстве с объектом описания.

Назначение:

1) осветить основную информацию, заключенную в тексте;
2) описать оригинал;
3) быть источником для справочных материалов.

План реферата:

1. выходные данные источника;
2. текст реферата, т.е. тема, основная мысль, краткое изложение содержания;
3. результаты и выводы.

Примерный объём реферата – 10-15% реферируемого текста.

Алгоритм составления реферата:

а) прочитать весь текст и попытаться понять его содержание и смысл;

б) пересказать основные тезисы текста своими словами;

в) объединить все предложения, организуя текст согласно порядку основных идей оригинала.

Клише для написания реферата:

The object (purpose) of the text (paper) is

- to discuss
- to describe
- to show
- to determine

The present paper discusses some problems relating to…
…… deals with some aspects of…
……. provides information on…
……. is devoted to…
……. is concerned with…
Introduction: The paper begins with a short discussion…
To begin with, the author…

The body of a summary: Then follows a discussion on…
Next, the author tries to…
It must be noted that…
Then comes the problem of…

Conclusion: The conclusion is that…
To sum up…
Finally, the author admits…
The final paragraph states…

Review – аннотация – самое краткое изложение главного содержания первичного документа, составленное в результате компрессии текста оригинала и в нескольких строчках дающее представление о его тематике.

Назначение – аннотация не может заменить текст оригинала, она лишь даёт возможность читателю составить мнение о целесообразности более детального ознакомления с материалом.

Размер – 30 – 40 слов (500 печатных знаков)

План:

1) выходные данные;
2) тема, основные понятия;
3) краткое содержание, отличительные черты документа, т.е. то новое, что несет в себе материал и особенности его подачи;
4) выводы;
5) читательская аудитория.

Алгоритм составления аннотации:

а) прочитать текст;
б) разделить текст на логические части;
в) ответить на вопрос: О чём текст? Сформулировать тему. Записать ответ в 1–2 предложениях, используя клише.
г) ответить на вопросы: Какова цель и назначение данного текста? Как вы оцениваете содержание текста? Сделайте свои выводы о его новизне, важности, достоинствах и недостатках в 2 -3 предложениях.

Отличия реферата от аннотации: реферат строится на основе ключевых фрагментов из текста оригинала. Аннотация пишется своими словами, поэтому она носит отпечаток субъективности и оценки.

Некоторые клише для написания аннотации:

This article / text / extract / paragraph deals with….
touches upon the problem of …
is concerned with …
centers around the issue…
is about …
is devoted to …
gives information on…..

The author points out …
stresses …
argues …
describes …
discusses…
gives the classification of …
looks at…
examines…
demonstrates….
illustrates….

Дополнительные клише:

In my opinion…
To my mind…
It is possible to understand that…
This tells us almost for certain…
In spite of all these differences…
In conclusion I would like to state the main problem…
The author concentrates on a wide range of things, which raise special problems…
The paper is interesting…
The paper is of importance…
It is valuable\ invaluable…
It is up-to-date\ out-of-date…
The article is useful\ useless
The article is informative
The article gives interesting facts about…

Presentation

Основная цель презентации – передача сообщения/ информации аудитории.

Подготовка к презентации

- Прежде всего, подумайте, ***кто будут Ваши слушатели***, будет ли им интересно Ваше сообщение, и как они будут реагировать на то, что Вы собираетесь им сообщить.
- Очень полезно заранее ***посмотреть аудиторию***, в которой Вы будете делать презентацию. Надо определить, достаточно ли мест в аудитории, где разместить наглядные пособия (***постеры, графики, таблицы*** и т.д.).
- Подумайте, какое оборудование Вам потребуется (***аудио, видео, мультимедийное, проектор с экраном для демонстрации слайдов*** и т.д.).
- С самого начала надо знать ***регламент презентации***, т.е. сколько времени должна длиться ваша презентация. Помните, что презентация не читается, а "***проговаривается***", что занимает гораздо больше времени, поэтому не старайтесь представить слишком много материала
- Хронометрируйте свою презентацию и, делая её, пользуйтесь только заметками на небольших листах бумаги, подобных открыткам. ***Ни в коем случае не читайте с листа с полным текстом!***

Основные признаки эффективной презентации

Организация

– ясно обозначена
– эмфаза на начало и конец
– резюме/ подведение итогов и заключение
– четкое соблюдение регламента

Передача сообщения, манера произнесения

– громкость, сила голоса
– темп и разнообразие скорости говорения
– логическое ударение и интонация для выделения
– уверенность
– дружеский тон

Язык тела и жестов (невербальные средства передачи сообщения)

– визуальный контакт с аудиторией
– поза
– жесты

Язык

– соответствующий уровень языка
– грамматическая правильность речи и правильность произношения

– длина предложений (фразы должны быть короткими и легко воспринимаемыми)

Интерес презентации для аудитории

– выбор темы

– релевантность/ уместность темы

– взаимодействие с аудиторий

Наглядные пособия

– четкое исполнение (графиков, таблиц, рисунков)

– достаточное количество раздаточного материала

– профессиональное использование проекторов и ноутбуков

Все презентации, как правило, состоят из трёх частей и вопросов:

1. Introduction.
2. Body.
3. Conclusion
4. Questions

Введение

Введение – это, возможно, самая важная часть выступления, так как аудитория получает первое впечатление о докладчике. Во введении обычно выделяют следующие этапы:

1. приветствие аудитории
2. сообщение темы и цели презентации
3. представление структуры презентации
4. информация о порядке ответа на вопросы
5. В таблице даны разные варианты конструкций и клише для каждого из этапов.

Этапы	Примеры конструкций и выражений
1. Приветствие аудитории/ Welcoming your audience	• Good morning, everyone. Thanks for coming • Good afternoon, ladies and gentlemen • Good afternoon, everybody
2. Тема и цель презентации/ Introducing your subject	• I am going to talk today about... • The purpose of my presentation is to introduce our new range of... • I'd like to …… …..say a few words to you today about…… …..explain to you today the main features of …….. …..describe the operation of …….. …..give you some information about…… …..report on……. …...take a look at…… …...discuss…… • The purpose of this presentation is to……..

3. Структура презентации/ Outlining your structure	• I've divided my talk into five main parts. • The subject can be looked at under five main headings. • During my talk I'll be looking at five main areas. • First(ly)… second(ly)…..third(ly)……..fourth ……fifth……..finally • I'll begin/start off by - looking at - filling you in on the background to… - bringing you up-to-date on…. - giving you an overview of…. - making a few observations about…. • ….. Then I'll – explain …… – go on to…… – discuss in more depth….. – talk you through…..
4. Порядок ответа на вопросы/Giving instructions about questions	• Do feel free to interrupt me if you have any questions. • I'll try to answer all of your questions after the presentation. • Perhaps we can leave any questions you may have until the end of the presentation • I plan to keep some time for questions after the presentation.

Основная часть

Требования, предъявляемые к основной части, это – хорошо продуманная структура и логичность изложения. Следующие клише помогут достичь этой цели.

Этапы	Примеры конструкций и выражений
1. Первый пункт доклада	• So, first of all, I'd like to…… • To start with…. • First of all, then…. • Let me begin by saying…..
2. Завершение первого пункта	• Well, that's all I have to say about. ….. • So that, then, is …. • That's all about…. • Now we've dealt with….
3. Переход к новому пункту	• Now let's turn to my next point, which is …. • Let's move on now to…. • The next point I'd like to make is…… • Next we come to ……. • This brings me to my next point…… • My next point is……. • I'd like to turn to……
4. Отступление от темы	• Incidentally… • Coming back to the subject of my talk…. • To come back to……
5. Обращение к наглядным материалам	• As you can see from this table…… • If you look at this curve, you will see that…. • It's quite clear from these figures that……
6. Переход к последнему пункту	• And finally,……. • That brings me to the last point, which is……..

Заключение

В заключительной части рекомендуется сделать следующее:

1. подвести итоги,
2. дать рекомендации по(необходимости),
3. поблагодарить аудиторию за внимание,
4. ответить на вопросы слушателей.

Этап	Примеры конструкций и выражений
1 Подведение итогов	• To conclude,... • In conclusion,... • So let me summarize/recap what I've said. • So now, I'd just like to summarize the main points. • In brief, we have looked at…. • Let me sum up. • So, to sum up (the main points briefly)…. • I would like to conclude by (saying)…. • Well, that brings me to the end of my talk …… • That's all I have to say for now…….. • Finally, may I remind you of some of the main points we've considered.
2 Рекомендации	• In conclusion, my recommendations are... • I therefore suggest/propose/recommend the following strategy.
3 Благодарность в адрес аудитории	• Thank you for listening. • Many thanks for your attention.
4 Ответы на вопросы	• Now I'll try to answer any questions you may have. • Can I answer any questions? • Are there any questions? • Are there any final questions?
4 Сложные вопросы	• I need to think about that one. Could we come back to it later? • I don't really know the answer to that. Could we discuss it later?

English Dictionaries for specific purposes

Работа со словарями

При изучении иностранного языка очень важно научиться правильно пользоваться справочной литературой, и в первую очередь, – словарями различных типов. Словари различаются подбором и объемом словника, а также по тому, как в них организуется материал. Они бывают одно-, дву-, и многоязычные.

Для университета лучше выбрать словари достаточно большого объема, например, «Большой русско-английский словарь» под ред. Д.И.Ермоловича, «Новый большой русско-английский словарь» под ред. П.Н.Макурова, М.С.Мюллера, В.Ю. Петрова; «Новый большой англо-русский словарь в 3 томах» (Ю.Д. Апресян, Э.М. Медникова, И. Гальперин).

Популярными в последнее время стали одноязычные англо-английские учебные словари, рассчитанные на иноязычных пользователей: “Oxford Advanced Learner’s Dictionary of Current English”, “Longman Dictionary of Contemporary English”, “Collins COBUILD English Language Dictionary”, “Longman Language Activator”, “Cambridge International Dictionary of English”.

При изучении текстов по своей специальности на английском языке вам обязательно пригодятся и специализированные, или отраслевые словари. Данные словари представляют лексику той или иной профессиональной сферы. Например, “Longman Business English Dictionary”, “The Law Dictionary” и т.п.

Энциклопедический словарь – дающий подробную информацию о предмете или явлении, обозначаемым данным словом. При изучении иностранного языка удобно пользоваться англо-английскими энциклопедическими словарями, например, “Webster’s Encyclopedic Unabridged Dictionary of English Language”.

Быстро отыскать необходимую ключевую лексику по нужной теме поможет словарь типа Word finder (“Oxford Learners’ WordFinder Dictionary”).

Очень удобен также и словарь сочетаемости слов (“Oxford Collocations”).

Периодически полезно заходить на сайты крупнейших словарных издательств: www.longman-elt.com/dictionaries; www.oup.com и другие.

Для поиска нужной информации можно и нужно широко использовать

Интернет-ресурсы

www.onelook.com – одновременный просмотр 500 словарей;

The Phrase Finder (http://phrases.shu.ac.uk) – ресурс. Где можно найти известные заголовки, названия, рекламные тексты, слова песен и т.д. Разделы: Phrase Thesaurus; meanings and orogons of Phrases; Discussion Forum; Book List.

www.multitran.ru – удобный для использования при переводе сайт, который предоставляет информацию как об общелитературной. Так и о специальной лексике по разным отраслям знания.

The Acronym Finder (www.acronymfinder.com). Поиск на этом сайте почти наверняка даст результат – часто это несколько расшифровок старых и новых, широко употребимых или редких сокращений. Аналогичный русский сайт – www.sokr.ru.

How to make an outline

When you read a chapter in a textbook from beginning to end, it's easy to get swept away in a sea of details and overlook the main ideas. If you're short on time, you might not even be able to make it through the entire chapter. By creating an outline, you'll be sifting through the information strategically and efficiently. Outlining helps you to focus on the most important points and gloss over excess detail.

To get started, follow this simple outlining process next time you read a textbook chapter.

1. Carefully Read the First Paragraph of the Chapter

In the first paragraph, the author establishes a basic structure for the entire chapter. This paragraph tells you what topics will be covered and what some of the chapter's main themes will be. It may also include **key questions** that the author plans to answer in this chapter. Make sure you read this paragraph slowly and carefully. Absorbing this information now will save you a lot of time later.

2. Carefully Read the Last Paragraph of the Chapter

Yes, that's right: you get to skip ahead! In the very last paragraph, the author sums up the chapter's conclusions about the main topics and themes and may provide brief answers to some of the key questions raised in the first paragraph. Again, read slowly and carefully.

3. Write Down Every Heading

After reading the first and last paragraphs, you should have a broad sense of the chapter's content. Now, return to the beginning of the chapter and write down the title of each section heading. These will be the largest headings in the chapter and should be identifiable by a big, bold font or bright color. These headings reflect the chapter's main topics and/or themes.

4. Write Down Every Subheading

Now it's time to head back to the beginning of the chapter. Repeat the process from Step 3, but this time, write down the subheadings beneath every section heading. The subheadings reflect the main points the author will make about each topic and/or theme covered in the chapter.

5. Read the First and Last Paragraph of Every Subheading Section, and Make Notes

Are you sensing a theme yet? The first and last paragraphs of each subheading section typically contain that section's most important content. Record that content in your outline. Don't worry about using complete sentences; write in whatever style is easiest for you to understand.

6. Read the First and Last Sentence of Every Paragraph, and Make Notes

Return to the beginning of the chapter. This time, read the first and last *sentence* of every paragraph. This process should reveal significant details that might not be included elsewhere in the chapter. Write down the important details you find in each subheading section of your outline.

7. Quickly Skim the Chapter, Looking for Bold Terms and/or Statements

For the final time, flip through the entire chapter, skimming each paragraph for terms or statements that the author emphasizes with bold or highlighted text. Read each one and record it in the proper section in your outline.

Remember, every textbook is a little different and may require a slightly modified outlining process. For example, if your textbook includes introductory paragraphs beneath every section heading, make a point of reading those in full and including a few notes in your outline. Your textbook might also include a table of contents at the beginning of each chapter, or better yet, a chapter summary or review. When you finish your outline, you can double check your work by comparing it to these sources. You'll be able to make sure your outline isn't missing any of the major points highlighted by the author.

At first, it might seem strange to skip over sentences. ("How can I understand the content if I don't read all of it?") Counterintuitive though it may feel, this outlining process is a simpler, faster strategy for understanding what you read. By starting with a broad view of the chapter's main points, you'll be able to better comprehend (and retain) details and their significance.

Plus, if you have extra time, you can always go back and read every line in the chapter from beginning to end. You'll probably be surprised by how well you already know the material.

PART 2. The functions of the verb to be

1. *a notional verb* (смысловой)

The solution **was** in its stable state. Раствор **находился** в устойчивом состоянии.

2. *an auxiliary verb* (вспомогательный)

He **is *developing*** a new method for obtaining low temperatures. Он разрабатывает новый метод для получения низких температур.

The temperature of the water **was *raised*** by heating. Температура воды **была** поднята нагреванием.

3. *a modal verb* (модальный)

He **is to** mix these substances. Он **должен** смешать эти вещества.

They **are not to** be weighed. Их **не надо** взвешивать.

Now the scientist **is to** study this phenomenon. Теперь ученому **предстоит (нужно)** изучить это явление.

4. *a link-verb* (глагол-связка)

The object **is** to provide low pressure. Цель заключается в том (состоит в том), чтобы создать низкое давление.

My friend **is** an architect. Мой друг – архитектор.

To stop in one's progress **is** to lag behind. Остановиться в своем развитии – значит отстать.

NOTE. При переводе словосочетаний типа ***to be of interest, to be of value, to be of importance*** следует использовать глаголы типа ***иметь, представлять***.

The theory **is of** particular **interest**. Эта теория **представляет (имеет)** особый **интерес**.

The functions of the verb to have.

1. a notional verb (смысловой)

Every material **has** a number of properties. Каждый материал (вещество) **имеет** ряд свойств.

An object at rest has no kinetic energy. Тело, находящееся в покое, не **обладает** кинетической энергией.

2. an auxiliary verb (вспомогательный)

Concrete **has** become an important construction material. Бетон стал важным строительным материалом.

They **have** weighed the product. Они взвесили этот продукт.

3. a modal verb (модальный)

They **have to** mix these substances. Они **должны** смешать эти вещества.

You **will have to** take measures to prevent waters from penetrating the foundation. Вам **нужно будет** принять меры, чтобы предотвратить проникновение воды в фундамент.

He **had to** explain the general principles of dissolving substances. Ему **пришлось** объяснить общие принципы растворения веществ.

The functions of the verb to do.

1. смысловой глагол делать, производить, выполнять

A locomotive **does** work while pulling a train. Паровоз **производит** работу, когда тащит поезд.

2. вспомогательный глагол

Do you speak Chinese? Вы говорите на китайском?

He **doesn't** know this rule. Он не знает это правило.

They **did** not know anything about this experiment. Они ничего не знали об этом опыте.

Don't use this tool. It's broken. Не пользуйтесь этим резцом, он сломан.

3. глагол-заместитель

The digital computer processes data with greater speed than the analog computer **does**. Электронная цифровая вычислительная машина обрабатывает данные быстрее, чем их **обрабатывает** моделирующая машина.

He knows this rule as well as you **do**. Он знает это правило также хорошо, как Вы (**знаете**).

4. эмфатический глагол

The results of the two experiments indicate that isomerization **did** take place. Результаты обоих опытов указывают на то, что изомеризация **действительно** имела место.

This substance **does** react at high pressure. Это вещество **все же** вступает в реакцию под высоким давлением.

This alloy **does** contain copper. Этот сплав **действительно** содержит медь.

The grammatical function of word order

The main function of word order is to express grammatical relations and determine the grammatical status of a word by fixing its position in the sentence. There exist two ways of arranging words – *direct word order* and *inverted word order.*

6.2. Direct word order

The most common pattern for the arrangement of the main parts in a declarative sentence is **Subject – Predicate – (Object),** which is called *direct* word order. Direct word order is also employed in pronominal questions to the subject or to its attribute.

Direct word order **allows of only few variations** in the fixed pattern, and then only for the secondary parts. Thus if there are two objects, the indirect one precedes the direct one, or the prepositional follows the direct one. Thus the pattern has the following form:

Subject – Predicate - **Indirect object – Direct object**

Direct object – Prepositional object

The birds have come.

Ann has seen this film.

As to other secondary parts of the sentence, such as attributes and adverbial modifiers, their position is less fixed. Usually those words that are closely connected tend to be placed together. Accordingly secondary parts referring to their headwords are placed close to them, or are incorporated into, or else frame them up. Thus attributes either premodify or postmodify or frame up their headwords: a *bright* morning, the problems *involved,* the scene *familiar* to us, the *happiest* man *alive,* the *best* skier *in the world.*

Adverbials and different form words seem to be the most movable parts in the sentence. Their mobility is partly accounted for by their varied reference to different parts of the sentence.

Образование Present Simple

Утвердительные предложения:

We investigate the problem	We investigate the problem
You investigate the problem	You investigate the problem
He / she / it investigates the problem	They investigate the problem

Вопросительные предложения:

Do you investigate the problem ?

Does he / she / it investigate the problem?

Отрицательные предложения:

I do not investigate the problem.

He / she / it does not investigate the problem.

Образование Past Simple (asked/saw)

Утвердительная форма Past Indefinite правильных глаголов образуется путем прибавления окончания **-ed** к основе инфинитива для всех лиц: work**ed**, help**ed**, chang**ed**, visit**ed**, decid**ed**.

Неправильные глаголы образуют Past Indefinite путем различных изменений и употребляются во второй форме: went, came, wrote.

Вопросительные и отрицательные предложения образуются при помощи вспомогательного глагола **did** (для всех лиц), который в вопросах всегда стоит перед подлежащим, а в отрицаниях **did not** (-didn't) после подлежащего перед смысловым глаголом в форме инифинитива без частицы **to** (1-й формы глагола).

They made the experiment last year.

Did they make the experiment last year?

Perfect Tenses (Совершенные времена)

Времена группы Perfect употребляются для выражения законченного действия, совершившегося к определенному моменту в настоящем или предшествующего действию по отношению к какому-то моменту в прошлом или будущем. **Perfect Tenses** образуются при помощи вспомогательного глагола to have (в соответствующем времени группы Indefinite) и причастия прошедшего времени (Participle II) смыслового глагола.

to have + Participle II

We **have used** this method since 2000.
He **has** just **removed** the precipitation from the solution.

Infinitive and its functions

Функции инфинитива в английском языке

Инфинитив может выполнять в предложении функции различных членов предложения. Основные **функции инфинитива в английском языке** – это подлежащее, часть простого сказуемого, часть составного глагольного сказуемого, именная часть составного сказуемого, дополнение, определение и обстоятельство.

1. Подлежащее.

To smoke is harmful. Курить вредно.
To obey the laws is everyone's duty.
Соблюдать законы – обязанность каждого.
To save money now is practically impossible.
Экономить (отложить) деньги сейчас практически невозможно.

2. Часть простого сказуемого в сочетании со вспомогательными глаголами.

I didn't use this new machine.

3. Часть составного глагольного сказуемого.

а) в сочетании с модальными глаголами:

He **can calculate** well.
б) в сочетании с глаголами, которые без инфинитива не дают полного смыслового значения: to begin – *начинать*, to continue – *продолжать*, to decide – *решать*, to want – *хотеть*, to hope – *надеяться*, to try – *пытаться, стараться*, to end – *закончить*, to stop – *остановиться* и др.:

He **decided to** check this part of the mountain
She **hoped to** achieve the results quickly.

4. Именная часть составного сказуемого.

Our plan **is to work** during our summer practice.

5. Дополнение (после переходных глаголов).

She asked me **to help her with the course paper.**
I told him **to consult with his professor**

6. Определение.

This was the difficult part of the work **to be done.**

Заметьте:
I. Инфинитив, который определяет существительное, переводится определительным придаточным предложением с глаголом, выражающим долженствование в форме будущего времени.

The students to take part in the experiment, have come.
Школьники, которые примут участие в эксперименте, пришли.

The text-book to be published next year is written by our lecturers.
Учебник, который будет опубликован в следующем году, написан нашими преподавателями.

2. Инфинитив в функции определения часто употребляется после слов the first, the second, the third,..., the last, the only и т. п. и переводится глаголом в личной форме в том времени, в котором стоит глагол-сказуемое.

He is always **the last to come** to work.
Он всегда приходит на работу последним.

7. Обстоятельство.

1. Для выражения цели (при переводе перед инфинитивом употребляется союз *чтобы, для того чтобы*):

He came to Moscow **to study** at the University.
Он приехал в Москву (, чтобы) учиться в университете.

He worked hard **not to lag** behind the other people.
Он усердно работал, чтобы не отставать от других.

НО: После глаголов to go и to come в повелительном наклонении инфинитив не употребляется. Инфинитив приобретает повелительную форму (форму повелительного наклонения), и оба глагола объединяются союзом and.

Go **and** ask him. Иди и попроси его.
Come **and** ring him up. Приходи и позвони ему.

Перед инфинитивом, выражающим цель, могут стоять союзы in order to – *чтобы*, so as to – *для того чтобы*.

He works so hard **in order not to lag behind** the other people.
Он работает так усердно (для того), чтобы не отставать от других.

2. Для выражения следствия в обороте

«too, enough + прилагательное или наречие + инфинитив»

It was **too late to come** back.
Было слишком поздно возвращаться назад.
I don't know him **well enough to ask** him for money.
Я не знаю его достаточно хорошо, чтобы просить у него деньги.

Оборот «Именительный падеж с инфинитивом» употребляется:

1. Когда сказуемое выражено следующими глаголами в страдательном залоге: to say – *говорить*, to state – *заявлять, сообщать*, to report – *сообщать*, to know – *знать*, to expect – *ожидать*, to believe – *полагать, считать*, to consider – *считать*, to see – *видеть*, to think – *думать*, to hear – *слышать*

Оборот «Именительный падеж с инфинитивом» (Complex Subject)

Подлежащее	Сказуемое		Второстепенные члены предложения
Our guests He (she)	are is	said stated reported known expected	to arrive tomorrow

Главное предложение	Придаточное предложение
Говорят, Заявляют, Сообщают, Известно, Ожидают,	что наши гости прибывают завтра что он (она) прибывает завтра

He *is said* **to live** in Moscow.
Говорят, что он живёт в Москве.

Our students *are reported* **to place** first.
Сообщают, что наши студенты заняли первое место.

Предложения с оборотом «Именительный падеж с инфинитивом» переводятся:

а) сложноподчиненным предложением. Глагол в страдательном залоге переводится неопределенно-личным оборотом – *говорят, сообщают, известно* и т. д., который играет роль главного предложения, за которым следует придаточное предложение с союзом *что*.

He *is said* **to come** home. Говорят, что он приезжает домой.

б) простым предложением с неопределенно-личным оборотом в роли вводного предложения.

He *is said* **to come** home. Он, как говорят, приезжает домой.

2. Когда сказуемое выражено глаголами to seem, to appear – *казаться*, to prove – *оказываться*, to happen, to chance – *случаться*. Эти глаголы употребляются только в действительном залоге.

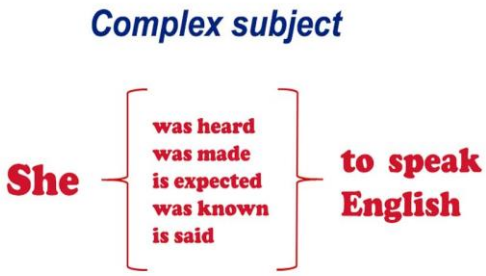
He *seems* **to come back**. Кажется, он возвращается.

I *happened* **to fall ill**. Случилось так, что я заболел.

He *proved* **to be** a good doctor. Он оказался хорошим врачом.

She *appears* **to be** ill. Она, по-видимому (кажется), больна.

НО: После глаголов **to seem, to appear, to prove** инфинитив, выраженный глаголом-связкой **to be**, часто опускается.



She **appears** (to be) **ill**. По-видимому, она больна.
He **seems** (to be) **surprised**. Кажется, он удивлён.

3. Когда сказуемое выражено сочетанием глагола to be и прилагательным: likely – *вероятный*, unlikely – *невероятный*, certain – *несомненный*, sure – *верный, безусловный*. Indefinite Infinitive после этих сочетаний обычно выражает действие, относящееся к будущему времени.

He **is likely to bring** a new magazine. Он, вероятно, принесет новый журнал.

They **are sure to take** their children to the sea in summer. Они, безусловно, отвезут детей летом к морю.

Инфинитив в обороте «Именительный падеж с инфинитивом» может выступать в различных глагольных формах:

1. Инфинитив в форме Indefinite выражает действие, одновременное с действием глагола в личной форме.

He *is said* **to work** in Minsk. Говорят, что он работает в Минске.

2. Инфинитив в форме Continuous выражает длительное действие, но одновременное с действием, выраженным глаголом в личной форме.

He *is reported* **to be writing** a new novel.
Сообщают, что он пишет новый роман.

3. Инфинитив в форме Perfect выражает действие, предшествующее действию, выраженному глаголом в личной форме.

He *is said to have worked* in Minsk. Говорят, что он работал в Минске.

She *is known* **to have been appointed** director of a new school. Известно, что она назначена директором новой школы.

4. Инфинитив в форме Perfect Continuous выражает длительное действие, которое совершалось в течение определенного отрезка времени до действия, выраженного глаголом в личной форме и связанного по времени со вторым действием или моментом (т. е. действие продолжается).

She *is said* **to have been working** in Minsk for twenty years. Говорят, что она работает в Минске в течение двадцати лет.

The Modal verbs and their equivalents

Долженствование	
Must	They must carry out the experiment today.
Should, ought to	You should (ought to) interpret the data obtained.
Have to	He has to investigate the results of well log.
	They had to finish the experiment yesterday.
Be to	The geophysicists are to employ new methods of
	investigation.
	The calculator was to be used for evaluation.
Физическая возможность	
Can	Porosity can be determined by means of several logs.
Could	They could use various types of logs in oil
	exploration.
be able to	They are able to provide quick evaluation of
	formation.
	The team of geophysicists were able to employ a new
	tool for effective evaluation of formation.
	You may examine the sample fossils.
Разрешение	The students are allowed to work in the lab.
May, might	He wasn’t allowed to carry out the experiment.
be allowed to	
	There may be various methods for formation
Предположение	evaluation.
May, might	The methods under study might be effective in oil
	exploration.
Must	This scientist must be carrying out the experiment in
	the lab.

Таблица времен пассивного залога

	Simple	Continuous	Perfect
Present	space is explored Is space explored? Space is not explored.	space is being explored	space has been explored
Past	space was explored	space was being explored	space had been explored
Future	space will be explored	_____	space will have been explored

Примеры вопросительных предложений:

Is the text written? (Present Indefinite Passive)
Was the boy taken to the Zoo? (Past Indefinite Passive)
Were the students shown a new textbook? (Past Indefinite Passive)
Have you been invited to the theatre? (Present Perfect Passive)
Had the text been written by Sunday? (Past Perfect Passive)

С модальными глаголами:

Для составления корректного предложения с модальным глаголом в страдательном залоге нам нужно поставить глагол **«be»** в сочетание с модальным. Это будет выглядеть так:

- **must be** (должен быть);
- **have to be** (должен быть);

- **ought to be** (следует быть);
- **can be** (может быть);
- **should be** (следует быть);

The writer should write a book. – Писателю следует написать книгу.
The book **should be written** by the writer. – Книга следует быть написана писателем.

Сложные случаи Пассивного залога:

При переводе английских предложений с глаголом в форме страдательного залога часто используется обратный порядок слов (русское предложение начинается со сказуемого):

New technique has been developed. – *Была разработана Новая методика.*

При переводе предложений, включающих оба типа глаголов в страдательном залоге, русское предложение следует начинать с предлога, например:

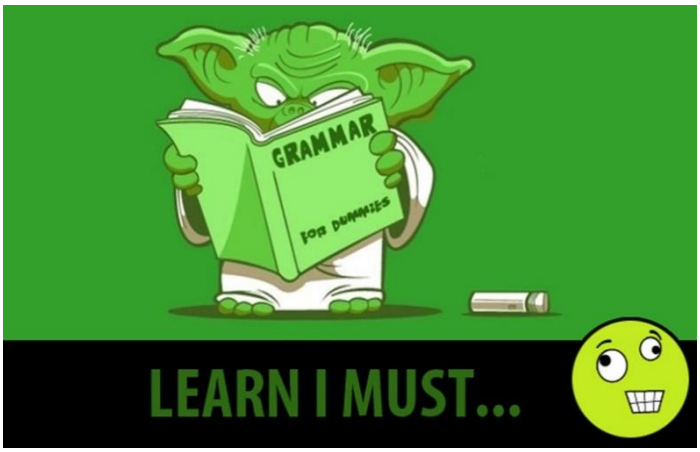
to follow smth. – следовать *за* чем-либо
to affect smth. – влиять *на* что-либо
to influence smth. – влиять *на* что-либо
to approach smth. – подходить к чему-либо

It is evident that not every experiment can be relied upon. *Rely upon* – полагаться на	Вполне очевидно, что не на каждый эксперимент можно положиться.
The problem was not dealt with. *Deal with* – иметь дело с	С этой проблемой не имели дела.
Many questions were answered correctly *Answer* – отвечать на	На многие вопросы были даны правильные ответы.

The doctor was sent into a business trip. – доктора послали в командировку.
The doctor was sent **for. – за** доктором послали

1. He was always laughed **at.**
2. This film is much spoken **about**.
3. The lecture was followed by a seminar.
4. The climate is affected by the global warming.
5. **В** этом домике никто не жил.
6. This house was not lived **in**.
7. **В** этой кровати никто не спал.
8. **Из** этой чашки никто не пил.
9. **Из** этой тарелки никто не ел.

PART 3. Grammar revision



Task 1. WHO, WHAT, WHICH.

1. … painted that picture?
2. … of these books is your favourite?
3. … would like a cup of tea?
4. … is the matter?
5. … other schools are there in England besides private schools and public schools?
6. … has happened?
7. … of you can answer my question?
8. … is wrong with this exercise?
9. … is the largest town in the world?
10. … river flows through London?
11. There are three cars here. … car is yours?
12. … told you about the accident?
13. … nationality are you? – I am Russian.
14. … has taken my scissors?
15. … went wrong?
16. … hotel is the nearest to the sea?
17. … language is the easiest to learn?
18. … was your ambition when you left school?
19. … is the answer?
20. … is the healthier place, the country or the seaside?
21 … is your husband's name?

Task 2. Find the sentences with the wrong word order. Make them correct.

Model: *Tom walks every morning to work. – Tom walks to work every morning.*

1. Jim doesn't like very much baseball.
2. Ann drives every day her car to work.
3. When I heard the news, I immediately called Tom.
4. Maria speaks very well English.
5. Last Friday very interesting cartoons children watched.
6. After eating quickly my dinner, I went out.
7. You watch all the time television.
8. Two books Liza reads every month.
9. I think I'll go early to bed tonight.
10. In London we were in July last year.
11. You should to the dentist go every six months.
12. We went last night to the movies.

Task 2. Fill in the blanks with do or does.

1. What colour... you like? 2. Where... she work? 3. Where... your parents live? 4. What kind of films... you prefer? 5.... he play football at the weekends? 6. How... your friends spend their free time? 7.... Allan have green eyes? 8. What time... she return from work? 9. What university... you study at? 10.... you have breakfast in the morning? 11. Where... they put their key? 12....your son often go to the gym? 13.... this girl and that boy get on well? 14.... your friend know any celebrities? 15. What subject... you study at the university?

Task 3. Put the verbs into Past Simple.

1. I... (to do) morning exercises yesterday. 2. He... (to work) at a factory last year. 3. She... (to sleep) after dinner. 4. We... (to work) part-time 5 days ago. 5. They... (to drink) tea every day last week. 6. Mike... (to be) a student last year. 7. Helen... (to buy) a car last month. 8. You... (to see) your friend yesterday. 9. You... (to be) at Moscow 2 years ago. 10. It... (to be) a good day yesterday.

Task 4. Use negative form.

1. They achieved successes in purifying air, water and soil.
2. They try to use fuel more efficiently.
3. Today we face a lot of environmental problems.

4. He took all the necessary books about ecology.

5. Global climate changed because of human activities.

6. We have lectures, seminars and course works on such subjects as ecology and material science.

7. Intensive agriculture damaged the environment through use of chemicals.

8. Many factors will affect the health of citizens.

Task 5. Translate into Russian paying attention to Present and Past Simple Tenses.

1. As computers grew more powerful, the problems posed to the programmer grew proportionally.

2. All three of our 9380 family of printers look pretty much alike.

3. The scale is so short that the relative error becomes appreciable.

4. There is also a substantial loss of resolution, as N gets larger.

5. This becomes increasingly apparent when the implementation of the procedure is considered.

6. A grateful environment is a substitute for happiness.

7. Honour and truthfulness are obvious examples of moral.

8. The synthetic utility of this transformation remains unexplored.

9. Rarely the functions of an organization remain unchanged in a computerization program.

10. Some values are be- coming or remaining relatively high.

11. Upon treating the compound turned dark red.

12. Similar remarks apply to Barnard's study of curvature.

13. The cross-sections for both of these processes increase as the energy of the electrons decreases.

14. The study of polyhedra held a central place in Greek geometry.

15. This differential equation holds true for a number of physical processes.

16. Some of the algebraic laws do hold for the situation under consideration.

18. The noble object of education is beyond any doubt.

19. The only -way out is changing the requirements

20. This interpretation is misleading

21. They paid due attention to the problem

22. Definite progress in the four-color problems is disappointing.

23. The interpretation of Hegel's dialectic,, method is clear.

24. This constraint is of practical value.

25. This was due to the noise disturbances.

26. Intuitive conclusions based on immediate observation are not always to be trusted, for they are often misleading.

27. Their failure to obtain satisfactory results in the latter case is not due to testing table.

28. A different approach to the problem is due to Pernedo (1972).

29. Pleasure is not the sole good.

30. This analysis is possible due to the recourse to mathematical methods of

31. The fundamental task of system analysis is not solving problems but defining them.

32. The anisotropy due to cobalt is especially helpful.

33. They are to have due regard for precision of the data.

34. These seemingly basic alterations of the administrative structure will be of small practical importance.

35. Newton supposed that the mean density of the earth is between 5 and 6.

36. Iron content in steel accounts for 99.9 percent.

37. This hypothesis lacked confirmation.

38. The problem goes beyond the subject matter of the work.

39. The line between emotion and reason seems rather sharp.

40. Several factors affected the quality of the broadcast signal.

41. Rather than solving one problem the technique involves the repetitive solution of a series of N sub problems.

42. Two approaches with a rather well established methodology suited well in our case.

Task 6. Translate into Russian paying attention to Present Perfect.

1. To date, several experiments have been reported in which a variety of instruments have been used to search for point sources.

2. From the mass of experimental data new conceptual problems have emerged.

3. The assumptions upon which the equations have been developed have been simple and have considered heat flow in only one direction.

4. Once a generator of executable self-checking test programs has been written the only limit on the scope of testing is the amount of computer time available.

5. Alternate filling and distilling will be continued until 25 ml of condensate has been collected.

6. Since Leibniz there has been no man who had had a full command of all the intellectual activity of his day.

7. The importance of control in machining has long been recognized, beginning with Taylor's tool-life experiments.

8. Taylor's mathematical model has been extended by several researchers.

9. The static nature of the structure has limited effective- ness due to two implicit assumptions.

10. As yet few principles have been developed to assist the researcher in this phase of his work.

11. A language competent to discuss that situation has been created. 12. Psychologists have certainly been concerned with rational behaviour.

13. Nearly half a million different organic compounds have already been reported and described in the chemical literature.

Task 7. Translate the sentences into Russian paying attention to the use of Infinitive.

1. To extract oil and natural gas from reservoirs, exploration and production companies must locate reservoirs and drill wells into the earth to bring the products to the surface.

2. Oil production in ancient times was too small to be of real economic interest.

3. Analyses of sediments of sandstones and of porous lime stones were carried out to know more about the structure of the pay and the movements of fluids in its pore space.

4. Even small and middle-sized oil companies own or share a computer with a special library of software to do work in a reasonable time and without error.

5. In order for petroleum to form, the organic matter in the rocks must be exposed to the right pressure and temperature over a long period.

6. Modern methods and computer technology are necessary to obtain the best possible information about interesting exploration areas.

7. The crust of our earth is not transparent enough to allow any prediction on quantities of natural resources, which we cannot see, estimate, or calculate.

8. Magnetic measurements can be used to determine the thickness and distribution of the rocks in the earth's crust.

9. Three conditions must be present for oil reservoirs to form: a rich source rock, a migration conduit and a trap (seal) that forms the reservoir.

10. Some wells (secondary wells) may be used to pump water, steam and acids or various gas mixtures.

11. Tertiary oil recovery reduces the oil's viscosity to increase oil production.

12. Secondary oil recovery uses various techniques to aid in recovery oil from depleted or low-pressure reservoir.

13. Occasionally detergents are used to decrease oil viscosity.

14. In order to provide the conduit for the petroleum to flow to the surface, a hole must be drilled to the petroleum-bearing formation.

15. Something must be known of the character of the formations to be penetrated in reaching the producing horizon in order to select the proper drilling system.

Task 8. Translate the sentences into Russian.

1. Люди прилагают много усилий, чтобы найти новые источники энергии.
2. Этот метод недостаточно хорош, чтобы использовать его повсеместно.
3. Чтобы достигнуть лучших результатов, были представлены новые методы работы.
4. Необходимо провести большую исследовательскую работу, чтобы найти нефть.
5. Чтобы пробурить скважину, необходимо установить буровую вышку.

Task 9. Translate the word combinations into Russian

1. the problem to be solved
2. the instrument to be used
3. the well to be drilled
4. the experiment to be carried out 5.the device to be introduced
6. the strain to be overcome
7. the theory to be considered 8.the new method to be employed
9. factors to be examined
10. the loss to be expect

Task 10. Translate the word combinations into English

1. Дом, который нужно спроектировать
2. Результаты, которые ожидаются
3. Мост, который нужно построить
4. Свойства, которые необходимо принять во внимание
5. Информация, которую необходимо получить
6. Первое, что нужно отметить
7. Вычисления, которые необходимо сделать
8. Нефть, которую нужно транспортировать
9. Работа, которую необходимо выполнить
10. Процесс, который нужно применить

Task 11. Translate the sentences with the Infinitive (all functions).

1. It should be mentioned that petroleum and its numerous products are really too valuable to be used as a source of energy.

2. In most countries, the government keeps all existent and future hydrocarbon deposits under position to use the profit coming from this source of welfare.

3. To avoid oil spills and fight them by harmless chemicals and methods is merely a question of international laws and of a corresponding control to keep the seas clean.

4. Modern methods of underground storage diminish the contamination of ground water and even fight the "pollution" of the landscape by a series of enormous tank, which would be necessary to store the same quantity of oil and oil products.

5. Generally, the first stage in the extraction of crude oil is to drill a well into the underground reservoir.

6. Many wells (called multilateral wells) will be drilled into the same reservoir, to ensure that the extraction rate will be economically valuable.

7. Together primary and secondary recovery allow 25% to 35% of the reservoir's oil to be recovered.

8. As oil prices continue to escalate, other alternatives to produce oil have been gaining importance.

9. It was a concept, pioneered in Nazi Germany when imports of petroleum were restricted due to war, and Germany found a method to extract oil from coal.

10. The barometer invented in 1643, was the first to measure the pressure of the gases in atmosphere.

11. It is a common practice of production engineers to stimulate wells with low permeability pays by hydraulic or chemical fracturing.

12. The easiest way to understand the properties of a pay, the accumulation and the production of oil and gas is to inspect granular pays like sands and sandstones.

13. The article to be translated at the lesson deals with the problem of oil extraction.

14. They were the last to use this equipment.

15. This method is the first to have been used for industrial drilling of oil wells.

Task 12. **Translate the following texts without dictionary paying attention to Infinitive function.**

1. He is too proud to apologize.

2. She spoke too quickly for me to understand.

3. We don't think we have got enough information to speak confidently.

5. I had to turn away to avoid letting him see my smile.

6. England failed to win a place in the European finals.

9. They helped him to fix it.

10. I don't appear to have written down his name.

11. I ask her to explain.

12. They advised us not to wait around too much longer.

13. She asked me what to do.

14. David encouraged me not to give up but to keep trying.

15. His new job proved to be a challenge.

16. It seems silly not to tell her.

17. There appears to have been a terrible mistake.

18. The idea was to spend more money on basic training.

Task 13. Translate the sentences with the Complex Subject.

1. By Toulmin, willing and thinking are asserted to be identical.

2. This approach cannot be expected to yield practical results.

3. Hot springs are believed often to be due to the presence of magma near the surface.

4. This irregular distribution of intensity is found by Wadati to be quite characteristic of the deep-focus earthquakes.

5. This is likely to be the case for an area such as organization design.

6. The Boltzmann expressions for the transition probabilities are shown to have been applied under conditions for which they are not valid.

7. The number of electrons per square meter of surface between the plasma and the vacuum is estimated from the average lifetime and the flux to be as follows.

8. The present era, which is distinguished by the utilization of metals in enormous quantities, may be said to have begun in 1860.

9. The atmosphere has been proved to extend several hundred kilometers above the earth.

10. Since the leakage flux turns out to be only a few per cent of the main flux, this rough method proves to be quite appropriate.

11. The loss of area is believed due to a filling or blocking off of catalyst pores.

12. The amount observed in the sulfate fraction in the present study, about 20 %, seems closer to the actual value.

13. The error does" not seem to be serious from an engineering standpoint.

14. The possibility of explaining the anisotropy on the basis of scattering theory does not appear to be excluded.

15. Discussion of this work has not been considered to be within the scope of this chapter.

16. In any event, current theories either empirical or electronic do not appear to account for this result.

17. Such fluctuations, being sensitive to the exact location of channel boundaries, would not be expected to reproduce in successive determinations.

18. The 354 reduction temperature does not appear to be sever 202 enough to cause metal migration.

19. Thus, an oxidation state is a formal device and should not be expected to predict the extent of electron transfer.

20. The data of Ritz would therefore not appear to be conclusive evidence for the former process.

21. The study of single electrical circuits does not seem to have given rise to the phenomenon.

Task 14. Open brackets and put the verb into necessary form.

1. Bromine happened (to prepare) in 1826. 2. The hypothesis is likely (to confirm) soon. 3. An atom was (to consider) by the ancients (to be) an indivisible particle. 4. The approach is sure (to attract) the attention of the scientists. 5. These new results are likely (to widely discuss). 6. At first the discovery did not seem (to be) very important. 7. The experiment is not likely (to finish) at 5. 8. Calculations are said (to confirm) this idea. 9. Fundamental particles are (to regard) to be indivisible. 10. The atom has long (to believe) to be a simple particle. 11. Nobody was supposed (to inform) about the observed phenomenon. 12. The reaction (suppose) to give a good yield. 13. The library is (to report) to have got many foreign journals this month. 14. The symposium was (to hear) to be a great success. 15. The composition of membranes was (to expect) (to describe) in the next chapter. 16. Their laboratory was known (to investigate) the properties of electrodes for some ten years. 17. Sulphur might be (to expect) to occur in a number of different forms. 18. A reaction may be shown (to occur) under ordinary conditions. 19. Chemical industry may be said (to begin) in the 19th century. 20. Mendeleyev is known (to be born) in Tobolsk. 21. Dalton's hypothesis was later proved (to be true). 22. Fundamental particles are no longer (to consider) to be non-existent. 23. Radioactivity is known (to affect) by the presence of other elements, which are not radioactive. 24. Air was later (to find) not to be an element. 25. Hydrogen (not to) appear to react quickly with chlorine in the dark. 26. Pure liquid HCl (not to seem) to be conductor of electricity. 27. Under certain conditions an atom of hydrogen may be (to regard) to be acting as a bond. 28. There (to appear) to be no difficulty in determining the rate of this reaction. 29. There (to seem) to be no evidence in favour of your idea. 30. The phenomenon has never (to observe) to occur under ordinary conditions. 31. Chlorine is stated to (discover) in 1774.

Task 15. Translate.

I. 1. Analysis shows that this is very unlikely to result in any error. 2. The differences are not systematic with increasing gravity and therefore are not likely to result from inconsistent calibrations. 3. The conversion of matter into energy seems to be the most satisfactory hypothesis yet offered though it cannot yet be said to be fully under- stood. 4. It must be remembered, however, that in these specimens a second phase exists whose concentration might be expected to vary with temperature. 5. Only a few of these articles contained descriptions that appear to be similar to the findings in my cases. 6. They succeeded in obtaining good results working with quicksilver, it being known to be a very dangerous metal. 7. The first proposal is subject to the chemical criticism that neutral sodium is not likely to exist in the presence of W ions. 8. A rough idea of what is thought to be taking place is given by the formula below.

II. 1. Metals known to exist in more than one crystallography form are cobalt, cerium, tin, manganese, chromium, thallium. 2. None of the rocks considered likely to be prevalent near the surface had density over 3–4 or so. 3. Mathematically two coordinates locate a point known to lie in a given plane, as the xy plane. 4. If all the melt, considered to be homogeneous, is kept at the same temperature, solidification will begin at certain positions in the body of the melt, called 'nuclei'. 5. The lower group of Torridonian, thought by geologists to be very likely much older than the upper two groups, has been found by Irving to be magnetized in a very different, direction. 6. While agents known to break hydrogen bonds do not seem to have been much employed for preparatory purposes, the detergents have found useful application.

Task 16. Modals. Translate the sentences paying attention to the modal verbs.

1.The system analyst must learn to distinguish between real problems and symptoms. 2.This mechanism must be produced in plenty . 3.They ought to pay more attention to the problem. 4.These techniques need to be balanced with other constraints on the system. 5.They may have to take the value into account. 6.Applications may also need to be preceded by research in modeling. 7.The following points should, however, be mentioned. 8.All the responsibility should be strictly defined. 9.The central adding and multiplying apparatus of the computing machine should be numerical, rather than on a basis of measurement. 10.These mechanisms should depend on electronic tubes rather than on basis of mechanical relays. 11.The entire sequence of operations should be laid out on the machine itself so that there should be no human intervention from

the time the data were entered until the final results should be taken off, and all logical decisions necessary for this should be built into the machine itself. 12.The machine should contain an apparatus for the storage of data which should record them quickly, hold them firmly, read them quickly, erase them quickly, and then be immediately available for the storage of new material. 13.You may ask many questions to the author of the book. 14.This idea might be of interest for many scientists. 15.Such tasks should be significant in solving economic problems. 16.They have not had to decide which course of actions to choose. 17.One sequence will have to be chosen. 18.Will one sequence have to be chosen? 19. In addition, account must be taken of p-rays. 20. However complex the task it must be done on time. 21. The error must be in his reasoning. 22.Every visible event in nature can be explained by previous events. 23. He believed in work – believed that man ought to eat his bread in the sweat of his brow. 24. The technique of taking Ra- man spectra cannot be made the subject of detailed discussion. 25. The pressure of one of these points can well be chosen at will. 26. These processes need not be considered in details. 27. Ideal must be composed of things known to us. 28. They must be able to identify the particular error that has occurred in the input. 29. It may not be economic to make the correction while the computer waits. 30. In a conceptual analysis one need only examine the parts. 31. If a person will not do a thing in the way he wants, he must do it in the only way he can. 32. A few words concerning the preparation of specimens may well be in order. 33. A great deal of work need to be done in this area. 34. There is, or ought to be, such a thing as Automation Economics. 35.Simplification as a method of under- standing can and must be the method of understanding any science. 36. As to the heat of the reaction it had to be care- fully controlled. 37.They were not allowed to carry out the experiment. 38. We have had to investigate a wide range of economic problems. 39.However, they were confronted with pressing problems, which they had to solve as well as they could. 40.The rate of gas flow does not have to be large. 41.The program or the database does not have to be changed. 42. He may have to stop his experiment. 43. This restriction is severe, but should be welcome to nonmathematical uses. 44.One of the simpler forms is probably to be preferred. 45. The less progressive firms have been allowed to exist. 46. It has been argued for a long time that programmers should not have to reinvent the wheel every time they write a program. 47. It may take you twelve hours' reading to produce an intellectually honest article of a thousand words. In fact you will have to educate yourself as well as your public. 48. Within this time the maximum change in conductivity was to be observed. 49. The full five names do not have to be specified. 50. In order to make the satellite a whole number of highly involved scientific and engineering problems had to be solved. 51. Each type of failure has to be recovered by an appropriate set of actions. 52. There will inevitably be components that cannot be reduced

entirely to physically measurable quantities and so will have to be evaluated subjectively. 53. Bad news should be broken gently and good news all at once. 54. Such a corrupt and despotic government must in itself be weak just when a government ought to be strong. 55. Special techniques have had to be advised for solving the problem. 56. If computers are ever to gain wide acceptance for process control they must be understood by the people who have to operate them. For this reason, they should be kept as simple as possible. 57. He may have to supply judgment to cover those aspects of the problem, which could not be covered by the research. 58. If a physiologist, who knows no mathematics, works together with a mathematician who knows no physiology, the one will be unable to state his problem in terms that the other can manipulate, and the second will be unable to put the answers in any form that the first can understand.

Task 17. Read the text, translate and correct grammar mistakes.

The Plan for Implementation.

Planning for the implementation of research results should begin when the research itself begins; it should not wait until the results is obtained. Specifically, the technical abilities of those who will use the results and the facilities at their disposal should take into account in determining the form and nature of the research results, which should be sought. It would be foolish to expect a clerk to solve an equation requiring the calculus of variations; a monograph or a table may be necessary. But a mono- graph or a table may be able to provide only very approximate solutions to equations. An approximation, which are used, however, will produce better results than an exact solution, which is ignored. In order to assure that the research results carry out as intended, it is necessary to develop a detailed plan for their implementation. This need are generally acknowledged where the action ultimately to be taken is to be performed by a computer. In such a situation, the researcher is recognized his responsibility for developing a program for the computer. What is not so well recognizing is that almost as detailed a program is required for human operators. It is necessary to specify exactly who is to do what, when they are to do it, and how. The “who” and “when” can normally be shown on a flow chart which indicates the way that the relevant operations will be to be conducted. The “what” requires detailed instructions in terms of operations that can is performed by the kinds of people involved.

Task 18. Translate paying attention to the modals in Perfect form.

1. This must have given rise to the molecule changing its configuration. 2. This intrinsic theorem may have been proved centuries ago. 3. His name might have been added to the list. 4. The host cells must have been growing in an appropriate physical and chemical environment. 5. The requirement may have been met in the previous experiment. 6. Sometimes he worked later than he ought to have done. 7. From the early times, the development of the mathematics of number must have given rise to philosophical puzzlement. 8. It should have been the duty of the Senate to hand the document at once. 9. The authors suggested that denaturation may have occurred during preparation of the gamma globulin. 10. Although the structures proposed may not have been established with complete certainty, all known facts, physical and chemical, fit beautifully this ingenious interpretation. 11. The introduction of symbols for negative numbers must have been a further source of difficulties. 12. Since the high fluid level could have been caused by downhole- equipment leaks, it is necessary to determine production at 80 % efficiency based on the old cycle. 13. An observer of the pattern recognition "scene" during the period of the last decade and a half could hardly have failed to no- tice the following features. 14. The foreign matter such as Sulphur and Iron, which are found in coals to varying degree, may have been due to the presence of minerals containing these elements in their neighbourhood. 15. Sustained experiments with the cyclotron produced rare hits of the target by what might have been the atom of the new element. 16. It is for this reason that many reports on scientific research include discussion of how the research ought to have been done in the light of the experience gained' in having done it the first time.

СПИСОК ИСТОЧНИКОВ

1. https://www.britannica.com/science/science
2. https://infourok.ru/angliyskiy-yazik-razrabotka-zanyatiya-po-teme-science-scientists-discoveries-2401445.html
3. https://www.centralofsuccess.com/famous-quotes-on-science-technology/
4. https://bhp-public.oerproject.com/chapters/2?WT.tsrc=BHPFacebook#the-rock-we-call-home)
5. https://bhp-public.oerproject.com/chapters/2?WT.tsrc=BHPFacebook#the-biosphere
6. https://www.bighistoryproject.com/chapters/1#
7. Учись учиться Методические рекомендации студентам по изучению курса английского языка и организации самостоятельной работы. Составители: Бардина В. П., Гриценко Е. А., Кочкарева И. В., Лыхина Е. В., Шеина Е. С., Ахметшина А. Г., Лучникова А. В., Гуреева А. М. Пермь 2008.
8. https://bhp-public.oerproject.com/chapters/2?WT.tsrc=BHPFacebook#
9. https://bhp-public.oerproject.com/chapters/2?WT.tsrc=BHPFacebook#the-rock-we-call-home)
10. https://bhp-public.oerproject.com/chapters/2?WT.tsrc=BHPFacebook#the-biosphere
11. https://www.bighistoryproject.com/chapters/1#
12. https://ebooks.grsu.by/physics_world/unit-24.htm
13. https://www.universetoday.com/37927/interesting-facts-about-the-universe/
14. https://mocomi.com/what-is-gravity/
15. https://www.youtube.com/watch?v=rXER39AEE9k
16. https://hubblesite.org/science/galaxies
17. http://www.press.uchicago.edu/Misc/Chicago/534189.html
18. https://www.youtube.com/watch?v=2iRJb15W-14
19. https://lektsii.org/8-72216.html
20. https://www.wise-geek.com/what-are-the-geosciences.htm
21. https://uncw.edu/career/majors/geoscience.html
22. Журова Т.В. Английский язык для студентов-геологов. Учебное пособие, Ухтинский государственный технический университет, 2009 https://studfile.net/preview/6226871/page:1/
23. https://geology.com/articles/what-is-geology.shtml

24. Valdes, Olivia. "How to Outline a Textbook Chapter." ThoughtCo, Feb. 16, 2021, thoughtco.com/how-to-outline-a-chapter-4149501.

25. https://oose.ru/trenirovochnye-uprazhneniya-grammaticheskoe-pole-vo-prosy-k-podlezhashhemu-who-what-which-intermediate-srednij-uroven/?ysclid=ld8so2v5nk76125384

26. https://www.thoughtco.com/how-to-find-the-main-idea-3212047

27. https://www.wikihow.com/Understand-a-Word-Without-Using-a-Dictionary.

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