УРАЛЬСКИЙ ГОСУДАРСТВЕННЫЙ ЛЕСОТЕХНИЧЕСКИЙ УНИВЕРСИТЕТ
УГЛТУ

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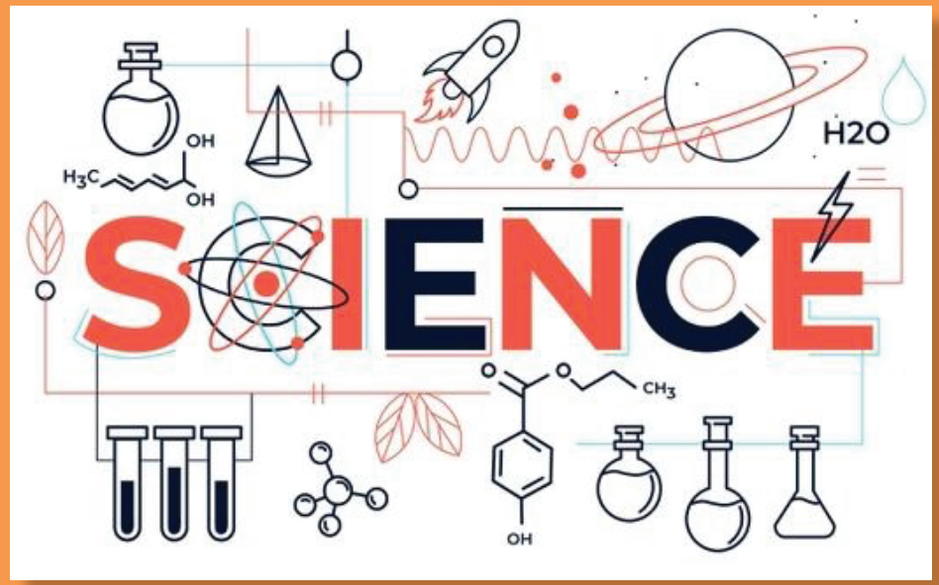

МИНИСТЕРСТВО НАУКИ И ВЫСШЕГО ОБРАЗОВАНИЯ
РОССИЙСКОЙ ФЕДЕРАЦИИ

Федеральное государственное бюджетное образовательное
учреждение высшего образования
«Уральский государственный лесотехнический университет»
(УГЛТУ)

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SCIENCE

Учебное пособие

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К43

Рецензенты:

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Основная цель заданий пособия – обеспечить совершенствование у учащихся навыков чтения, говорения в области, связанной с естественными науками, что способствует развитию всех составляющих коммуникативной компетенции. Пособие предназначено для всех обучающихся химико-технологических направлений вузов.

Издается по решению редакционно-издательского совета Уральского государственного лесотехнического университета.

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ВВЕДЕНИЕ

Предлагаемое учебное пособие предназначено для всех обучающихся химико-технологических направлений вузов. Оно составлено согласно карте направлений Химико-технологического института, что в языковом плане нашло воплощение в 12 разделах. Каждый раздел начинается с информации, которая дает обучающимся ясное представление о целях и задачах работы (In this unit you will learn, read, practise ...), и заканчивается информацией о том, чему они научились, завершив работу над разделом (Now I can…). Это дает обучающимся возможность проверить свои знания по изученной лексике и грамматике, умение читать и писать, а также свою способность к коммуникации.

В каждом разделе представлены следующие рубрики:

– подготовка к коммуникации (Discuss these questions);

– упражнение по фонетике (Pronunciation guide);

– тексты и послетекстовые задания для изучающего, ознакомительного, просмотрового, поискового видов чтения (Tasks 1, 2, 3, 5);

– лексические и грамматические упражнения (Tasks 4, 6 with Grammar tips);

– задания по развитию компетенций в говорении и в письменной речи (Tasks 7, 8);

– проектные задания (Project time).

В пособии также размещены лексико-грамматические тесты, которые являются проверочными и охватывают материал пройденных разделов.

Такая структура пособия находится в полном соответствии с требованиями, предъявляемыми к владению английским языком по окончании изучения общего курса.

Основными ресурсами для эффективной работы с учебным пособием являются словари, справочники, сайты сети Интернет, которые указаны в прилагаемом списке рекомендуемой литературы.

UNIT 1
CHEMISTRY AROUND US

In this unit you will…

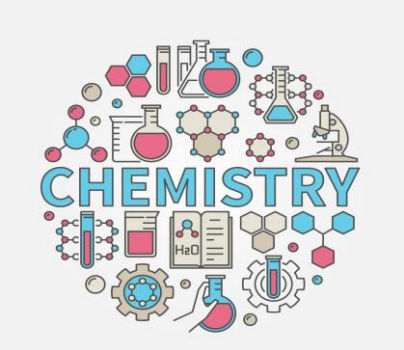
- learn, read, talk about
  - ✓ many reasons to study chemistry
  - ✓ chemistry as the study of matter and energy
  - ✓ vocabulary related to chemistry
  - ✓ adjective prefixes
  - ✓ general questions

- practise
  - ✓ talking about basic knowledge of chemistry
  - ✓ talking about chemistry in daily life
  - ✓ asking general questions
  - ✓ using adjective prefixes

Unit 1

❖ **Discuss these questions.**

- What does chemistry study?
- How old is the science of chemistry?



❖ **Pronunciation guide.**

chemistry chemical substance
society process recipe
action reaction function
conclusion digestion
question

Task 1. Read the text and say which examples illustrate the topic.

CHEMISTRY IS EVERYWHERE

You might think of chemistry only in the context of lab tests, food additives or dangerous substances, but the field of chemistry involves everything around us. "Everything you hear, see, smell, taste, and touch involves chemistry and chemicals (matter)," according to the American Chemical Society (ACS), a non-profit science organization for the advancement of chemistry, chartered by the U.S. Congress.

Many people shy away from chemistry or are afraid it's too difficult to learn because it involves math and equations. However, understanding basic chemical principles is important, even if you don't have to take a chemistry class for a grade. Chemistry is at the heart of understanding everyday materials and processes. Here are some examples of chemistry in daily life:

– Cooking food is applied chemistry, as recipes are basically chemical reactions. Baking a cake and boiling an egg are examples of chemistry in action.

– Once you cook the food, you eat it. Digestion is another set of chemical reactions, intended to break down complex molecules into a form the body can absorb and use.

– How the body uses food and how cells and organs function is more chemistry. Biochemical processes of metabolism (catabolism and anabolism) and homeostasis govern health and illness. Even if you don't understand the details of the processes, it's important to understand why, for example, you need to breathe oxygen or the purpose served by molecules, such as insulin and estrogen.

– Drugs and supplements are a matter of chemistry. Knowing how chemicals are named can help you decipher labels, not only on a bottle of pills but also a box of breakfast cereal. You can learn what types of molecules are related to making the best choices for yourself and your family.

– Everything is made of molecules! Some types of molecules combine in ways that can present health risks. If you know the basics of chemistry, you can avoid mixing household products that inadvertently form poisons.

– Understanding chemistry or any science means learning the scientific method. This is a process of asking questions about the world and finding answers that extend beyond science. It can be used to reach logical conclusions, based on evidence. (*URL: https://www.livescience.com/45986-what-is-chemistry.html)*

Task 2. **Decide if the following statements are true, false or they don’t have that information.**

1. Chemistry doesn’t affect our lives.

True / False / No information

2. Cooking food is applied chemistry.

True / False / No information

3. Hydrogen is lighter than oxygen.

True / False / No information

4. Drugs aren’t a matter of chemistry.

True / False / No information

5. Some gases are dangerous.

True / False / No information

6. Understanding chemistry means learning the scientific method.

True / False / No information

Task 3. Read the text and answer the question below.

WHAT IS CHEMISTRY?

Chemistry is the study of matter and energy and the interactions between them. This is also the definition for physics, by the way. Chemistry and physics are specializations of physical science. Chemistry tends to focus on the properties of substances and the interactions between different types of matter, particularly reactions that involve electrons. Physics tends to focus more on the nuclear part of the atom, as well as the subatomic realm.

If you look up the word “chemistry” in Webster's Dictionary, you'll find the following definition: "chem·is·try n., pl. -tries. 1. the science that systematically studies the composition, properties, and activity of organic and inorganic substances and various elementary forms of matter. 2. chemical properties, reactions, phenomena, etc.: the chemistry of carbon."

An important point to remember is that chemistry is a science, which means its procedures are systematic and reproducible and its hypotheses are tested using the scientific method. Chemistry is closely related to physics and to biology. Chemistry and physics both are physical sciences. In fact, some texts define chemistry and physics in exactly the same way.

GRAMMAR TIPS **GENERAL QUESTIONS**

Вспомогательный или модальный глаголы* + действующее лицо + (смысловой глагол) + другие члены предложения?

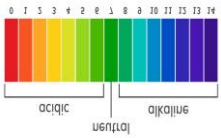
*am, is, are, was, were, have, has, had, do, does, did, will, would, should, could, can, may, might, must, ought.

Task 4. Make seven general questions to the text “WHAT IS CHEMISTRY?” Then answer them.

1. *Is chemistry the study of matter and energy?*
2. ……..
3. ……
4. ……
5. ……..
6. ……..
7. ……..
8. ……..

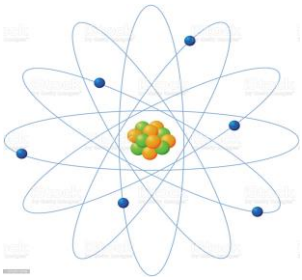
Task 5. Match the general chemistry topics (1–6) with the information related to them (a–f).

1. *Acids, Bases and pH*



__a__ An important part of general chemistry is learning about different types of solutions and mixtures and how to calculate concentrations. This category includes topics such as colloids, suspensions, and dilutions.

2. *Atomic Structure*



__b___ Acids, bases, and pH are concepts that apply to aqueous solutions (solutions in water). pH refers to the hydrogen ion concentration, or the ability of a species to donate/accept protons or electrons. Acids and bases reflect the relative availability of hydrogen ions or proton/electron donors or acceptors. Acid-base reactions are extremely important in living cells and industrial processes.

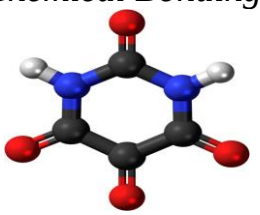
3. *Solutions and Mixtures*

__c___ The periodic table is a systematic way of organizing the chemical elements. The elements exhibit periodic properties that can be used to predict their characteristics, including the likelihood that they will form compounds and participate in chemical reactions.

4. *Units and Measurement*

__d___ Atoms and molecules join together through ionic and covalent bonding. Related topics include electronegativity, oxidation numbers, and Lewis electron dot structure.

5. *Chemical Bonding*



__e___ Atoms are composed of protons, neutrons, and electrons. Protons and neutrons form the nucleus of each atom, with electrons moving around this core. The study of atomic structure involves understanding the composition of atoms, isotopes, and ions.

6. *Periodic Table*

___f__ Chemistry is a science that relies on experimentation, which often involves taking measurements and performing calculations based on those measurements. It is important to be familiar with the units of measurement and the various ways of converting between different units.

GRAMMAR TIPS **ADJECTIVE PREFIXES**

un- has a negative meaning →
un*friendly*

im- is used before some words beginning with **m** or **p** →
im*polite*

il- is used before some words beginning with **l** →
il*legible*

ir- is used before some words beginning with **r** →
ir*responsible*

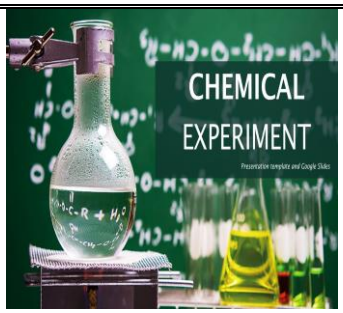
dis- is used before some adjectives →
dis*honest*

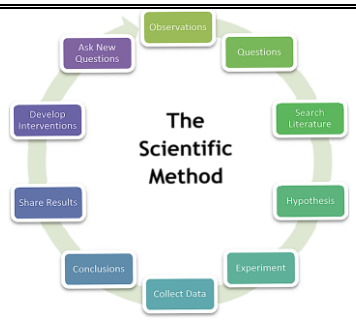
in- is used before a limited number of words →
in*visible*

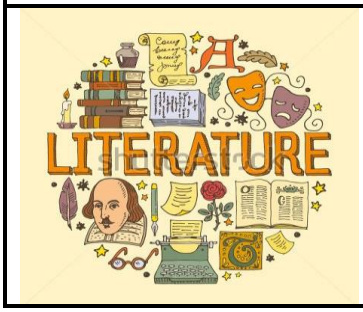
Task 6. Which prefix forms the opposite of these words?

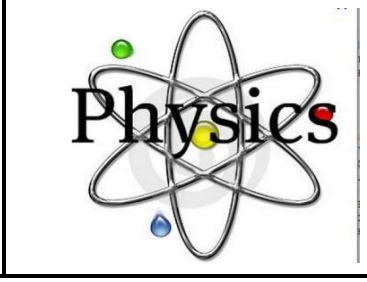
1. … happy … tidy
2. … visible … flexible
3. … regular … rational
4. … patient … possible
5. … logical … legal
6. … accurate … active
7. … natural … attractive
8. … mature … perfect
9. … correct … complete
10. … trustful … tasteful

Task 7. Look at these three pictures. Which one is different in each group? Why?









Task 8. Look up the definitions of the following words in the dictionary and complete the table.

Words	Definitions
1. Chemistry (n)	a. The study of matter and energy and the interactions between them.
2. Science (n)	b. ……
3. Property (n)	c. ……
4. Substance (n)	d. ……
5. Process (n)	e. ……
6. Reaction (n)	f. ……

❖ PROJECT TIME

Find out some interesting facts
about the history of chemistry on the internet.

❖ NOW I CAN…

- ✓ *name the reasons to study chemistry;*
- ✓ *talk about chemistry in daily life and its basic knowledge;*
- ✓ *ask general questions;*
- ✓ *use adjective prefixes.*

UNIT 2
CHEMISTRY AND CHEMISTS

In this unit you will…

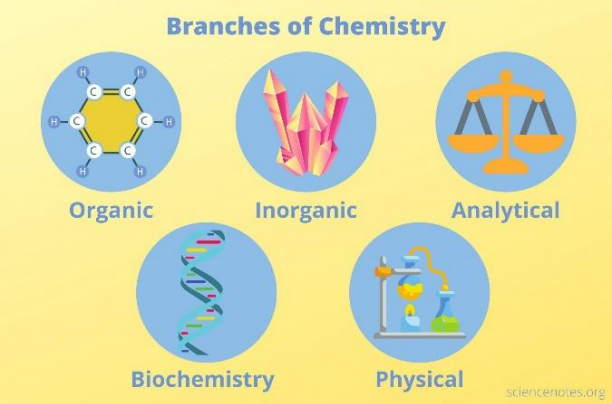
- learn, read, talk about
  - ✓ the main branches of chemistry
  - ✓ career options in chemistry
  - ✓ vocabulary related to chemistry types
  - ✓ verb prefixes
  - ✓ special questions

- practise
  - ✓ talking about major areas of chemistry
  - ✓ talking about chemistry jobs
  - ✓ asking special questions
  - ✓ using verb prefixes

Unit 2

❖ **Discuss these questions.**

- What does a chemist do?
- Would you like to work as a chemist?



❖ **Pronunciation guide.**

major organism organic
occur fertilizer cure
qualitative unique technique
essential measure
biotechnology

Task 1. Read the text, find the sentences with the words given in *Pronunciation guide* and translate them.

THE FIVE MAIN BRANCHES OF CHEMISTRY

Traditionally, the five major branches of chemistry are organic chemistry, inorganic chemistry, analytical chemistry, physical chemistry, biochemistry**.**

Organic chemistry deals with chemical compounds that contain carbon, an element considered essential to life. It is the study of the chemistry of life and reactions occurring in living organisms. Organic chemistry is used in many applications, such as biotechnology, the petroleum industry, pharmaceuticals and plastics.

Inorganic chemistry studies the chemical compounds in inorganic, or non-living things such as minerals and metals. Traditionally, inorganic chemistry considers compounds that do not contain carbon, but this definition is not com-

pletely accurate. Some compounds studied in inorganic chemistry, like "organometallic compounds," contain metals, which are metals that are attached to carbon – the main element that's studied in organic chemistry. Inorganic chemistry is used to create a variety of products, including paints, fertilizers and sunscreens.

Analytical chemistry involves the analysis of chemicals, and includes qualitative methods like looking at color changes, as well as quantitative methods like examining the exact wavelength(s) of light that a chemical absorbed to result in that color change. Analytical chemistry helps food companies make tastier frozen dinners by detecting how chemicals in food change when they are frozen over time. It is also used to monitor the health of the environment by measuring chemicals in water or soil.

Physical chemistry uses concepts from physics to understand how chemistry works. For example, figuring out how atoms move and interact with each other, or why some liquids, including water, turn into vapor at high temperatures. Physical chemists try to understand these phenomena at a very small scale – on the level of atoms and molecules — to derive conclusions about how chemical reactions work and what gives specific materials their own unique properties. This type of research helps inform other branches of chemistry and is important for product development.

Biochemistry uses chemistry techniques to understand how biological systems work at a chemical level. Thanks to biochemistry, researchers have been able to map out the human genome, understand what different proteins do in the body and develop cures for many diseases. (*URL: https://www.livescience.com/45986-what-is-chemistry.html)*

Task 2. **Circle the correct answer. There is only one possible answer.**

1. Organic chemistry deals with chemical compounds that contain …
   a) carbon b) oxygen c) metals
2. Inorganic chemistry studies the chemical compounds in …
   a) living things b) organic things c) inorganic things
3. Inorganic chemistry is used to create …
   a) fertilizers b) polymers c) drugs
4. Analytical chemistry includes ……
   a) geological materials b) qualitative methods c) historical processes
5. Physical chemistry uses concepts from….
   a) physics b) psychology c) physiology
6. Biochemistry uses chemistry techniques to understand how ……work.
   a) logical systems b) biological systems c) botanical systems

Task 3. **Read the text and answer the question below.**

WHAT DO CHEMISTS DO?

Chemists work in a variety of fields, including quality control, environmental protection, research and development, consulting and law. They can work at universities, for the government or in private industry as well.

Environmental chemists study how chemicals interact with the natural environment, characterizing the chemicals and chemical reactions present in natural processes in the soil, water and air. For example, scientists can collect soil, water or air from a place of interest and analyze it in a laboratory to determine if human activities have contaminated, or will contaminate, the environment or affect it in other ways.

In industry, chemists in research and development use scientific knowledge to develop or improve a specific product or process. In academia, chemists performing research aim to further knowledge about a particular topic. Their results, however, can still be applied to relevant products and applications.

Chemists can also perform analyses that help law enforcement. Forensic chemists capture and analyze the physical evidence left behind at a crime scene to help determine the identities of the people involved.

GRAMMAR TIPS **SPECIAL QUESTIONS**

Вопросительное слово* + вспомогательный или модальный глаголы** + действующее лицо + (смысловой глагол) + другие члены предложения?

* when, where, why, how, how long, how many etc.
**am, is, are, was, were, have, has, had, do, does, did, will, would, should, could, can, may, might, must, ought.

Task 4. Make seven special questions to the text "WHAT DO CHEMISTS DO?" Then answer them.

1. *Where can chemists work?*
2. ……..
3. …….
4. …….
5. ……..
6. ……..
7. ……..
8. ……..

Task 5. Match the chemistry careers (1–6) with the information related to them (a–f).

1. *Career in Medicine*

__a__ It takes a lot of chemistry know-how to succeed in the veterinary field, beyond what most doctors require. The entrance exams for veterinary schools emphasize organic chemistry and biochemistry, so a chemistry degree is a superior pre-vet major.

2. *Career in Engineering*

__b___ In addition to spending time in a lab, chemistry majors work on computers, both using and writing programs to help with calculations. An undergraduate degree in chemistry can be the springboard for advanced studies in computer science or programming.

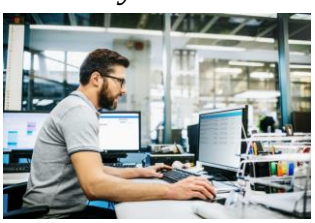
3. *Career in Business*

__c___ Many students get an undergraduate degree in chemistry to pursue a master's degree in engineering, particularly chemical engineering. Engineers are highly employable, get to travel, are well-compensated, and have excellent job security and benefits. An undergraduate degree in chemistry offers in-depth coverage of analytical methods, scientific principles, and chemistry concepts that translate well into advanced studies in process engineering, materials, etc.

4. *Career in Teaching*

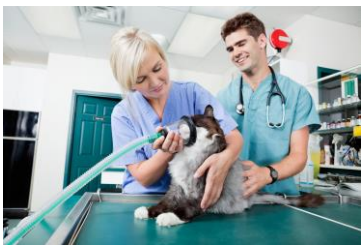
__d___ Many med school students say chemistry is the most challenging of the subjects they needed to master, so taking courses in college prepares you for the rigors of medical school and teaches how to be systematic and analytical when you practice medicine.

5. *Career in Software industry*



__e___ A chemistry degree opens doors to teaching college, high school, middle school, and elementary school. You'll need a master's or doctoral degree to teach college. Elementary and secondary teachers need a bachelor's degree plus courses and certification in education.

6. *Career in Veterinary*



___f__ Chemistry or engineering degree works wonders with an MBA, opening doors into the management of labs, engineering firms, and industry. Chemists may start their own companies or work as sales representatives or technicians for instrument companies, consulting firms, or pharmaceutical companies.

GRAMMAR TIPS **VERB PREFIXES**

dis- has a negative meaning or means the opposite of an action →

dis*allow*

un- reverses the meaning of the verb→

un*pack*

re- (= again or back) →

re*write*

over- (= too much) →

over*sleep*

mis- (= badly or incorrectly) →

mis*read*

inter- (= between) →

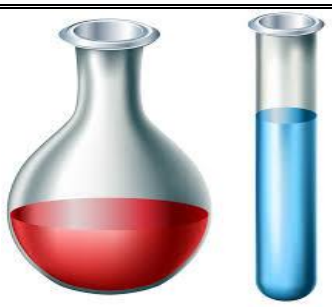
inter*mix*

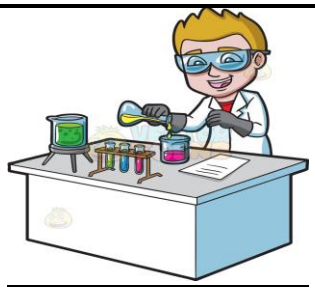
Task 6. Fill in the gaps with the correct prefixes.

1. They ……..*understood* this message completely.
2. We always have similar opinions but on this subject I …*agree* with him.
3. I ……..*like* this book, but the others enjoyed it.
4. Synonyms can be ……*changed*.
5. He was bending and ……*bending* his fingers.
6. She had been ……*working* and needed a holiday.
7. This building was ……..….*built* in 1880.
8. He …….*connected* a gas line.

Task 7. Look at these three pictures. Which one is different in each group? Why?








Task 8. Write the definitions of the following words to complete the table.

Words	Definitions
1. Chemist	a. A person who studies chemistry, or a scientist who works with chemicals.
2. Engineer	b. ……
3. Veterinarian	c. ……
4. Scientist	d. ……
5. Pharmacist	e. ……..
6. Businessman	f. ……

❖ **PROJECT TIME**

Find out some exciting facts about the origin of the words "chemistry, chemist" on the internet.

❖ **NOW I CAN…**

- ✓ *name the main branches of chemistry;*
- ✓ *talk about career options and major areas of chemistry;*
- ✓ *ask special questions;*
- ✓ *use verb prefixes.*

UNIT 3
ATOMS AND MOLECULES

In this unit you will…

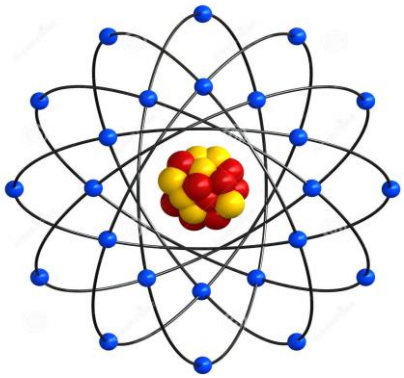
- learn, read, talk about
  - ✓ the structure of atoms
  - ✓ chemical formulae
  - ✓ vocabulary related to chemical formulae, units of measurement
  - ✓ noun suffixes
  - ✓ negative questions

- practise
  - ✓ talking about atoms, molecules, compounds
  - ✓ talking about measurements
  - ✓ asking negative questions
  - ✓ using noun suffixes

Unit 3

❖ **Discuss these questions.**

- What is an atom?
- Why is it impossible to see an atom?



❖ **Pronunciation guide.**

proton electron neutron
atom atomic
formula structure molecule
form element
electrical

Task 1. Read the text, find the sentences with the international words given above and translate them.

ATOMIC STRUCTURE

Chemistry is the study of matter and the interactions between different types of matter and energy. The fundamental building block of matter is the atom. An atom consists of three main parts: protons, neutrons, and electrons. Protons have a positive electrical charge. Neutrons have no electrical charge. Electrons have a negative electrical charge. Protons and neutrons form the atomic nucleus. Electrons are attracted to the protons in the nucleus, but are moving so quickly they fall toward it (orbit) rather than stick to protons. The identity of an atom is determined by its number of protons. This is also called its atomic number.

The word "atom" was coined by the early Greeks Democritus and Leucippus, but the nature of the atom wasn't understood until later. In the 1800s, John Dalton demonstrated atoms react with each other in whole ratios to form compounds. The discovery of the electron earned J.J. Thomson the 1906 Nobel Prize in Physics. The atomic nucleus was discovered in the gold foil experiment conducted by Geiger and Marsden under the supervision of Ernest Rutherford in 1909.

The terms molecule, compound, and atom can be confusing! Here's an explanation of what a molecule is (and is not) with some examples of common molecules. Molecules form when two or more atoms form chemical bonds with each other. It doesn't matter if the atoms are the same or are different from each other. Molecules may be simple or complex. Here are examples of common molecules: H_2O (water), N_2 (nitrogen), O_3 (ozone), CaO (calcium oxide).

The chemical formula H_2O tells us that there are two hydrogen atoms and one oxygen atom present in each water molecule. An ozone molecule consists of three oxygen atoms (O_3) and a nitrogen molecule consists of two nitrogen atoms (O_3). The chemical formula CaO (calcium oxide) tells us that there is one carbon atom and one oxygen atom.

Molecules made up of two or more elements are called compounds. Water, calcium oxide, and glucose are molecules that compound. All compounds are molecules; not all molecules are compounds. Single atoms of elements are not molecules. A single oxygen, O, is not a molecule. When oxygen bonds to itself (e.g., O_2, O_3) or to another element (e.g., carbon dioxide or CO_2), molecules are formed. (*URL: https://www.thoughtco.com/atoms-and-atomic-theory-study-guide)*

Task 2. **Match the beginnings (1–6) and endings (a–f) of the sentences.**

1. Chemistry is the study of _____
2. An atom consists of _____
3. Electrons have _____
4. Protons have _____
5. An ozone molecule consists of _____
6. Molecules made up of _____

a) three oxygen atoms.
b) matter and the interactions between different types of matter and energy.
c) three main parts: protons, neutrons, and electrons.
d) two or more elements are called compounds.
e) a positive electrical charge.
f) a negative electrical charge.

Task 3. **Read the text and answer the question below.**

WHAT IS A MOLE IN CHEMISTRY?

A mole is simply a unit of measurement. In fact, it's one of the seven base units in the International System of Units (SI). Units are invented when existing units are inadequate. Chemical reactions often take place at levels where using grams wouldn't make sense, yet using absolute numbers of atoms/ molecules/ions would be confusing, too. So, scientists invented the mole to bridge the gap between very small and very large numbers.

Mole in Chemistry:

- The mole is an SI unit used to measure the amount of any substance.
- The abbreviation for mole is mol.
- One mole is exactly $6.02214076 \times 10^{23}$ particles. The "particles" could be something small, like electrons or atoms, or something large, like elephants or stars.

Why don't we simply stick with units like grams (and nanograms and kilograms, etc.)? The answer is that moles give us a consistent method to convert between atoms/molecules and grams. It's simply a convenient unit to use when performing calculations. You may not find it too convenient when you are first learning how to use it, but once you become familiar with it, a mole will be as normal a unit as, say, a dozen or a byte.

GRAMMAR TIPS **NEGATIVE QUESTIONS**
(Why) + отрицание вспомогательных или модальных глаголов* + действующее лицо + (смысловой глагол)? *isn't, aren't, wasn't, weren't, haven't, hasn't, hadn't, don't, doesn't, didn't, won't, can't, couldn't, shouldn't, wouldn't.

Task 4. Make seven negative questions to the text "WHAT IS A MOLE IN CHEMISTRY?" Then answer them.

1. *Why don't we simply stick with units like grams?*
2. …….
3. …….
4. ……..
5. ……..
6. ……..
7. ……..
8. ……..

Task 5. Match the units in the International System of Units (SI) (1–6) with the information related to them (a–f).

1. *Meter (m)*

__a__ The base unit of electrical current; a constant current which, if maintained in two straight parallel conductors of infinite length, of negligible circuit cross-section, and placed 1 meter apart in vacuum, would produce between these conductors a force equal to 2 x 10^{-7} newtons per meter of length.

2. *Kilogram (kg)*

__b___ The base unit of length; determined by the length of the path traveled by light in a vacuum during a time interval of 1/299,792,458 of a second.

3. *Second (s)*

__c___ The base unit of mass; equal to the mass of the international prototype of the kilogram (commissioned by the CGPM in 1889).

4. *Ampere (A)*

__d___ The base unit of thermodynamic temperature; the fraction 1/273.16 of the thermodynamic temperature of the triple point of water (the triple point is the point in a phase diagram where three phases coexist in equilibrium).

5. *Kelvin (degrees K)*

__e___ The base unit of luminous intensity; the luminous intensity, in a given direction, of a source that emits monochromatic radiation of frequency 540 x 10^{12} hertz and that has a radiant intensity in that direction of 1/683 watt per steradian.

6. *Candela (cd)*

__f___ The base unit of time; duration of 9,192,631,770 periods of the radiation corresponding to the transition between the two hyperfine levels of the ground state in the cesium 133 atoms.

GRAMMAR TIPS **NOUN SUFFIXES**

-ment (verb + suffix) →
*manage**ment***

-ion (verb + suffix) →
*elect**ion***

-ation (verb + suffix) →
*organis**ation***

-ness (adjective + suffix) →
*dark**ness***

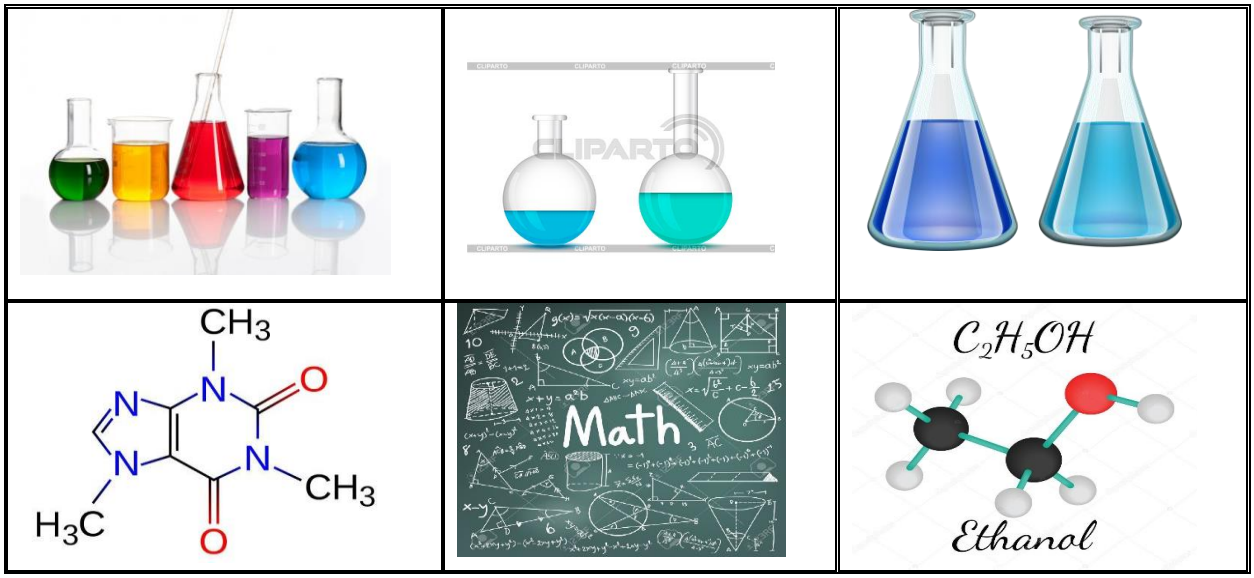
-ity (adjective + suffix) →
*similar**ity***

-er/-or/-ist (nouns or verbs + suffix; they describe people and their jobs) →
*danc**er,** act**or,** art**ist***

Task 6. Combine the suffixes with the verbs, adjectives or nouns. Remember you may need to make a small spelling change.

1. Improve (v) - _____
2. Discuss (v)- _____
3. Inform (v) - _____
4. Operate (v) - _____
5. Weak (adj) - _____
6. Punctual (adj) - _____
7. Economy (n) - _____
8. Farm (n) - _____
9. Entertain (v) - _____
10. Pure (adj)- _____

Task 7. Look at these three pictures. Which one is different in each group? Why?



Task 8. Find the definitions of the following words in the dictionary and complete the table.

Words	Definitions
1. Electron (n)	a. An extremely small piece of matter with a negative electrical charge.
2. Proton (n)	b. ……
3. Neutron (n)	c. ……
4. Molecule (n)	d. ……
5. Compound (n)	e. ……..
6. Measurement (n)	f. ……

❖ PROJECT TIME

Find out some amazing facts
and opinions about atoms on the internet.

❖ NOW I CAN…

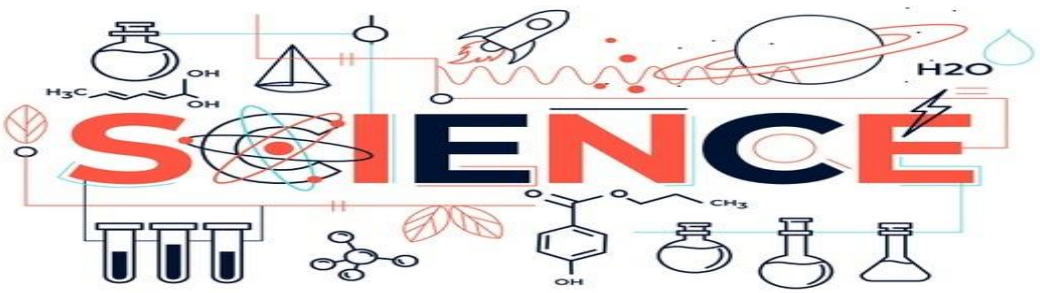
- ✓ *name chemical formulae, units of measurement;*
- ✓ *talk about atoms, molecules, compounds;*
- ✓ *ask negative questions;*
- ✓ *use noun suffixes.*

UNIT 4
CHEMICAL ELEMENTS

In this unit you will…

- learn, read, talk about
  - ✓ the periodic table of elements
  - ✓ chemical elements, their abundance and synthesis
  - ✓ vocabulary related to chemical elements
  - ✓ adjective suffixes
  - ✓ subject questions

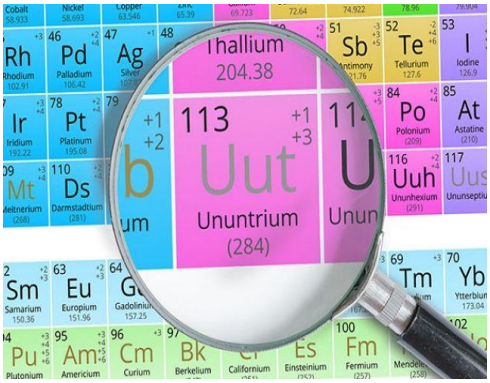
- practise
  - ✓ talking about element names and symbols
  - ✓ talking about the periodic table and its structure
  - ✓ asking subject questions
  - ✓ using adjective suffixes



Unit 4

❖ **Discuss these questions.**

- What is an example of a chemical element?
- Where are known chemical elements represented?



❖ **Pronunciation guide.**

particle symbol isotope

synthesize occur

oxygen hydrogen helium

pure applied

abundant fusion fission

Task 1. Read the text, find the sentences with the key words given in the box and translate them.

CHEMICAL ELEMENTS – BASIC FACTS

__a__ A chemical element is a substance consisting of only one type of atom. In other words, all atoms in an element contain the same number of protons.

__b__ The identity of a chemical element cannot be changed by any chemical reaction. However, a nuclear reaction can transmute one element into another one. Elements are considered to be the building blocks of matter. This is true, but it's worth noting atoms of an element consist of subatomic particles. There are 118 known elements. New elements may yet be synthesized.

___c__ Each element may be represented by its atomic number or by its element name or symbol. The element symbol is a one or two letter abbrevi-

ation. The first letter of an element symbol is always capitalized. A second letter, if it exists, is written in lower case. The International Union of Pure and Applied Chemistry (IUPAC) has agreed on a set of names and symbols for the elements, which are used in scientific literature.

___d__ However, the names and symbols for the elements may be different in common use in various countries. For example, element 56 is called barium with element symbol Ba by the IUPAC and in English. It is called bario in Italian and baryum in French. Element atomic number 4 is boron to the IUPAC, but boro in Italian, Portuguese, and Spanish, Bor in German, and bore in French. Common element symbols are used by countries with similar alphabets.

__e___ Of the 118 known elements, 94 are known to occur naturally on Earth. The others are called synthetic elements. The number of neutrons in an element determines its isotope. 80 elements have at least one stable isotope. On Earth, the most abundant element in the crust is oxygen, while the most abundant element in the entire planet is believed to be iron. In contrast, the most abundant element in the universe is hydrogen, followed by helium.

___f__ Atoms of an element may be produced by the processes of fusion, fission, and radioactive decay. All of these are nuclear processes, which means they involve the protons and neutrons in the nucleus of an atom. In contrast, chemical processes (reactions) involve electrons and not nuclei. In fusion, two atomic nuclei fuse to form a heavier element. In fission, heavy atomic nuclei split to form one or more lighter ones. Radioactive decay can produce different isotopes of the same element or a lighter element. (*URL: https://www.thoughtco.com/what-is-a-chemical-element)*

Task 2. **Choose the most suitable heading from the list below (1–6) for each part (a–f) of the text.**

1. Element Synthesis
   _____
2. Element Abundance
   _____
3. Element Definition
   _____
4. Different Element Names
   _____
5. Identity of Elements
   _____
6. Element Names and Symbols
   _____

Task 3. **Read the text and answer the question below.**

WHAT IS THE PERIODIC TABLE?

In the late 19th century, Russian chemist Dmitri Mendeleev published his first attempt at grouping chemical elements according to their atomic weights. There were only about 60 elements known at the time, but Mendeleev realized that when the elements were organized by weight, certain types of elements occurred in regular intervals, or periods.

Today, 150 years later, chemists officially recognize 118 elements (after the addition of four newcomers in 2016) and still use Mendeleev's periodic table of elements to organize them. The table starts with the simplest atom, hydrogen, and then organizes the rest of the elements by atomic number, which is the number of protons each contains. With a handful of exceptions, the order of the elements corresponds with the increasing mass of each atom.

The table has 7 rows and 18 columns. Each row represents one period; the period number of an element indicates how many of its energy levels house electrons. Moving down the table, periods are longer because it takes more electrons to fill the larger and more complex outer levels.

The columns of the table represent groups, or families, of elements. The elements in a group often look and behave similarly, because they have the same number of electrons in their outermost shell — the face they show to the world.

GRAMMAR TIPS	**SUBJECT QUESTIONS**
Вопросительное слово к действующему лицу* + смысловой глагол (или модальный глагол с инфинитивом) +другие члены предложения? *who, what; which, what, whose, how many + существительное.	

Task 4. Make seven subject questions to the text "WHAT IS THE PERIODIC TABLE?" Then answer them.

1. *Who recognizes 118 elements?*
2. …….
3. …….
4. ……..
5. ……..
6. ……..
7. ……..
8. ……..

Task 5. Match the elements of the periodic table (1–8) with the information related to them (a–h).

1. *Pure nitrogen*

__a__ It is the first element on the periodic table, with one proton per atom. It's the most abundant element in the universe. If you look at the Sun, you're mostly looking at hydrogen. Its usual ionization color is sort of a purplish-blue. On Earth, it's a transparent gas, which isn't really worth a picture.

2. *Pure oxygen*

__b__ It is a transparent gas. It forms a transparent liquid and a clear solid that looks much like water ice. However, it's quite colorful as an ionized gas, emitting a blue-violet glow.

3. *Phosphorus*

__c__ It is a transparent gas which makes up about 20% of the Earth's atmosphere. It forms a blue liquid. The solid form of the element is even more colorful. Depending on the conditions, it may be blue, red, yellow, orange, or even metallic black!

4. *Hydrogen*

__d__ It is a metallic element you often encounter in its pure form, although it requires purification from its ore or else recycling to get it that way.

5. *Sulfur*

__e__ It is one of the alkaline earth metals. It darkens or oxidizes in air. It is the 5th most abundant element in the body and the most abundant metal.

6. *Calcium*

__f__ It is a nonmetal that can be found in pure form, mostly around volcanoes. The solid element has a distinctive yellow color, but it's red in liquid form.

7. *Aluminium*

__g__ Like carbon, it is a nonmetal that can take any of multiple forms. White phosphorus is deadly toxic and reacts with air to glow green. Red phosphorus is used in safety matches.

8. *Sodium*

__h__ Like lithium, it is a highly reactive metal that will burn in water. The element doesn't occur naturally in pure form, but it's fairly common in science labs. The soft, shiny metal is stored under oil to protect it from oxidation.

GRAMMAR TIPS **ADJECTIVE SUFFIXES**

-ous (noun, verb + suffix) →
*danger**ous***

-al (noun, verb + suffix) →
*music**al***

-ive (noun, verb + suffix) →
*creat**ive***

-y (noun, verb + suffix) →
*cloud**y***

-able/ible (noun, verb + suffix) →
*(un)comfort**able**, (in)flex**ible***

-ful ("full of" + the meaning of adjective) →
*pain**ful***

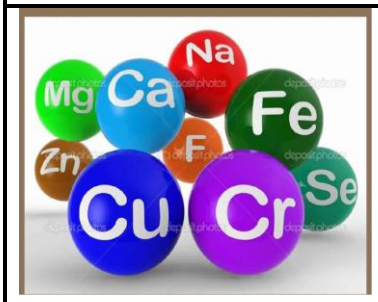
-less *("without"* + the meaning of adjective) →
*pain**less***

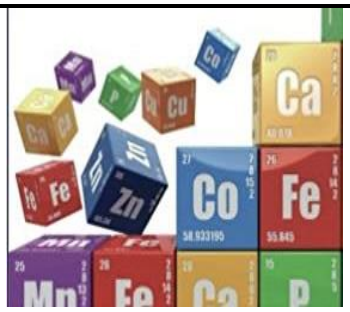
Task 6. Fill in the gaps with the correct suffixes. Sometimes there is a spelling change.

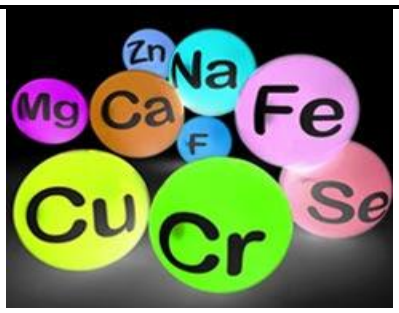
1. You must be very *care*…….. when you drive in wet weather.
2. Everyone has heard of her; she's very *fame*…….
3. The factory is in the middle of the *centre* ……part of the city.
4. It was so *fog*…….. this morning that I couldn't see anymore.
5. The people in the tourist information office were very *attract*…….
6. My working hours are very *flex*……..
7. It's *use*…… to complain.
8. We need to find a *suit*…….. person for the job.

Task 7. Look at these three pictures. Which one is different in each group? Why?







Task 8. Use the dictionary to complete the table with the definitions.

Words	Definitions
1. Helium (n)	a. A gas, one of the chemical elements, that is lighter than air and will not burn.
2. Oxygen (n)	b. ……
3. Hydrogen (n)	c. ……
4. Nitrogen (n)	d. ……
5. Particle (n)	e. ……..
6. Isotope (n)	f. ……

❖ **PROJECT TIME**

Find out some fun and surprising facts about chemical elements on the internet.

❖ **NOW I CAN…**

- ✓ *name chemical elements, their symbols, abundance and synthesis;*
- ✓ *talk about the periodic table, its structure;*
- ✓ *ask subject questions;*
- ✓ *use adjective suffixes.*

UNIT 5
SUBSTANCES, PROPERTIES

In this unit you will…

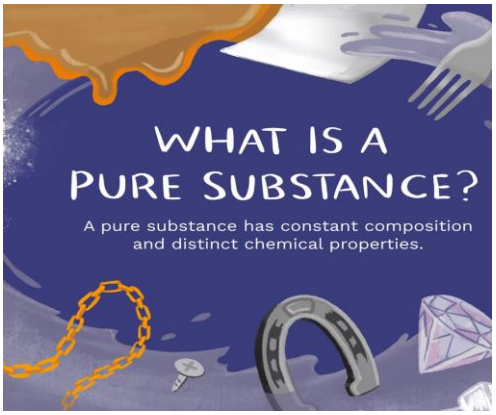
- learn, read, talk about
  - ✓ different chemical substances
  - ✓ chemical properties, examples and uses
  - ✓ vocabulary related to chemical substances, properties
  - ✓ compound nouns
  - ✓ alternative questions

- practise
  - ✓ talking about the types of chemical substances
  - ✓ talking about chemical property definitions
  - ✓ asking alternative questions
  - ✓ using compound nouns

Unit 5

❖ **Discuss these questions.**

- What do the words "pure/impure" mean?
- What do you know about chemical properties?



❖ **Pronunciation guide.**

constant consistent
composition predictable
sample sulfate protein
homogeneous heterogeneous
sugar sulfur crystal

Task 1. Read the text and give examples of substances mentioned below.

A PURE SUBSTANCE

A pure substance or chemical substance is a material that has a constant composition (is homogeneous) and has consistent properties throughout the sample. A pure substance participates in a chemical reaction to form predictable products. In chemistry, a pure substance consists of only one type of atom, molecule, or compound. In other disciplines, the definition extends to homogeneous mixtures.

Examples of pure substances include tin, sulfur, diamond, water, pure sugar (sucrose), table salt (sodium chloride) and baking soda (sodium bicarbonate). Crystals, in general, are pure substances.

Tin, sulfur and diamond are examples of pure substances that are chemical elements. All elements are pure substances. Sugar, salt and baking soda are pure

substances that are compounds. Examples of pure substances that are crystals include salt, diamond, protein crystals, and copper sulfate crystals.

An element is a chemical substance that is made up of a particular kind of atom and hence cannot be broken down or transformed by a chemical reaction into a different element. All atoms of an element have the same number of protons, though they may have different numbers of neutrons and electrons.

A pure chemical compound is a chemical substance that is composed of a particular set of molecules or ions that are chemically bonded. Two or more elements combined into one substance through a chemical reaction, such as water, form a chemical compound. All compounds are substances, but not all substances are compounds. A chemical compound can be either atoms bonded together in molecules or crystals in which atoms, molecules or ions form a crystalline lattice. Compounds made primarily of carbon and hydrogen atoms are called organic compounds, and all others are called inorganic compounds. Compounds containing bonds between carbon and a metal are called organometallic compounds.

Depending on who you talk to, homogeneous mixtures may be considered examples of pure substances. They include vegetable oil, honey, and air. While these substances contain multiple types of molecules, their composition is consistent throughout a sample. If you add soot to air, it ceases to be a pure substance. Contaminants in water make it impure. Heterogeneous mixtures are not pure substances. They include gravel, your computer, a mixture of salt and sugar, and a tree. *(URL: https://www.thoughtco.com/examples-of-pure-substances)*

Task 2. Are these statements true or false? If the statement is false, correct it.

1. A pure substance or chemical substance is homogeneous. _____
2. Tin, sulfur, and diamond are pure substances that are chemical compounds. _____
3. Pure substances that are crystals include salt, diamond, protein crystals. _____
4. Compounds made primarily of carbon and hydrogen atoms are called inorganic compounds. _____
5. Organometallic compounds contain bonds between carbon and a metal. _____
6. Heterogeneous mixtures are not pure substances. _____

Task 3. Read the text and answer the question below.

WHAT ARE CHEMICAL PROPERTIES?

It's important to know the chemical properties of a sample because this information can be used to classify it, identify an unknown sample, purify it, separate it from other substance, predict its behavior, predict its uses.

A chemical property is a characteristic or behavior of a substance that may be observed when it undergoes a chemical change or reaction. Chemical properties are seen either during or following a reaction since the arrangement of atoms within a sample must be disrupted for the property to be investigated. This is different from a physical property, which is a characteristic that may be observed and measured without changing the chemical identity of a specimen.

Chemical properties are of great interest to materials science. These characteristics help scientists classify samples, identify unknown materials, and purify substances. Knowing the properties helps chemists make predictions about the type of reactions to expect. Because chemical properties are not readily apparent, they are included in labels for chemical containers. Hazard labels based on chemical properties should be affixed to containers, while full documentation should be maintained for easy reference.

GRAMMAR TIPS **ALTERNATIVE QUESTIONS**
Вспомогательный, модальный глагол или глагол to be + действующее лицо +_____**or**_____?
Вспомогательный, модальный глагол или to be + 1-е действ. лицо **or** вспомогательный, модальный глагол или to be + 2-е действ. лицо?
Вопросительное слово + вспомогательный, модальный глагол или to be + действующее лицо + (смысловой глагол) + вариант 1 **or** вариант 2?

Task 4. Make seven alternative questions to the text "WHAT ARE CHEMICAL PROPERTIES?" Then answer them.

1. *Is it important to know or to study the chemical properties?*
2. ……..
3. ……
4. ……
5. ……..
6. ……..
7. ……..
8. ……..

Task 5. Match the chemical properties (1–5) with the information related to them (a–e).

1. *Flammability*

__a__ It is how dangerous a chemical is to your health, a particular organ, another organism, or to the environment. You can't tell by looking at a chemical whether or not it is toxic. How poisonous a substance is depends on the situation, so this is a property that can only be observed and measured by exposing an organic system to a sample. The exposure causes a chemical reaction or set of reactions. The net result of the chemical changes is this property.

2. *Chemical stability*

__b__ It is a measure of how readily a sample ignites or how well it can sustain a combustion reaction. You don't know how easily something will burn until you try to ignite it, so this is an example of a chemical property.

3. *Oxidation states*

__c__ It is also known as thermodynamic stability. It occurs when a substance is at chemical equilibrium in its environment, which is its lowest energy state. This is a property of matter that is determined by its specific conditions, so it can't be observed without exposing a sample to that situation. Thus, it fits the definition of a chemical property of matter.

4. *Reactivity*

__d__ Each element has a preferred set of oxidation states or oxidation numbers. It is a measure of the loss of electrons or oxidation of an atom in a compound. Although integers (e.g., -1, 0, 2) are used to describe oxidation states, the true level of oxidation is more complicated. Because oxidation can't be known until an element participates in a chemical reaction to form chemical bonds, this is a chemical property.

5. *Toxicity*

__e__ It is a measure of how readily a substance undergoes a chemical reaction. The reaction can involve the substance on its own or with other atoms or compounds, generally accompanied by a release of energy. The most reactive elements and compounds may ignite spontaneously or explosively. They generally burn in water as well as the oxygen in the air. It is dependent upon temperature.

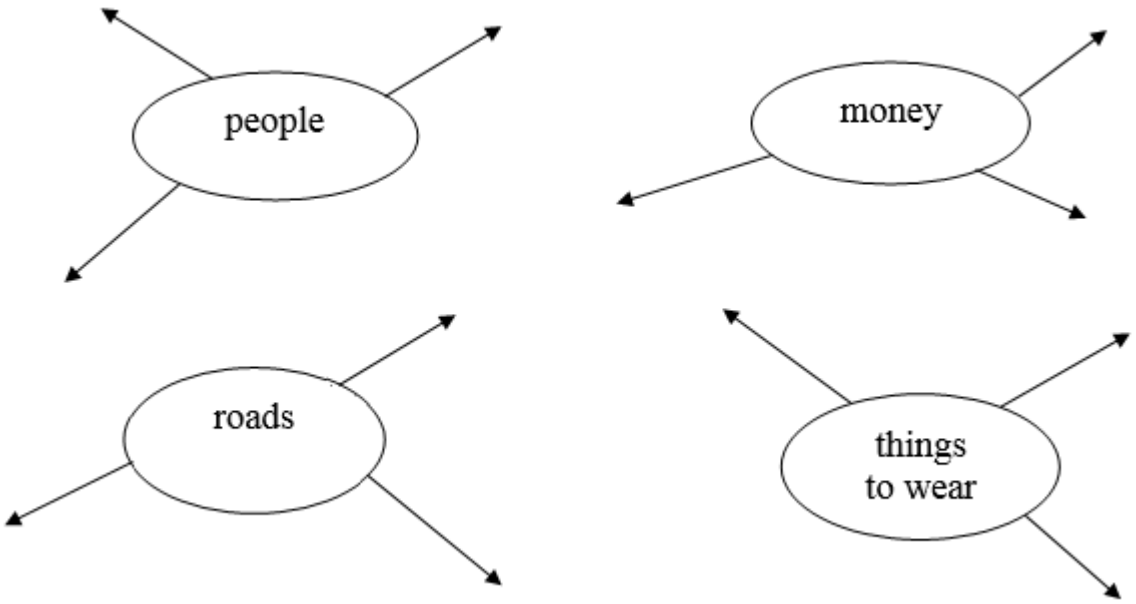
GRAMMAR TIPS **COMPOUND NOUNS**

Formation (noun + noun; adjective + noun**)** → *ticket office, writing paper*

Spelling (written as one word, as two words, joined by a hyphen) → *earring, sunglasses, credit card, income tax, traffic lights, mother-in-law, baby-sitter, T-shirt*

Pronunciation (on the first part, on both parts**)** → *parking meter, mother tongue*

Task 6. Choose compound nouns connected with each of these topics.



Task 7. Now here are two pictures. Picture A is nearly the same as Picture B but some things are different? Which ones?

A

B

Task 8. Look up the definitions of the following adjectives in the dictionary and complete the table.

Words (adjectives)	Definitions
1. Impure	a. Mixed with other substances and therefore lower in quality.
2. Pure	b. ……
3. Homogeneous	c. ……
4. Flammable	d. ……
5. Stable	e. ……..
6. Toxic	f. ……

❖ **PROJECT TIME**

Find out more examples of chemical properties on the internet.

❖ **NOW I CAN…**

- ✓ *name the types of chemical substances;*
- ✓ *talk about chemical properties, examples and uses;*
- ✓ *ask alternative questions;*
- ✓ *use compound nouns.*

UNIT 6
CHEMICAL AND PHYSICAL CHANGES

In this unit you will…

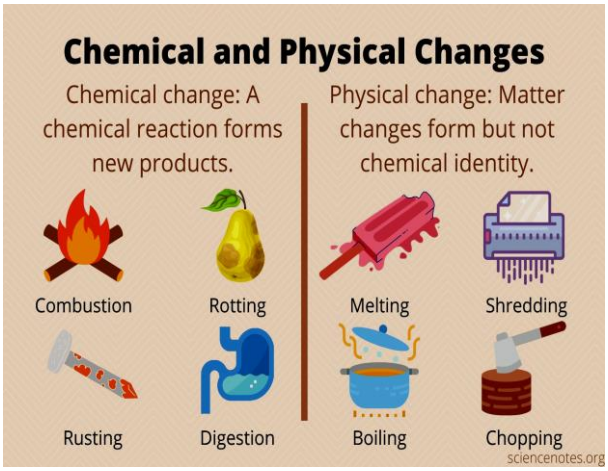
- learn, read, talk about
  - ✓ chemical and physical changes
  - ✓ examples of physical properties
  - ✓ vocabulary related to chemical and physical changes
  - ✓ compound adjectives
  - ✓ disjunctive questions

- practise
  - ✓ talking about types of chemical and physical changes
  - ✓ talking about chemical reactions
  - ✓ asking disjunctive questions
  - ✓ using compound adjectives

Unit 6

❖ **Discuss these questions.**

- What does the word "change" mean?
- Have you ever heard about chemical reactions?



❖ **Pronunciation guide.**

alter call odour reverse
rearrange change
reactant product bond sign
characteristic indicator
combustion enzyme photosynthesis

Task 1. Read the text, find the sentences with the words given in *Pronunciation guide* and translate them.

CHEMICAL CHANGES

A chemical change, also known as a chemical reaction, is a process in which one or more substances are altered into one or more new and different substances. The starting substances are called the reactants, and the new substances that form are called the products. While a physical change can often be reversed, a chemical change typically cannot be, except through more chemical reactions.

A chemical reaction can include atoms, ions, compounds, or molecules of a single element. During a chemical reaction, chemical bonds between the atoms break in the reactants and new chemical bonds form in the products. The atoms

rearrange to form the new bonds. As the chemical bonds break, the positions of electrons change, resulting in products with properties that are different from the properties of the reactants.

There are ways to identify a chemical reaction. The signs that indicate a reaction are called indicators of a chemical reaction. The breaking and formation of bonds are considered as the essential characteristic for the occurrence of a chemical reaction. Therefore, the characteristics of a chemical reaction include: change in colour, formation of a precipitate, formation of a gas, odour change, temperature change.

It's important to know that chemical change may occur without any of these indicators being obvious to the casual observer. For example, the rusting of iron produces heat and a color change, but it takes a long time for the change to be evident, even though the process is ongoing.

Chemists recognize three categories of chemical changes: inorganic chemical changes, organic chemical changes, and biochemical change. Inorganic chemical changes are chemical reactions that don't generally involve the element carbon. Examples of inorganic changes including mixing acids and bases, oxidation (including combustion), and redox reactions. Organic chemical changes are those that involve organic compounds (containing carbon and hydrogen). Examples include crude oil cracking, polymerization, methylation, and halogenation. Biochemical changes are organic chemical changes that occur in living organisms. These reactions are controlled by enzymes and hormones. Examples of biochemical changes include fermentation, the Krebs cycle, nitrogen fixation, photosynthesis, and digestion. (*URL: https://www.thoughtco.com/definition-of-chemical-change)*

Task 2. **Add the information from the text to complete the table.**

Chemical changes	*Examples*	*Characteristics*
Inorganic chemical changes		
		They involve organic compounds
	Fermentation, the Krebs cycle, nitrogen fixation, photosynthesis, and digestion	

Task 3. **Read the text and answer the question below.**

WHAT ARE PHYSICAL CHANGES?

A physical change is a type of change in which the form of matter is altered but one substance is not transformed into another. The size or shape of matter may be changed, but no chemical reaction occurs.

Physical changes are usually reversible. Note that whether a process is reversible or not is not truly a criterion for being a physical change. For example, smashing a rock or shredding paper are physical changes that cannot be undone. Contrast this with a chemical change, in which chemical bonds are broken or formed so that the starting and ending materials are chemically different. Most chemical changes are irreversible. On the other hand, melting water into ice (and other phase changes) can be reversed.

Examples of physical changes include: crumpling a sheet or paper (a reversible physical change); breaking a pane of glass (the chemical composition of the glass remains the same); freezing water into ice (the chemical formula is not changed); chopping vegetables (cutting separates molecules, but does not alter them); dissolving sugar in water (sugar mixes with water, but the molecules are not changed and may be recovered by boiling off the water); tempering steel (hammering the steel does not change its composition, but does alter its properties, including hardness and flexibility).

GRAMMAR TIPS	**DISJUNCTIVE QUESTIONS**
(1-я часть) - утвердительное предложение, (2-я часть) – отрицательный краткий общий вопрос? (1-я часть) - отрицательное предложение, (2-я часть) – положительный краткий общий вопрос?	

Task 4. Make seven disjunctive questions to the text "WHAT ARE PHYSICAL CHANGES?" Then answer them.

1. *Physical changes are usually reversible, aren't they?*
2. ……..
3. …….
4. …….
5. ……..
6. ……..
7. ……..
8. ……..

Task 5. Match the physical properties (1–16) with the information related to them (a–p).

1. *Density*	__a__ The amount of matter in an object.
2. *Malleability*	__b__ A form that matter can take: solid, liquid or gas.
3. *Ductility*	__c__ The visual and tactile quality of a surface.
4. *Elasticity*	__d__ The measure of the resistance of a solid to being scratched or dented.
5. *Magnetism*	__e__ A force that pull magnetic objects.
6. *Solubility*	__f__ Whether something sinks or floats in liquid.
7. *Mass*	__g__ The ability to be flattened into thin sheets by hammering.
8. *State of Matter*	__h__ The ability to be drawn or pulled into a wire.
9. *Diffusion*	__i__ The ability to resist a distorting influence and to regain its original size and shape when that force is removed.
10. *Transparency*	__j__ The ability of a solid to dissolve in a liquid.
11. *Boiling Point*	__k__ It allows electricity or heat to flow through it.
12. *Melting Point*	__l__ It describes how easily a substance will vaporize (turn into a gas or vapor).
13. *Texture*	__m__ The movement of molecules of matter from high concentration towards the low concentration.
14. *Hardness*	__n__ It allows light to pass through the material.
15. *Conductivity*	__o__ The temperature at which a substance starts boiling.
16. *Volatility*	__p__ The temperature at which a substance starts melting.

GRAMMAR TIPS **COMPOUND ADJECTIVES**

Formation (from two or three words**)** →
good-looking, ten-year-old

Spelling (usually written with a hyphen) →
brand-new, full-time

Pronunciation (usually on both parts**)** →
north-west, right- handed

Usage: - for describing people (appearance, character, clothes, situation) →
well-off, easy-going, short-sleeved

- well and badly + past participles →
well-directed, well-made, well-written, badly-paid, badly-behaved, badly-dressed

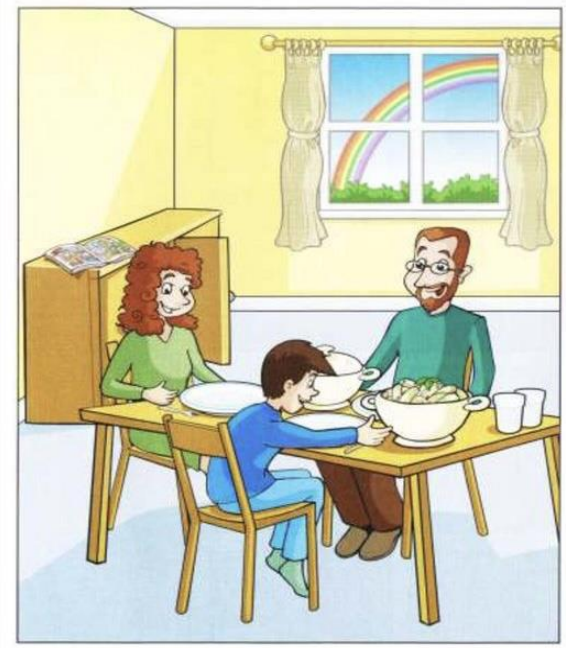
- number + singular noun →
four-star, five-pound, two-hour, ten-minute, nine-year-old

Task 6. Fill in the gaps with the second part of the compound adjectives in these sentences.

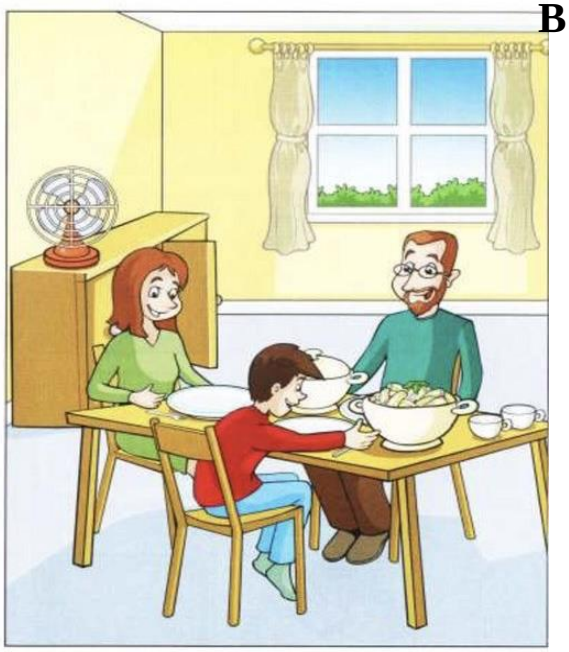
1. There is a shop in London which sells things for *left-*…… people.
2. One little child was very *badly-*……; she kept shouting during lunch.
3. She's just got a *part-*…….. job; she works three hours a day on Mondays.
4. It was a very *badly-*…… article: I noticed several punctuation mistakes.
5. It's a *twenty-*……walk to the house, but it takes much less than that in the car.
6. I was astonished when the man at the next table gave the waiter a *ten-*……. note as a tip.
7. They were both wearing *short-* …….. shirts.
8. We had a great time–he's very *easy-*…… .

Task 7. Now here are two pictures. Picture A is nearly the same as Picture B but some things are different? Which ones?

A



B



Task 8. Check the definitions of the following verbs in the dictionary and complete the table.

Words (verbs)	Definitions
1. Start	a. To begin doing something.
2. Alter	b. ……
3. Reverse	c. ……
4. Change	d. ……
5. Occur	e. ……..
6. Indicate	f. ……..

❖ PROJECT TIME

Find out more examples of physical properties or changes on the internet.

❖ NOW I CAN…

- ✓ *name the types of chemical and physical changes, examples of physical properties;*
- ✓ *talk about chemical and physical changes;*
- ✓ *ask disjunctive questions;*
- ✓ *use compound adjectives.*

UNIT 7
SOLIDS, LIQUIDS, GASES

In this unit you will…

- learn, read, talk about
  - ✓ matter, states of matter
  - ✓ the phase changes between states of matter
  - ✓ vocabulary related to states of matter
  - ✓ nouns with prepositions
  - ✓ disjunctive questions (special cases)

- practise
  - ✓ talking about solids, liquids, gases, plasma
  - ✓ talking about the phase changes
  - ✓ asking disjunctive questions (special cases)
  - ✓ using nouns with prepositions

Unit 7

❖ **Discuss these questions.**

- How would you describe the word “matter”?
- Are humans considered matter?

❖ **Pronunciation guide.**

matter solid plasma
liquid quality
charge vapour
unusual volume liquefy
intangible conductive

Task 1. Read the text, find the sentences with the words in bold and translate them.

STATES OF MATTER

The word "**matter**" refers to everything in the universe that has mass and takes up space. All matter is made up of atoms of elements. Sometimes, atoms bond together closely, while at other times they are scattered widely.

Some introductory chemistry texts name solids, liquids, and gases as the three states of matter, but higher level texts recognize **plasma** as the fourth state of matter. Like a gas, plasma can change its volume and shape, but unlike a gas, it can also change its electrical charge.

States of matter are generally described on the basis of **qualities** that can be seen or felt. Matter that feels hard and maintains a fixed shape is called a solid; matter that feels wet and maintains its volume but not its shape is called a liquid. Matter that can change both shape and volume is called a gas.

The same element, compound, or solution can behave very differently depending on its state of matter. For example, solid water (ice) feels hard and cold while liquid water is wet and mobile. It's important to note, however, that water

is a very **unusual** type of matter: rather than shrinking when it forms a crystalline structure, it actually expands.

A solid has a definite shape and **volume** because the molecules that make up the solid are packed closely together and move slowly. Solids are often crystalline; examples of crystalline solids include table salt, sugar, diamonds, and many other minerals. Solids are sometimes formed when liquids or gases are cooled; ice is an example of a cooled liquid which has become solid. Other examples of solids include wood, metal, and rock at room temperature.

A liquid has a definite volume but takes the shape of its container. Examples of liquids include water and oil. Gases may **liquefy** when they cool, as is the case with water vapour. Solids may liquefy when they heat up; molten lava is an example of solid rock which has liquefied as a result of intense heat.

A gas has neither a definite volume nor a definite shape. Some gases can be seen and felt, while others are **intangible** for human beings. Examples of gases are air, oxygen, and helium. Earth's atmosphere is made up of gases including nitrogen, oxygen, and carbon dioxide.

Plasma has neither a definite volume nor a definite shape. Plasma often is seen in ionized gases, but it is distinct from a gas because it possesses unique properties. Free electrical charges (not bound to atoms or ions) cause the plasma to be electrically **conductive**. The plasma may be formed by heating and ionizing a gas. Examples of plasma include stars, lightning, fluorescent lights, and neon signs. (*URL: https://www.thoughtco.com/states-of-matter)*

Task 2. **Complete the sentences with the information from the text above.**

1. The word "matter" refers to everything in the universe that has ……..
2. States of matter are generally described on the basis of ……..
3. Examples of crystalline solids include …….
4. Molten lava is an example of solid rock which has liquefied as a result of ……..
5. Earth's atmosphere is made up of gases including ……..
6. Examples of plasma include ……..**.....** .

Task 3. **Read the text and answer the question below.**

WHY ARE LIGHT AND HEAT NOT MATTER?

The universe consists of both matter and energy. The Conservation Laws state that the total amount of matter plus energy are constant in a reaction, but matter and energy may change forms. Matter includes anything that has mass. Energy describes the ability to do work. While matter may contain energy, the two are different from one another.

One easy way to tell matter and energy apart is to ask yourself whether what you observe has mass. If it doesn't, it's energy! Examples of energy include any part of the electromagnetic spectrum, which includes visible light, infrared, ultraviolet, X-ray, microwaves, radio, and gamma rays. Other forms of energy are heat (which may be considered infrared radiation), sound, potential energy, and kinetic energy.

Another way to distinguish between matter and energy is to ask whether something takes up space. Matter takes up space. You can put it in a container. While gases, liquids, and solids take up space, light and heat do not.

Usually, matter and energy are found together, so it can be tricky to distinguish between them. For example, a flame consists of matter in the form of ionized gases and particulates and energy in the form of light and heat. You can observe light and heat, but you can't weigh them on any scale.

GRAMMAR TIPS **DISJUNCTIVE QUESTIONS (special cases)**
"I am" → "aren't I?" Everybody, nobody → “aren’t they”? Imperative → "will/won't you?" "Let's" → "shall we?" "Let me/him", etc. → "will/won't you?"

Task 4. Make seven disjunctive questions to the text “WHY ARE LIGHT AND HEAT NOT MATTER?” Then answer them.

1. *I am right, aren’t I?*
2. Everybody knows the Conservation Laws, ……..…..?
3. Nobody was there, ……..……?
4. Let’s study matter and energy, ……..….…?
5. Let him give examples of energy, ……..….?
6. Answer the questions about kinetic energy,……?
7. Don’t put it in a container, ……..……?
8. I am surprised at this result,…….?

Task 5. Match the phase changes between states of matter (1–6) with the information related to them (a–f).

1. *Ionization (Gas → Plasma)*

__a__ This example shows an ice cube melting into water. It is the process by which a substance changes from the solid phase to the liquid phase.

2. *Melting (Solid → Liquid)*

__b__ This example shows the freezing of sweetened cream into ice cream. It is the process through which a substance changes from a liquid to a solid. All liquids except helium undergo freezing when the temperature becomes sufficiently cold.

3. *Sublimation (Solid → Gas)*

__c__ This image shows the vaporization, or evaporation, of alcohol into its vapor. It is the process by which molecules undergo a spontaneous transition from a liquid phase to a gas phase.

4. *Condensation (Gas → Liquid)*

__d__ This photo displays the process of condensation of water vapor into dew drops. Condensation, the opposite of evaporation, is the change in the state of matter from the gas phase to the liquid phase.

5. *Freezing (Liquid → Solid)*

__e__ This photo shows the sublimation of dry ice (solid carbon dioxide) into carbon dioxide gas. Sublimation is the transition from a solid phase to a gas phase without passing through an intermediate liquid phase. Another example is when ice directly transitions into water vapor on a cold, windy winter

6. *Vaporization (Liquid → Gas)*

__f__ This image captures the ionization of particles in the upper atmosphere to form the aurora. It may be observed inside a plasma ball novelty toy. Ionization energy is the energy required to remove an electron from a gaseous atom or ion.

GRAMMAR TIPS **NOUNS + PREPOSITION**

Remember this list of nouns + preposition

a check for, a demand /a need for, a reason for,
a rise/ an increase / a fall/ a decrease in,
an advantage/ a disadvantage of, a cause of, a picture of,
damage to, an invitation to, a reaction to, a solution to,
an answer/ a question to, a key to,
an attitude to/ towards
a relationship/ a connection/ contact with (between)

Task 6. Read a sentence then complete another sentence with the same meaning.

1. We're trying to solve the problem.
We're trying to find *a solution* _____
2. I don' t know how to answer your question.
I can't think of *an answer* _____
3. I don't think that a new road is necessary.
I don't think that there is *any need* _____
4. The number of people without jobs has fallen this year.
There has been *a fall* _____
5. Nobody wants to buy shoes like these.
There is *no demand* _____
6. Prices have increased a lot.
There is *a big increase* _____
7. I think being married has some advantages.
There are *some advantages*_____
8. She gets on well with him.
She has *a good relationship* _____

Task 7. Look at these two pictures. Picture A is nearly the same as Picture B but some things are different? Say which ones are the same and different.

Task 8. Write the definitions of the following nouns and complete the table.

Words (nouns)	Definitions
1. Ice	a. Water that has frozen and become solid.
2. Gas	b. ……
3. Solid	c. ……
4. Plasma	d. ……
5. Liquid	e. ……
6. Vapour	f. ……

❖ PROJECT TIME

Find out exciting examples of matter, energy, matter + energy on the internet.

❖ NOW I CAN…

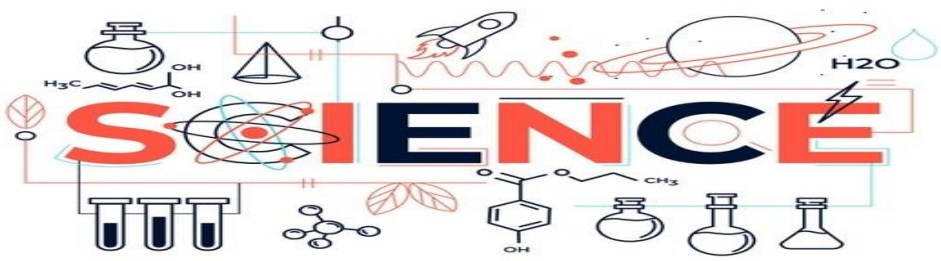
- ✓ *name solids, liquids, gases, plasma;*
- ✓ *talk about matter, states of matter, the phase changes;*
- ✓ *ask disjunctive questions (special cases);*
- ✓ *use nouns with prepositions.*

UNIT 8
MIXTURES, SOLUTIONS, ACIDS

In this unit you will…

- learn, read, talk about
  - ✓ the classification of mixtures
  - ✓ the components of solutions
  - ✓ vocabulary related to mixtures, solutions, acids
  - ✓ prepositions with nouns
  - ✓ indirect questions

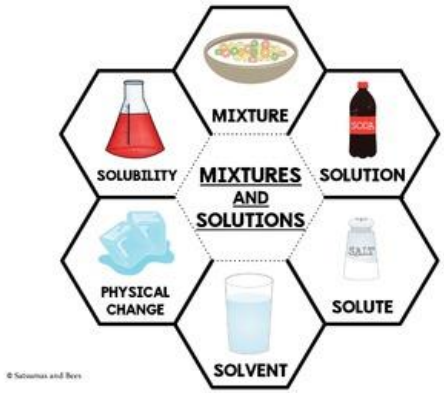
- practise
  - ✓ talking about the categories of mixture
  - ✓ talking about mixtures, solutions, acids
  - ✓ asking indirect questions
  - ✓ using prepositions with nouns



Unit 8

❖ **Discuss these questions.**

- What is the meaning of mixtures?
- What is the opposite of homogeneous?



❖ **Pronunciation guide.**

mixture		mercury
relative	uniform	dissolve
maintain	exhibit	combine
acid	base	colloid
solution	suspension	decantation

Task 1. Read the text, find the sentences with the words in italics and translate them.

CLASSIFICATION OF MIXTURES

__a__ A mixture is defined as the result of combining two or more substances, such that each *maintain*s its chemical identity. In other words, a chemical reaction does not occur between components of a mixture. Flour and sugar or marbles and salt may be combined to form a mixture. Smoke is a mixture of solid particles and gases.

__b__ Just because you mix two chemicals together, don't expect you'll always get a *mixture*! If a chemical reaction occurs, the identity of a reactant changes. This is not a mixture. Combining vinegar and baking soda results in a reaction to produce carbon dioxide and water. So, you don't have a mixture. Combining an acid and a base also does not produce a mixture.

__c__ Mixtures are classified based on how *uniform* they are and on the particle size of components relative to each other. Two broad categories of mixtures are heterogeneous and homogeneous mixtures. Homogeneous mixtures have a uniform composition and phase throughout their volume, while heterogeneous mixtures do not appear uniform and may consist of different phases (e.g., liquid and gas).

__d__ Besides mixtures may also be described according to the particle size of the components: *solutions*, colloids, suspensions. A chemical solution contains very small particle sizes (less than 1 nanometer in diameter). A solution is physically stable and the components cannot be separated by decanting or centrifuging the sample. Examples of solutions include air (gas), dissolved oxygen in water (liquid), and mercury in gold amalgam (solid), opal (solid), and gelatin (solid).

__e__ A colloidal solution appears homogeneous to the naked eye, but particles are apparent under microscope magnification. Particle sizes range from 1 nanometer to 1 micrometer. Like solutions, *colloids* are physically stable. They exhibit the Tyndall effect. Colloid components can't be separated using decantation, but may be isolated by centrifugation. Examples of colloids include hair spray (gas), smoke (gas), whipped cream (liquid foam), blood (liquid).

__f__ Particles in a suspension are often large enough that the mixture appears heterogeneous. Stabilizing agents are required to keep the particles from separating. Like colloids, *suspensions* exhibit the Tyndall effect. Suspensions may be separated using either decantation or centrifugation. Examples of suspensions include dust in air (solid in gas), vinaigrette (liquid in liquid), mud (solid in liquid), sand (solids blended together), and granite (blended solids).
URL: https://www.thoughtco.com/mixture-definition-chemistry-glossary

Task 2. **Title the paragraphs (a–f) of the text. The first one is done for you.**

1. __*a*__ Mixture definition
2. __*b*__ _____
3. __*c*__ _____
4. __*d*__ _____
5. __*e*__ _____
6. __*f*__ _____

Task 3. **Read the text and answer the question below.**

WHAT ARE THE COMPONENTS OF SOLUTIONS?

A solution is a homogeneous mixture of two or more substances. A solution may exist in any phase. It consists of a solute and a solvent. The solute is the substance that is dissolved in the solvent. The amount of solute that can be dissolved in solvent is called its solubility. For example, in a saline solution, salt is the solute dissolved in water as the solvent. For solutions with components in the same phase, the substances present in lower concentration are solutes, while the substance present in highest abundance is the solvent.

For gaseous solutions, if the solvent is a gas, the gases are the solute that can only be dissolved under a given set of conditions. An example of a gaseous solution is air. Oxygen and carbon dioxide gases are solutes, while nitrogen gas is the solvent.

When gas or solid materials dissolve in a liquid, it is referred to as a solute. When two liquids dissolve in each other, the major component is called the solvent and the minor component is called the solute. So, if the solvent is a liquid, gases, liquids and solids can be dissolved. An example of a liquid solution is aqueous hydrochloric acid (HCl in water). If the solvent is a solid, gases, liquids and solids can likewise be dissolved. An example of a solid solution is an alloy such as bronze or brass.

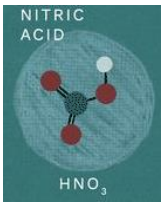
GRAMMAR TIPS	**INDIRECT QUESTIONS**
(1-я часть)*, вопросительное слово + действ. лицо + глагол(ы)? (1-я часть)*, if / whether + действ. лицо + глагол(ы)? * Could you tell me...?, Do you know...?, I wonder..., I want to know..., I doubt..., etc.	

Task 4. Make seven indirect questions to the text "WHAT ARE THE COMPONENTS OF SOLUTIONS?" Then answer them.

1. *Could you tell me, if* a *solution is a homogeneous mixture?*
2. ……..
3. ……..
4. ……..
5. ……..
6. ……..
7. ……..
8. ……..

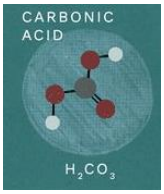
Task 5. Match these common acids (1–6) with the information related to them (a–f).

1. *Nitric acid*



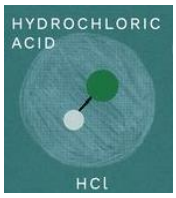
__a__ It is found in vinegar. Vinegar contains between 5 and 20 percent acetic acid. This weak acid is most often found in liquid form. Pure acetic acid (glacial) crystallizes just below room temperature.

2. *Carbonic acid*



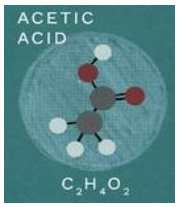
__b__ It may be used as a disinfectant or pesticide. It's usually found as a white crystalline powder. Borax (sodium tetraborate) is a familiar related compound.

3. *Hydrochloric acid*



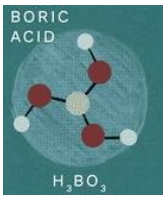
__c__ Solutions of carbon dioxide in water (carbonated water) may be called carbonic acid. This is the only acid excreted by the lungs as a gas. It is a weak acid. It is responsible for dissolving limestone to produce geological features such as stalagmites and stalactites.

4. *Acetic acid*



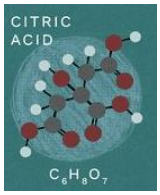
__d__ It is a weak organic acid that gets its name because it is a natural acid in citrus fruits. The chemical is an intermediate species in the citric acid cycle, which is key for aerobic metabolism. The acid is widely used as a flavoring and acidifier in food. Pure citric acid has a tangy, tart flavor.

5. *Boric acid*



__e__ It is a clear, highly corrosive strong acid. It's found in diluted form as muriatic acid. The chemical has many industrial and lab uses. Muriatic acid for industrial purposes typically is 20 to 35 percent hydrochloric acid, while muriatic acid for household purposes ranges between 10 and 12 percent hydrochloric acid. HCl is the acid found in gastric juice.

6. *Citric acid*



__f__ It is a strong mineral acid. In pure form, it is a colorless liquid. Over time, it develops a yellow color from decomposition into nitrogen oxides and water. Nitric acid is used to make explosives and inks and as a strong oxidizer for industrial and lab use.

GRAMMAR TIPS **PREPOSITION + NOUNS**

Remember this list of preposition + nouns

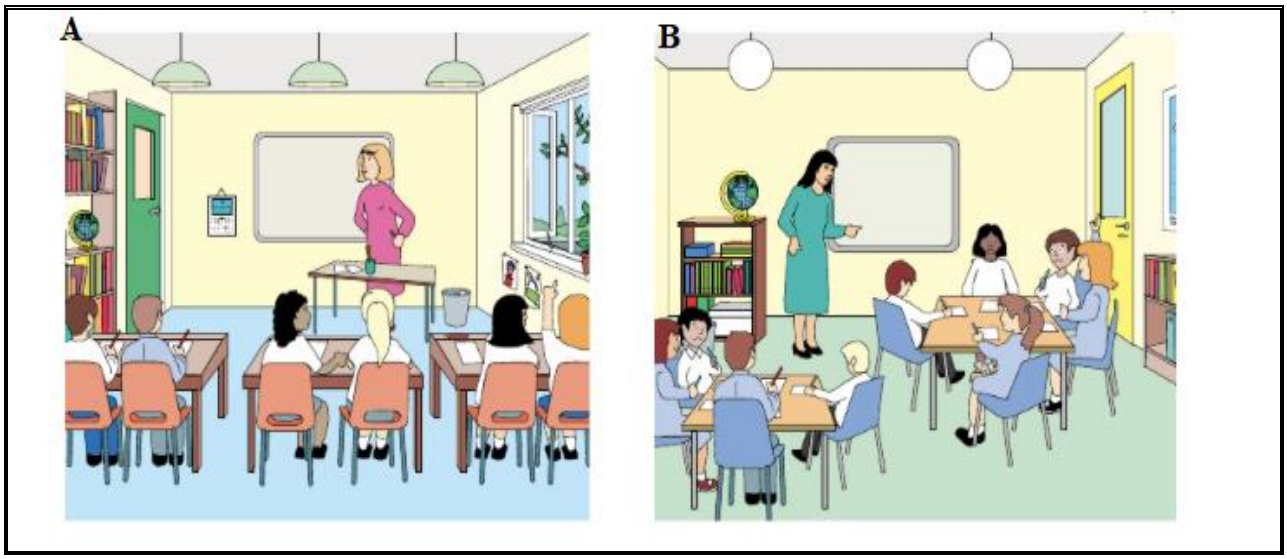
by check, (in) cash,
by accident, by mistake, by chance,
in love with, in (my) opinion,
on fire, on the phone, on the radio, on TV,
on strike, on business, on holiday,
on a trip, on a tour, on an excursion, on an expedition,
go to a place for a holiday,
for a swim, for a walk,
for lunch, for breakfast

Task 6. Complete the sentences with the correct prepositions and one of the words from the box.

business chance
his opinion a walk
love TV dinner
a world tour

1. We hadn't arranged to meet. We met …… .
2. Have you ever been ……. anyone?
3. ……the book wasn't very good.
4. I didn't watch the match …….. yesterday.
5. She's away at the moment. She is…….in France.
6. We always go ……..with our dog.
7. What did you have ……?
8. One day I'd like to go …….. .

Task 7. Look at these two pictures. Picture A is nearly the same as Picture B but some things are different? Say which ones are the same and different.



Task 8. Consult the dictionary to complete the table with the definitions.

Words	Definitions
1. Mixture (n)	a. A substance made from a combination of different substances.
2. Solution (n)	b. ……
3. Uniform (adj)	c. ……
4. Relevant (adj)	d. ……
5. Acid (n)	e. ……..
6. Combine (v)	f. ……

❖ **PROJECT TIME**

Find out some useful information about acids on the internet.

❖ **NOW I CAN…**

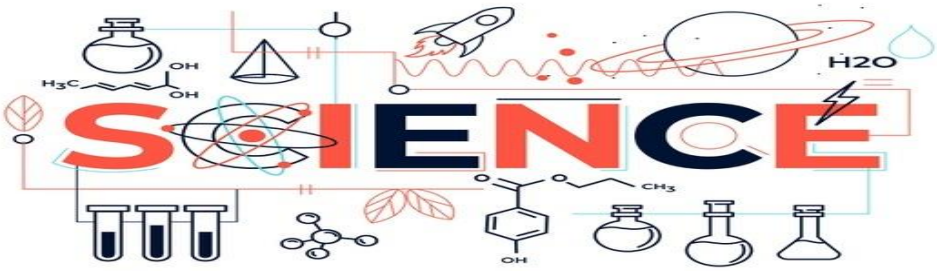
- ✓ *name the categories of mixtures and their examples;*
- ✓ *talk about the components of solutions, common acids;*
- ✓ *ask indirect questions;*
- ✓ *use prepositions with nouns.*

UNIT 9
HUMAN BODY

In this unit you will…

- learn, read, talk about
  - ✓ the importance of chemistry for human body
  - ✓ vitamins, nutrients, macrominerals, microminerals
  - ✓ vocabulary related to vitamins, nutrients, minerals
  - ✓ adjectives with prepositions

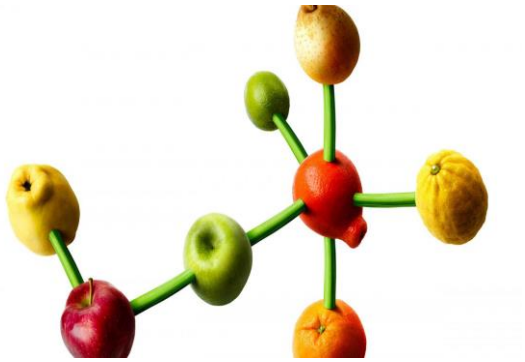
- practise
  - ✓ talking about the role of chemistry for human body
  - ✓ talking about vitamins, nutrients, minerals
  - ✓ using adjectives with prepositions
  - ✓ general, alternative questions and short answers



Unit 9

❖ **Discuss these questions.**

- What vitamins do you know?
- How many minerals and vitamins does your body need?



❖ **Pronunciation guide.**

breathe	store	determine
blood	food	muscle
cell	vitamin	protein
nutrition	collection	construction
bacteria	viruses	

Task 1. Read the text and say what role chemistry plays for human body.

CHEMISTRY AND ANATOMY & PHYSIOLOGY

Why chemistry is important to the study of anatomy and physiology may not be obvious if you're just looking at your body as a collection of organs. But all the cells in your organs are composed of chemicals, and chemical reactions are involved in all of your body's movements and cycles. Chemistry explains how your cells produce energy and proteins, why you breathe and have blood and what sorts of foods and vitamins are important for nutrition. With a basic understanding of chemistry, you can understand why your organs function the way they do and how the systems of your body work together.

Chemistry explains how your cells function. Perhaps the most important chemical reactions in the body involve adenosine triphosphate, or ATP. ATP is used to temporarily store energy from food, which cells can later convert to the energy they need to function.

Chemistry also explains how cells are built. A cell is enclosed by a cell membrane of chemicals called lipids, whose chemical structure allows them to keep other chemicals out of the cell. In addition, cells produce all of the body's proteins -- complex chemicals containing hundreds of atoms -- through chemical reactions among DNA, RNA and amino acids. Proteins perform many important functions in our bodies; they are used in the construction of cells, to carry oxygen through the blood and as antibodies to identify harmful bacteria and viruses.

Chemistry helps you understand the purpose of your body's organs. For instance, one of the functions of your kidneys is to maintain the pH level -- the proper level of acidity and alkalinity -- of your blood at around 7.4. The proper pH level is important for oxygen and other chemicals to move back and forth between your bloodstream and your cells during osmosis, and it affects how muscles function, as exercise makes the blood more acidic. By understanding how these different systems work together chemically, you can figure out how a problem in one organ can cause problems in other parts of your body.

Understanding body chemistry helps you determine which chemicals are needed for the body to function properly. That's how nutritionists determine what sorts of foods are best for maintaining health. For example, vitamins are an important class of chemical that support reactions in your body, such as the formation of strong bones, the creation of blood cells and the proper functioning of your metabolism. By understanding what vitamins are needed for each of these reactions, you can figure out what foods you should be eating to get these vitamins. (*URL: https://sciencing.com/what-is-main-purpose-of-protein-in-living-things-7317884.html*)

Task 2. **Read the following statements and say if they are true, false or they don’t have that information.**

1. Chemical reactions aren’t involved in all of your body's movements and cycles.	True / False / No information
2. ATP is used to temporarily store energy from food.	True / False / No information
3. Proteins are used in the construction of cells, to carry oxygen through the blood.	True / False / No information
4. One of the functions of your heart is to maintain the pH level.	True / False / No information
5. Fat provides the body with energy.	True / False / No information
6. Vitamins support reactions in the body.	True / False / No information

Task 3. **Read the text and answer the question below.**

WHY DO YOU NEED NUTRIENTS?

Foods that contain sugar, such as oranges and milk, are found in the Fruit and Milk Groups. Foods that contain starch, such as pasta and potatoes, are found in the Bread and Vegetable Groups. Sugar and starch are carbohydrates. During digestion, the body breaks down starch into a simple sugar called glucose that can be absorbed by cells and used for energy. All carbohydrates provide quick energy.

Like carbohydrates, fat provides the body with energy. But fat contains more than twice as many food calories per unit of mass as carbohydrates. Unlike most carbohydrates, fats can be stored in the body. They can be used when the body needs energy. Foods that are rich in fats include margarine, butter, salad oils, olives, nuts and seeds, cheeses, and many meats. These foods are found in the Milk and Meat Groups, as well as in Fats, Oils, and Sweets.

Proteins are the third group of nutrients that can provide energy. Their primary use, however, is not to supply the body with energy. Proteins make up much of the structure of cells. They are needed for the growth and repair of cells. Milk, meats, fish, eggs, beans, and cheeses are good sources of protein. These foods are found in the Milk and Meat Groups. Foods in the Bread and Vegetable Groups also contain protein, but in smaller amounts.

Task 4. Ask general or alternative questions to the underlined sentences in the text "WHY DO YOU NEED NUTRIENTS?" Give short answers.

EXAMPLE: ***Do foods contain sugar?*** ***Yes, they do.***

1. Are……?
   Yes, _____.

2. Do……?
   Yes, _____.

3. Does……..?
   Yes, _____.

4. ……..?
   Yes, _____.

5. ……..?
   Yes, _____.

6. ……..?
   Yes, _____.

Task 5. Match the minerals (1–6) with the information related to them (a–f).

1. *Phosphorous*

__a__ It is found in dairy foods, for example, cheese and milk. It is also found in green vegetables, dried peas and beans. It is used in the body for the formation and hardening of bones and teeth. It also promotes the healthy functioning of the nerves and promotes the normal clotting of blood. In children, a deficiency can lead to rickets, where the bones of the legs bend as they cannot support the legs. In adults, the condition is called Osteomalacia. It can also cause brittle bones and this can increase the risk of fracture.

2. *Magnesium*

__b__ It is found mainly in green leafy vegetables, nuts, dried peas and beans. It is essential for effective nerve and muscle functioning and is important in energy production. A lack of this mineral can lead to tiredness and weakness.

3. *Zinc*

__c__ The main source of this mineral is in table salt, and sodium chloride in foods. In the body it helps the contraction of the muscles and the transmission of the nerve impulses. A lack of salt in the diet can lead to painful muscle cramps and poor transmission of nerve impulses.

4. *Sodium*

__d__ It comes from dark green leafy vegetables and pumpkin. Other sources are liver, kidney, fish and red meat. It is important in hemoglobin which carries oxygen in the blood. A diet deficient in iron can lead to anemia which causes weakness and tiredness as less oxygen reaches cells for respiration and release of energy.

5. *Calcium*

__e__ It is used in enzyme and protein synthesis as well as the synthesis of the genetic material. Additional functions are wound healing, foetal development, production of sperm, normal growth and sexual maturation, immune system health. It is found mainly in pork, beef, nuts, turnips, onions, fish, wheat germ.

6. *Iron*

__f__ It is required for healthy bone formation and protein formation, muscle contraction, nerve transmission etc. The main sources of this mineral are fish, poultry, meat, eggs, milk

GRAMMAR TIPS **ADJECTIVES + PREPOSITION**

Remember this list of adjectives + preposition

married / engaged to
good/bad/excellent/hopeless at,
afraid/frightened/scared of, proud/ashamed of,
envious/jealous/suspicious of, aware, conscious of,
nice/kind/generous/mean/silly/polite/rude to smb(of smb to do),
surprised/shocked/amazed/astonished at/by
impressed by/with, crowded with,
excited/worried/upset about,
pleased/satisfied/disappointed with,
bored/fed up with,
angry/annoyed/furious about smth, with smb for doing smth,
sorry about smth, for doing smth, for smb,
famous/responsible for, similar to, different from (to),
interested in, keen on,
fond of, tired of, full of, short of, (in)capable of

Task 6. Complete the sentences with the correct prepositions and the adjectives in brackets.

1. He is big, strong, aggressive and I'm ……him. (afraid)
2. This man has been telling lies about you and I'm…….him. (angry)
3. My friend is much better at everything and I'm…….him. (jealous)
4. He is her husband and she is ……him.(married)
5. Our house is……..theirs. (similar)
6. Britain isn't ……..its food. (famous)
7. This part of town is usually ……people. (crowded)
8. We are ……staff in the office now. (short)

Task 7. Choose Picture A or Picture B and describe it. Say what/who is in the picture, what they look like, what they are wearing, what they are doing, where the action is taking place, tell about the weather, the feelings of people and your feelings connected with the picture.

A	B
	

Task 8. Look up the definitions of the following words in the dictionary and complete the table.

Words	Definitions
1. Fat (n)	a. The substance under the skin of humans and animals that store energy and keeps them warm.
2. Protein (n)	b…….
3. Carbohydrate (n)	c…….
4. Vitamin (n)	d…….
5. Mineral (n)	e……..
6. Nutrient (n)	f……

❖ **PROJECT TIME**

Find out more information about macrominerals or microminerals on the internet.

❖ **NOW I CAN…**

- ✓ *name the vitamins, minerals, nutrients;*
- ✓ *talk about the role of chemistry for human body;*
- ✓ *give short answers to general and alternative questions;*
- ✓ *use adjectives with prepositions.*

UNIT 10
EARTH, PLANETS, LAYERS OF ATMOSPHERE

In this unit you will…

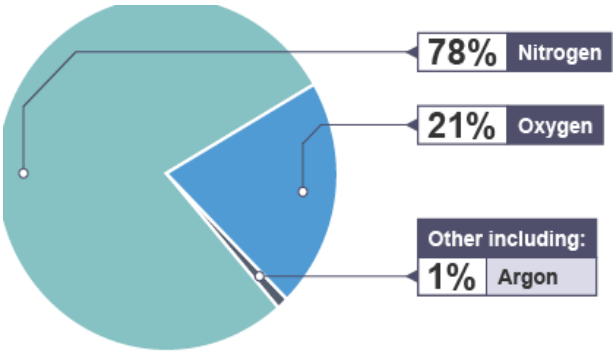
- learn, read, talk about
  - ✓ the composition and evolution of Earth's atmosphere
  - ✓ the structure of the atmosphere, planets
  - ✓ vocabulary related to the atmosphere's layers, planets
  - ✓ verbs with prepositions

- practise
  - ✓ talking about the Earth, the Earth's atmosphere
  - ✓ talking about the atmosphere's layers, planets
  - ✓ using verbs with prepositions
  - ✓ special and subject questions

Unit 10

❖ **Discuss these questions.**

- What is the atmosphere?
- What planets do you know?



❖ **Pronunciation guide.**

Earth volcanic ancient
crust mantle climate
atmosphere ammonia methane
surround condense
emission proportion

Task 1. Read the text, find the sentences with the words given in *Pronunciation guide* and translate them.

ATMOSPHERE OF EARTH

The Earth has three main layers. These are its main layers, starting with the outermost: crust (relatively thin and rocky), mantle (has the properties of a solid, but can flow very slowly), core (made from nickel and iron). We live on the outer layer, the crust, and are surrounded by a mixture of gases, the atmosphere. The Earth's atmosphere is the relatively thin layer of gases that surround the planet.

There is evidence that the Earth's early atmosphere contained less oxygen, but more carbon dioxide and water vapour, than today. Increased emissions of greenhouse gases are leading to climate change. The Earth formed about 4.5 billion years ago. Scientists believe that its early atmosphere was produced by volcanic activity.

The early atmosphere probably contained: little or no oxygen, a large amount of carbon dioxide, water vapour, small amounts of other gases, such as ammonia and methane. Scientists cannot be sure about the early atmosphere, since it formed so long ago. They can only analyse evidence from other sources.

Some ancient rocks contain iron compounds that break down in the presence of oxygen. They could only have formed if there was little or no oxygen at the time. A volcano releases large volumes of carbon dioxide and water vapour. Since the early atmosphere was produced by volcanic activity, it was likely to have contained a large amount of carbon dioxide and water vapour.

Compared to the Earth's early atmosphere, the modern atmosphere contains: less water vapour, less carbon dioxide, more oxygen. When the Earth became cool enough, water vapour in the atmosphere condensed to liquid water. It fell as rain, creating the oceans. As the oceans formed, carbon dioxide dissolved and its amount in the atmosphere decreased. Photosynthesis by primitive plants and algae caused the removal of carbon dioxide from the air, and the release of oxygen. This had two effects: the amount of carbon dioxide decreased further, the amount of oxygen in the atmosphere gradually increased.

The three most abundant gases in the atmosphere are all elements: nitrogen, oxygen, argon. Notice that nitrogen and oxygen exist as molecules, each containing two atoms, while argon exists as single atoms. These three gases comprise 99.9 % of the atmosphere. The remaining gases are found in much smaller proportions. These include carbon dioxide (0.04 %) and water vapour (which varies). (*URL: https://www.bbc.co.uk/bitesize/guides/zyd64qt/revision/1)*

Task 2. Choose the correct answer. There is only one possible answer.

1. The Earth has …….. .

two main layers / three main layers / four main layers

2. We live on the outer layer, the..…… .

crust / mantle / core

3. the Earth's early atmosphere contained …….. .

more carbon dioxide / more oxygen / less oxygen

4. The early atmosphere was produced by ……. .

flood activity / volcanic activity / human activity

5. The modern atmosphere contains: ……. .

more carbon dioxide / more oxygen / less oxygen

6. The three most abundant gases in the atmosphere are all elements: …… .

nitrogen, oxygen, argon / nitrogen, oxygen, carbon / carbon, oxygen, argon

Task 3. **Read the text and answer the question below.**

WHAT ARE THE GAS PLANETS?

There are four planets in our solar system that are collectively known as the "gas giants". They are much bigger than the rocky planets, and they are the furthest planets from the Sun. The gas planets are Jupiter, Saturn, Uranus and Neptune. They are also called "Jovians," as Jove is the Latin name for Jupiter, the largest of the four.

The gas planets are made up almost entirely of gases, primarily hydrogen and helium. While they might have near-solid inner cores of molten heavy metals, they have thick outer layers of liquid and gaseous molecular hydrogen and helium and metallic hydrogen.

A ring system around a planet or asteroid is a disk made up of dust, chunks of material (ice, in the outer solar system), and small moons. This material forms a ring (or rings) around its parent body. The largest ring system in the solar system is the one around Saturn. Jupiter, Uranus and Neptune also have rings, and at least one asteroid is known to have a small ring as well.

Jupiter is the largest planet in the solar system. Jupiter has the shortest day of all the planets. Saturn is the second largest planet. Saturn is also the flattest planet. Uranus became the first planet discovered with the use of a telescope. Neptune is the smallest gas giant.

Task 4. Ask special or subject questions to the underlined words in the text "WHAT ARE THE GAS PLANETS?"

*EXAMPLE: **What are much bigger than the rocky planets?***
Why are they called "Jovians"?

1. How many……. ?
2. What…… ?
3. What …….. ?
4. Where…….. ?
5. What……. ?
6. How…….. ?

Task 5. Match the layers of the atmosphere (1–6) with the information related to them (a–f).

1. *Exosphere*

__a__ It is the layer of the atmosphere closest to the Earth. It begins at the surface of the Earth and extends out to about 4 to 12 miles (6 to 20 km). This layer is known as the lower atmosphere. It's where weather happens and contains the air humans breathe. The temperature of this layer decreases with height.

2. *Thermosphere*

__b__ Above the troposphere is another layer, which extends to about 31 miles (50 km) above the Earth's surface. This layer is where the ozone layer exists and scientists send weather balloons. Jets fly in the lower stratosphere to avoid turbulence in the troposphere. Temperature rises within this layer but still remains well below freezing.

3. *Troposphere*

__c__ From about 31 to 53 miles (50 to 85 km) above the surface of the Earth lies the layer, where the air is especially thin and molecules are great distances apart. Temperatures reach a low of -130 degrees Fahrenheit (–90 ^{0}C). This layer is difficult to study directly; weather balloons can't reach it, and weather satellites orbit above it. The stratosphere and the mesosphere are known as the middle atmospheres.

4. *Stratosphere*

__d__ This layer rises several hundred miles above the Earth's surface, from 56 miles (90 km) up to between 311 and 621 miles (500–1,000 km). Temperature is very much affected by the sun here; it can be 360 degrees Fahrenheit hotter (500 ^{0}C) during the day than at night. Temperature increases with height and can rise to as high as 3,600 degrees Fahrenheit (2000 ^{0}C). Nonetheless, the air would feel cold because the hot molecules are so far apart. This layer is known as the upper atmosphere, and it is where the auroras occur (northern and southern lights).

5. *Mesosphere*

__e__ Extending from the top of the thermosphere to 6,200 miles (10,000 km) above Earth is the layer, where weather satellites are. This layer

has very few atmospheric molecules, which can escape into space. Some scientists disagree that it is a part of the atmosphere and instead classify it actually as a part of outer space. There is no clear upper boundary, as in other layers.

6. Ionosphere

__f__ This layer isn't actually a layer of the atmosphere but regions in the layers where there are ionized particles (electrically charged ions and free electrons), especially located in the mesosphere and thermosphere. The altitude of the ionosphere's layers changes during the day and from one season to another.

GRAMMAR TIPS **VERBS + PREPOSITION**

Remember this list of verbs + preposition

listen to, happen to, speak/talk to, write to, belong to,
laugh/smile at, shout at,
rely on, live on, concentrate on, depend on, believe in,
pay for, search for, wait for, apply for, consist of, die of,
suffer from, collide with, drive/run into,
dream about smb, smth/ of being, doing smth (=imagine)
hear about, hear of (=know), hear from (=receive a letter),
care about (=think), care for, think about, of,
look at, look for (=search), look after (=take care of)
apologise to smb for smth, complain to smb about,
********We don't use a preposition with these verbs:*
phone, enter, discuss, marry, lack, approach, resemble

Task 6. Fill in the gaps with the correct prepositions where necessary.

1. He loves complaining. He *complains*….. everything.
2. I don't *believe*……..ghosts.
3. Are you going to *apologise* ……..what you did?
4. What *happened* ……the picture that used to be on the wall?
5. You know that you can always *rely*……..me.
6. What's funny? What are you *laughing* …….?
7. They stopped talking when she *entered*……the room.
8. We *waited* ……him but he never arrived.

Task 7. Choose Picture A or Picture B and describe it. Say what/who is in the picture, what they look like, what they are wearing, what they are doing, where the action is taking place, tell about the weather, the feelings of people and your feelings connected with the picture.

A	B
	

Task 8. Write the definitions of the following words and complete the table.

Words	Definitions
1. Atmosphere (n)	a. The mixture of gases around the earth.
7. Earth (n)	b. …….
8. Crust (n)	c. …….
9. Mantle (n)	d. …….
10.Surface (n)	e. ……..
11. Planet (n)	f. ……

❖ **PROJECT TIME**

Find out new and fun information about planets on the internet.

❖ **NOW I CAN…**

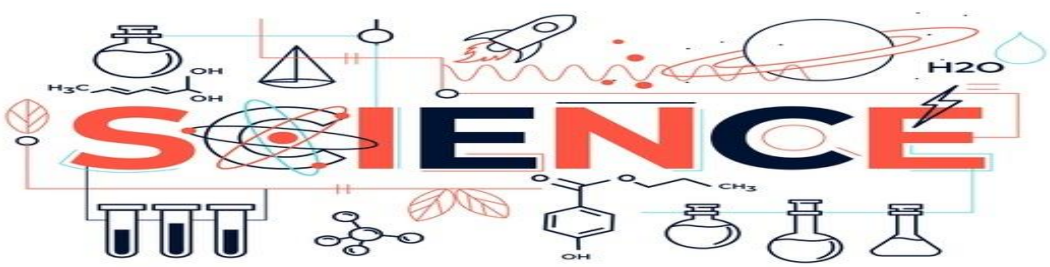
- ✓ *name the atmosphere's layers, planets;*
- ✓ *talk about the Earth, the Earth's atmosphere, planets;*
- ✓ *ask special and subject questions;*
- ✓ *use verbs with prepositions.*

UNIT 11
FAMOUS SCIENTISTS

In this unit you will…

- learn, read, talk about
  - ✓ great scientists, their biographies
  - ✓ the contributions to science
  - ✓ vocabulary related to science and scientists
  - ✓ verbs and object with prepositions

- practise
  - ✓ talking about the science and famous scientists
  - ✓ talking about achievements, discoveries
  - ✓ using verbs and object with prepositions
  - ✓ disjunctive questions and short answers



Unit 11

❖ **Discuss these questions.**

- Can you name any famous scientists?
- What are they famous for?

❖ **Pronunciation guide.**

research discover
enrol award hypothesis
radioactive radioactivity exposure
ray ore leukemia
application radiation vision

Task 1. Read the text, find the sentences with the key words given in the box and translate them.

MARIE CURIE

__a__ Marie Curie was the first truly famous woman scientist in the modern world. She was known as the "Mother of Modern Physics" for her pioneer work in research about radioactivity. She was the first woman awarded a Ph.D. in research science in Europe and the first woman professor at the Sorbonne. Curie discovered and isolated polonium and radium, and established the nature of radiation and beta rays. She won Nobel Prizes in 1903 (Physics) and 1911 (Chemistry) and was the first woman to be awarded a Nobel Prize, and the first person to win Nobel Prizes in two different scientific disciplines.

__b__ Marie Curie was born in Warsaw, the youngest of five children. Her father was a physics teacher, her mother, who died when Curie was 11, was also an educator. After graduating with high honors in her early schooling, Marie Curie found herself, as a woman, without options in Poland for higher

education. In Paris, Marie Curie enrolled at the Sorbonne. She graduated in first place in physics (1893), then, on a scholarship, returned for a degree in mathematics in which she took second place (1894).

__c__ She began to work as a researcher in Paris. Through her work, she met a French scientist, Pierre Curie, in 1894 when he was 35. They were married on July 26, 1895, in a civil marriage. Their first child, Irène, was born in 1897 and their second daughter, Ève, was born in 1904. Ève would later write a biography of her mother.

__d__ On April 12, 1898, she published her hypothesis of a still-unknown radioactive element, and worked with pitchblende and chalcocite, both uranium ores, to isolate this element. Pierre joined her in this research. Marie Curie and Pierre Curie thus discovered first polonium (named for her native Poland) and then radium. In 1903, for their work, Marie Curie, her husband Pierre, and Henry Becquerel, were awarded the Nobel Prize for Physics.

__e__ In 1906 a month after Pierre's death, she was offered his chair at the Sorbonne, and she accepted. Two years later she was elected a full professor—the first woman to hold a chair at the Sorbonne. In 1911 she was awarded a second Nobel Prize. After the war, her daughter Irene joined Marie Curie as an assistant at the laboratory. The Curie Foundation was established in 1920 to work on medical applications for radium. Marie Curie took an important trip to the United States in 1921 to accept the generous gift of a gram of pure radium for research.

__f__The work of Marie Curie, her husband, and colleagues with radioactivity was done in ignorance of its effect on human health. Marie Curie and her daughter Irene contracted leukemia, apparently induced by exposure to high levels of radioactivity. Marie Curie's health was declining seriously by the end of the 1920s. Cataracts contributed to failing vision. Marie Curie retired to a sanatorium, with her daughter Eve as her companion. She died of pernicious anemia, also most likely an effect of the radioactivity in her work, in 1934. **(***URL: https://www.thoughtco.com/marie-curie-biography-3529555)*

Task 2. **Match the paragraphs (a–f) with the sentences (1–6) of the text.**

1. Marie Curie met a French scientist, Pierre Curie. _____
2. Marie Curie and Pierre Curie discovered first polonium and then radium. _____
3. Marie Curie was the first truly famous woman scientist. _____
4. She graduated in first place in physics, then in mathematics. _____
5. Marie Curie's health was declining seriously by the end of the 1920s. _____
6. In 1911 Marie Curie was awarded a second Nobel Prize. _____

Task 3. **Read the text and answer the question below.**

10 FACTS ABOUT DMITRI MENDELEEV! DID YOU KNOW?

- Dmitri Mendeleev was born in Tobolsk on the 8th of February 1834.
- He has been characterized as a chemist of genius, first-class physicist and fruitful researcher in the fields of hydrodynamics, meteorology and geology.
- Mendeleev was also a thorough expert in certain branches of chemical technology and other disciplines adjacent to chemistry and physics. He was an original thinker in the field of economy.
- He was one of the first modern-day scientists who corresponded with other scientists around the globe to receive data that they had collected rather than depend completely on his own work.
- Mendeleev has been credited as being the creator of the first version of the periodic table of elements for which he was awarded the Nobel Prize in Chemistry.
- The Element 101 Md (mendelevium) was named after him.
- Dmitri Mendeleev was known to have long hair and a long beard. He would trim his hair once every year.
- Mendeleev was one of the founding members of the Russian Chemical Society and helped open the lines of communications between scientist in Europe and the United States.
- His famous publication, "Organic Chemistry", won him the Demidov Prize and put him on the forefront of Russian chemical education.
- Dmitri Mendeleev died at the age of seventy two in Petersburg.

Task 4. Ask disjunctive questions to these sentences and give short answers according to the text "10 FACTS ABOUT DMITRI MENDELEEV! DID YOU KNOW?"

EXAMPLE: **Dmitri Mendeleev was born in Tobolsk, wasn't he? Yes, he was.**

1. Mendeleev was also a thorough expert, ……? Yes, _____.
2. He was an original thinker in the field of economy, ……..? Yes, _____.
3. Mendeleev has been credited as being the creator of the first version of the periodic table of elements, ……..? Yes, _____.
4. He wouldn't trim his hair once every year, …….? Yes, _____.
5. He didn't help open the lines of communications between scientist in Europe and the United States, ……..? Yes, _____.
6. Dmitri Mendeleev died at the age of seventy two in Petersburg, ……..? Yes, _____.

Task 5. Match the outstanding scientists (1–6) with the information related to them (a–f).

1. *Michael Faraday*

__a__ **Nationality:** *German.*
Known for: *Created version of the periodic table.*
He was a chemist and contemporary of Dmitri Mendeleev. The scientists independently developed the periodic table in which the elements were ordered according to increasing atomic weight and grouped according to periodic properties.

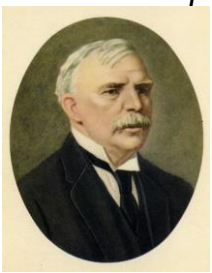
2. *John Dalton*

__b__ **Nationality:** *Swedish.*
Known for: *Invented dynamite and explosives. Started Nobel Prize organization.*
He created various explosives, the most well-known being dynamite. By the time of his death he had over 350 patents. He used his fortunes to create the Nobel Prize awards posthumously.

3. *Julius Meyer*

__c__ **Nationality:** *English.*
Known for: *Pioneer of modern atomic theory.*
He was the very first person to explain atomic behavior based on weight measurements. He also created what is now called Dalton's Law of Partial Pressures.

4. *Ernest Rutherford*



__d__ **Nationality:** *French.*
Known for: *Naming of oxygen and hydrogen.*
He is known as the "father of modern chemistry," he named hydrogen and oxygen as well as predicted the existence of silicon. He helped to create the metric system and make a list of the elements. He also found that matter's mass remains the same regardless of form or shape.

5. *Antoine Lavoisier*

__e__ **Nationality:** *British.*
Known for: *Contributions to electrochemistry.*
He discovered two new compounds of carbon and chlorine, experimented on diffusion of gases, created an early version of the Bunsen burner, liquified gasses and discovered the laws of electrolysis.

6. *Alfred Nobel*

__f__ **Nationality:** *British.*
Known for: *Theory on existence of atomic nucleu.*
His studies in radioactivity are what directed others to explore nuclear physics. He was the first person to split an atom and he has been given the name "Father of the Nuclear Age."

GRAMMAR TIPS **VERBS + OBJECT + PREPOSITION**

Remember this list of verbs + object + preposition

ask smb for, leave (a place) for, blame smb/smth for,on
borrow smth from, protect smth,smb from,
provide smb with, charge smb with,
do smth about, warn smb ,smth about
congratulate smb on, spend (money) on,
point/aim smth at, regard smb, smth as, accuse smb of,
invite smb to, explain smb to, prefer smth,smb to,
divide/cut/split smth into, translate smth from…into,
remind smb of, remind smb about (=tell smb not to forget),
throw smth at (in order to hit), throw smth to (for smb to catch)

Task 6. Complete these sentences with the correct prepositions.

1. Do you *prefer* your present job …… the one you had before?
2. They wore warm clothes to *protect* themselves …….... the cold.
3. Do you *spend* much money ……..……....clothes?
4. *Remind* me ……..…..the meeting tomorrow night. I'm sure to forget otherwise.
5. Do you see that girl over there? Does she *remind* you……..anyone you know?
6. When I saw Tom, I *congratulated* him ……passing his driving test.
7. I've been *invited* ……the wedding but unfortunately I can't go.
8. It's a very large house. It's *divided* ……four flats.

Task 7. Study the two photographs and be ready to compare and contrast them. Describe them (action, location), say what they have in common, in what way they are different, which kind of achievement you'd prefer and explain why.

A	B
	

Task 8. Check the definitions of the following words in the dictionary and complete the table.

Words	Definitions
1. Application (n)	a. A way in which something can be used for a particular purpose.
2. Award (v)	b. ……
3. Discover (v)	c. ……
4. Invention (n)	d. ……
5. Achievement (n)	e. ……
6. Research (n)	f. ……..

❖ PROJECT TIME

Find out important information about different discoveries, inventions achievements or explorations on the internet.

❖ NOW I CAN…

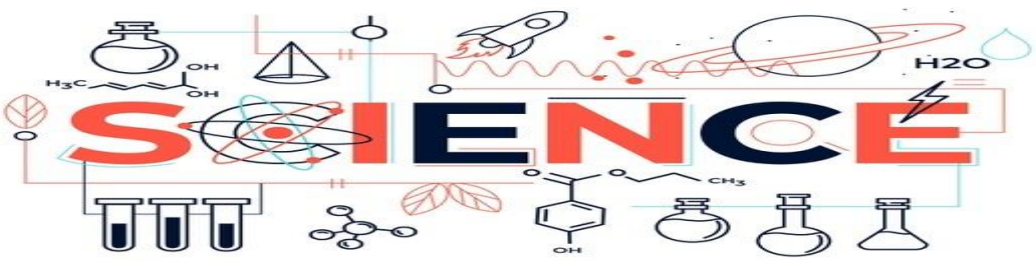
- ✓ *name the scientists, achievements;*
- ✓ *talk about the scientists, their contribution to science;*
- ✓ *use verbs and object with prepositions;*
- ✓ *give short answers to disjunctive questions.*

UNIT 12
SAFETY, LABORATORY, EXPERIMENTS

In this unit you will…

- learn, read, talk about
  - ✓ safety rules in science laboratories
  - ✓ the steps of the scientific method
  - ✓ vocabulary related to safety rules, experiments
  - ✓ verbs and object/no object with prepositions+Ving

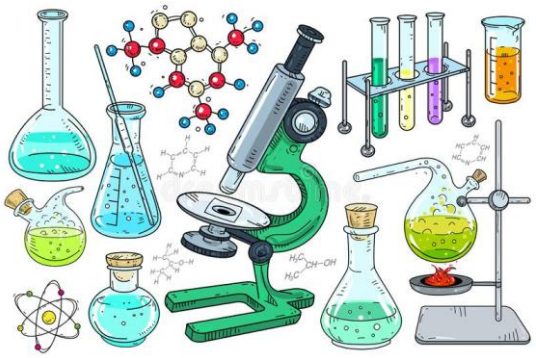
- practise
  - ✓ talking about safety, laboratories, experiments
  - ✓ talking about the scientific method
  - ✓ using verbs and object/no object with prepositions+ Ving
  - ✓ indirect questions



Unit 12

❖ **Discuss these questions.**

- Why should we follow safety rules?
- What easy experiments can you do at home?



❖ **Pronunciation guide.**

safety accident harm
equipment experiment
emergency experience
permission instruction conclusion
follow cause prepare damage

Task 1. Read the text and say why safety rules are important.

THE MOST IMPORTANT LAB SAFETY RULES

Lab safety rules are guidelines designed to help keep you safe while you are experimenting. Some equipment and chemicals in a laboratory can cause serious harm. It is always wise to follow all lab safety rules. Don't forget, the most helpful safety rule is to use plain old common sense.

Before you enter any lab, you should be prepared for and knowledgeable about any lab exercises that are to be performed. That means you should read your lab manual to know exactly what you will be doing. Review your notes and relevant sections in your textbook before your lab begins. Make sure you understand all procedures and purposes, as this will help you understand the lab activities you will perform. It will also help you get your thoughts organized for when you have to write your lab report.

Accidents do happen in a lab. Some chemicals have the potential to damage clothing. For any science lab, wear covered shoes, long pants, and keep your hair up so it can't fall into your experiment or a flame. Make sure you wear protective gear, as needed. Basics include a lab coat and safety goggles. You may also need gloves, hearing protection, and other items, depending on the nature of the experiment.

The best way to remain safe when dealing with chemicals is to assume that any chemical you handle is dangerous. Be sure you understand what type of chemicals you are using and how they should be properly handled. If any chemical comes in contact with your skin, wash immediately with water and inform your lab instructor. Wear protective eyewear when handling chemicals, which brings us to the next rule.

Be sure you know where to find all safety equipment in the lab. This includes such items as the fire extinguisher, first aid kit, broken glass receptacles, and chemical waste containers. Also be sure you know where all the emergency exits are located and which exit route to take in case of an emergency.

There are several things in a lab that you must always avoid–here are a few major laboratory don'ts. Don't eat or drink in the science laboratory. Don't taste any chemicals or substances you are working with. Don't handle broken glass with bare hands. Don't operate lab equipment without permission. Don't leave any heated materials unattended. Don't place flammable substances near heat. Don't perform your own experiments unless given permission. Don't experiment on yourself. Science means using the scientific method. You need data on multiple subjects to draw conclusions, but using yourself as a subject and self-experimenting is dangerous. In order to have a good lab experience, make sure that you follow these lab safety rules and any instructions given to you by your lab instructor. (*URL: https://www.thoughtco.com/biology-lab-safety-rules-373321)*

Task 2. **Complete the table according to the information of the text.**

Laboratory Do’s	Laboratory Don'ts

Task 3. **Read the text and answer the question below.**

IS IT EASY TO MAKE AN EDIBLE WATER BOTTLE?

In a small bowl, add 1 gram of sodium alginate to 1 cup of water.

Use the hand mixer to make sure the sodium alginate is combined with the water. Let the mixture sit for about 15 minutes to remove any air bubbles. The mixture will turn from a white liquid to a clear mixture.

In a large bowl, stir 5 grams of calcium lactate into 4 cups of water. Mix well to dissolve the calcium lactate.

Use your rounded spoon to scoop up the sodium alginate solution.

Gently drop the sodium alginate solution into the bowl containing the calcium lactate solution. It will immediately form a ball of water in the bowl. You can drop more spoonfuls of sodium alginate solution into the calcium lactate bath, just be careful the water balls don't touch each other because they would stick together. Let the water balls sit in the calcium lactate solution for 3 minutes. You can gently stir around the calcium lactate solution if you like. (Note: the time determines the thickness of the polymer coating. Use less time for a thinner coating and more time for a thicker coating.)

Use a slotted spoon to gently remove each water ball. Place each ball in a bowl of water to stop any further reaction. Now you can remove the edible water bottles and drink them. The inside of each ball is water. The bottle is edible too–it's an algae-based polymer.

As you might imagine, it's possible to color and flavor both the edible coating and the liquid inside the "bottle". It's okay to add food coloring to the liquid. You can use flavored beverages rather than water, but it's best to avoid acidic drinks because they affect the polymerization reaction.

Task 4. Ask indirect questions to the sentences of the text "IS IT EASY TO MAKE AN EDIBLE WATER BOTTLE?"

EXAMPLE: **Do you know how much sodium alginate you should add?**
I 'd like to know if you should add sodium alginate.

1. Do you know …… ?
2. Do you know …… ?
3. Do you know …… ?
4. Do you know …… ?
5. I 'd like to know …… .
6. I 'd like to know …… .
7. I 'd like to know …… .
8. I 'd like to know …… .

Task 5. Match the steps of scientific method (1–6) with the information related to them (a–f).

1. *Data/Analysis*

__a__ Formal observations are a type of brainstorming that can help you find an idea and form a hypothesis. Observe your subject and record everything about it.

2. *Conclusion*

__b__ Write down your sources so you can cite your references. In the modern era, a lot of your research may be conducted online. Scroll to the bottom of articles to check the references. Interview experts on a topic. The more you know about a subject, the easier it will be to conduct your investigation.

3. *Purpose/Question*

__c__ Propose a hypothesis. This is a sort of educated guess about what you expect. It is a statement used to predict the outcome of an experiment. Usually, it is written in terms of cause and effect. Alternatively, it may describe the relationship between two phenomena.

4. *Research*

__d__ Design and perform an experiment to test your hypothesis. It 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 for an experiment rather than try to combine the effects of variables in an experiment.

5. *Hypothesis*

__e__ Record observations and analyze the meaning of the data. Often, you'll prepare a table or graph of the data. Don't throw out data points you think are bad or that don't support your predictions. Once you have the data, you may need to perform a mathematical analysis to support or refute your hypothesis.

6. *Experiment*	__f__ Conclude whether to accept or reject your hypothesis. There is no right or wrong outcome to an experiment, so either result is fine. Accepting a hypothesis does not necessarily mean it's correct! Sometimes repeating an experiment may give a different result. In other cases, a hypothesis may predict an outcome, yet you might draw an incorrect conclusion. Communicate your results. The results may be compiled into a lab report or formally submitted as a paper. Whether you accept or reject the hypothesis, you likely learned something about the subject and may wish to revise the original hypothesis or form a new one for a future experiment.

GRAMMAR TIPS **VERBS + OBJECT/ NO OBJECT + PREPOSITION + Ving**

Remember this list of verbs + preposition +Ving

succeed in doing smth, feel like doing smth
think about/of doing smth, dream of doing smth
(dis)approve of doing smth, look forward to doing smth
insist on doing smth, decide against doing smth
apologise for doing smth

Remember this list of verbs + object + preposition +Ving

accuse smb of doing smth, suspect smb of doing smth
congratulate smb on doing smth, prevent smb from doing smth
stop smb from doing smth, thank smb for doing smth
forgive smb for doing smth, warn smb against doing smth

Task 6. Write the correct prepositions and put the verbs into the correct form. Use the verbs in brackets at the end of each sentence.

1. I've been *thinking* ……for a new job. (look)
2. *Forgive* me ……..you but I must ask you a question. (interrupt)
3. I'm getting hungry. I'm *looking forward* …….dinner. (have)
4. We have *decided* ……a new car. (buy)
5. I don't *feel* ……today. (study)
6. She *apologized* ……...so rude to me. (be)
7. I've always *dreamed* ……..on a small island. (live)
8. I *thanked* her ……..so helpful. (be)

Task 7. Study the two photographs and be ready to compare and contrast them. Describe them (action, location), say what they have in common, in what way they are different, which kind of studies you'd prefer and explain why.

A

B

Task 8. Use the dictionary to complete the table with the definitions.

Words	Definitions
1. Safety (n)	a. A state in which or a place where you are safe and not in danger or at risk.
2. Prepare (v)	b. ……
3. Follow (v)	c. ……
4. Experiment (n)	d. ……
5. Laboratory (n)	e. ……
6. Method (n)	f. ……

❖ PROJECT TIME

Find out useful information about easy experiments at home on the internet.

❖ NOW I CAN…

- ✓ *name safety rules, the steps of the scientific method;*
- ✓ *talk about safety, laboratories, experiments;*
- ✓ *verbs and object/no object with prepositions + Ving;*
- ✓ *ask indirect questions.*

REVIEW ●●● UNITS 1–4

1. She studied _____ and physics at college.
   a) chemistry b) property c) process

2. He is an _____ at a large electronics company.
   a) chemist b) engineer c) veterinarian

3. A force that exists only between charged _____ (ions) or surfaces.
   a) electrons b) neutrons c) molecules

4. The laboratory was honored in 2012 by having the synthetic chemical _____ livermorium.
   a) symbol b) law c) element

5. How many English _____ verbs do you know? (regular)
   a) un - b) ir- c) im-

6. All the rubbish must be _____(cycle).
   a) re- b) over- c) under-

7. She has been suffering from _____ (depress).
   a) –tion b) –ion c) –ment

8. We don't know if these chemicals are _____ to people (danger).
   a) –ful b) –ous c) –al

9. _____the study of matter and energy?
   a) Is chemistry b) Chemistry is c) Do chemistry

10. Where_____?
    a) chemists can work b) can chemists work c) can chemists works

11. Why _____we simply stick with units like grams?
    a) do b) don't c) doesn't

12. Who _____118 elements?
    a) recognize b) recognizing c) recognizes

REVIEW ●●● UNITS 5–8

1. It’s useful to check the weather _____before you have a picnic.
   a) forecast b) pressure c) advice

2. The office is air-_____ so it’s always fresh and cool there.
   a) condition b) conditioned c) unconditioned

3. The reason _____ the disaster was engine failure.
   a) of b) for c) from

4. I've paid this bill twice _____ mistake.
   a) by b) at c) on

5. Tap water is never chemically _____.
   a) toxic b) pure c) flammable

6. Various studies _____ that some forms of alternative medicine are extremely effective.
   a) change b) alter c) indicate

7. Oxygen, hydrogen, and nitrogen are all_____.
   a) liquids b) gases c) substances

8. Vinegar is_____.
   a) a mixture b) a solution c) an acid

9. Is it important to know _____ to study the chemical properties?
   a) or b) if c) of

10. Physical changes are usually reversible, _____?
    a) they aren’t b) are they c) aren’t they

11. Let’s study matter and energy, ……..…?
    a) shall we b) will we c) won't you

12. Could you tell me, _____ a homogeneous mixture?
    a) solution is a b) a solution is c) is a solution

REVIEW ●●● UNITS 9–12

1. He's rude _____ everyone.
   a) to b) for c) of

2. The later chapters discuss _____ the effects on the environment.
   a) about b) c) on

3. It's important to protect your skin _____ the harmful effects of the sun.
   a) from b) for c) of

4. I feel like _____to get ice cream.
   a) go b) going c) to go

5. Oranges are full of _____ C.
   a) vitamin b) fat c) protein

6. The _____ takes approximately 3651/4 days to go round the sun.
   a) atmosphere b) sphere c) earth

7. Scientists have_____ how to predict an earthquake.
   a) invented b) discovered c) uncovered

8. We have very high _____ standards in this laboratory.
   a) method b) safety c) comfort

9. Do foods contain sugar?
   a) Yes, they contain b) Yes, they do c) Yes, they

10. _____are they called “Jovians”?
    a) Who b) Why c) How far

11. Your friend doesn't read a lot, does he?
    a) Yes, he does b) No, he does c) Yes, he do

12. I wonder _____you saw her notebook.
    a) if b) or c) of

СЛОВАРЬ ГРАММАТИЧЕСКИХ ТЕРМИНОВ

Noun	Существительное	A word that refers to a person, place, thing, event, substance or quality
Adjective	Прилагательное	A word or phrase that describes An action, condition or experience
Verb	Глагол	A word or phrase that describes An action, condition or experience
Attributive	Определение	Of an adjective, noun, pronoun or phrase placed before the noun it describes
Object	Дополнение	A noun or noun phrase that is affected by the action of a verb or that follows A preposition
Subject	Подлежащее	The person or thing that performs the action Of a verb or is joined to a description by a verb
Participle	Причастие	A form of a verb, often ending in "-ed" or "-ing" and used with auxiliary verbs to make verb tenses, or to form adjectives
Infinitive	Инфинитив, неопределённая форма глагола	The basic form of a verb that usually follows "to"
General question	Общий вопрос	**Do** you read books*?*
Special question	Специальный вопрос	**When** do you usually read books*?*
Negative question	Отрицательный вопрос	Why **don't** you come with us?
Subject question	Вопрос к подлежащему	**Who** reads books*?*
Alternative question	Альтернативный вопрос	**Do** you read books **or** magazines*?*
Disjunctive question	Разделительный вопрос	You don’t read books, **do you**?

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