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ENGLISH OF EARTH SCIENCE

PART 1

НАВЧАЛЬНИЙ ПОСІБНИК

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English of Earth Science. Part 1: Навч. посіб. для студентів 1 року навчання спеціальностей 103 *Науки про землю* і 193 *Геодезія і землеустрій*. Автори: К. Мегела, Т. Мірончук, Т. Пастушенко. Навчальне видання. Київ, 2023. 163 с.

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Навчальне видання English of Earth Science. Part 1: навчальний посібник з англійської мови за професійним спрямуванням для студентів 1 року навчання спеціальностей 103 *Науки про землю* та 193 *Геодезія і землеустрій*» авторів К. Мегела, Т. Пастушенко, Т. Мірончук. Посібник містить комплексну розробку лексичних тем програмного матеріалу для викладання нормативної дисципліни *«Англійська мова за професійним спрямуванням».* Посібник призначається студентам 1 року навчання геологічних спеціальностей, які володіють іноземною мовою на рівні $A2^+$ згідно з міжнародною шкалою *CEFR*. Змістове наповнення та комплекс методичних вправ сприяють формуванню та подальшому розвитку фонетичних, лексичних і граматичних навичок, а також комунікативних компетентностей майбутніх *геологів та геодезистів*. Матеріал посібника може також стати у нагоді широкому колу спеціалістів у галузі *природничі науки.*

ПЕРЕДМОВА

Сучасні євроінтеграційні процеси в українській освіті очікують від випускника ЗВО не лише фундаментальних теоретичних та академічних знань зі спеціальності, а й високого рівня володіння іноземною мовою з фаху.

Формування комунікативних компетентностей та умінь спілкуватись іноземною мовою на виробничі теми у мультикультурному чи міжнародному середовищі є пріоритетним аспектом вивчення професійної іноземної мови майбутнім спеціалістом. Належний рівень іншомовних комунікативних вмінь необхідний не лише для успішного спілкування на професійні теми чи ефективного вирішення завдань виробничого характеру, а й для міжособистісної, соціальної та професійної самореалізації фахівця.

Навчальний посібник "English of Earth Science" розрахований на вивчення професійної англійської мови студентами природничих спеціальностей у закладах вищої освіти і, зокрема, призначений для студентів 1 року навчання ННІ «Інститут геології» КНУ імені Тараса Шевченка рівня А2-В1 напрямів *103-науки про землю* та *193-архітектура і будівництво*, а також для всіх, хто працює над вдосконаленням рівня володіння англійською мовою професійного спрямування у сфері геології.

Метою посібника є ознайомлення студентів з базовими поняттями та термінами наук про Землю, забезпечення розуміння професійно-орієнтованих текстів, аудіо- та відеоматеріалів, розвиток вмінь усного та писемного мовлення на основі тем природничого циклу, а також розширення фахової компетентності майбутнього бакалавра.

Навчальний посібник розроблений на основі сучасних принципів викладання професійно орієнтованої мови з акцентом на забезпечення комунікативних потреб майбутніх фахівців, а також відповідно до рекомендацій Ради Європи щодо вивчення й викладання іноземних мов, а також оцінювання рівня володіння ними. Комунікативно-орієнтований та професійно-орієнтований підходи до вивчення іноземної мови стали основоположними при розробці вправ і завдань у посібнику.

Посібник "English of Earth Science" є спробою пошуку шляхів оптимізації навчання професійно-орієнтованій лексиці природничої галузі, розробки інтегрованого підходу у викладанні іноземної мови із залученням чотирьох видів мовленнєвої діяльності, що враховує нові тенденції у розвитку суспільства, міжнародного співробітництва у сфері науки та освіти, а також програми модернізації вітчизняної освіти.

Умовою ефективного навчання іноземній мові професійного спілкування є, на наш погляд, поєднання традиційних інтенсивних методик навчання з розробкою та використанням низки сучасних інтерактивних методів, що орієнтовані на особистість студента, більш широку взаємодію студентів не лише з викладачем, але й один з одним, а також підвищення їхньої активності у процесі навчання. Навчально-методичні матеріали посібника дозволяють гнучко застосовувати у процесі навчання англійській мові за геологічним спрямуванням широкого спектру форм роботи: виконання завдань у парах і малих групах, обговорення дискусійних

питань та проблем, навчальні ігри, творчі завдання, проєктно-презентаційна робота, використання академічних способів обробки та подачі інформації, залучення аудіовізуальних технологій, навчально-професійних онлайн платформ та інтерактивних онлайн завдань для оцінювання знань та / чи професійного самовдосконалення.

Посібник складається з 7 розділів, що охоплюють такі теми: «Планета Земля», «Сонячна система», «Речовина», «Науки про Землю», «Сфери Землі», «Атмосфера Землі», «Погода та клімат».

Усі розділи посібника складаються із двох блоків і мають однорідну структуру:

1. Завдання для мовленнєвої розминки (наприклад, складання лексико-семантичного поля поняття (“мозкова атака”).
2. Перелік загально-наукових, термінологічних, вузькоспеціалізованих слів та виразів для активного засвоєння з теми.
3. Фахові тексти, дібрані тематично з авторитетних навчальних видань, зокрема серій Encyclopedia Britannica.
4. Система вправ для перевірки розуміння й осмислення текстуальної інформації з фаху (відповіді на запитання, тести з множинним вибором, заповнення таблиць, схем).
5. Система вправ для засвоєння вокабуляру уроку (співвіднесення термінів з їхніми визначеннями, словотворення, пошук синонімів, переклад слів та словосполучень).
6. Завдання для розвитку умінь аудіювання (відповіді на запитання, виконання тестів з множинним вибором, заповнення пропусків, інтерпретація текстової інформації в графічну: складання таблиць, схем).
7. Завдання для розвитку умінь говоріння (виконання рольових завдань, проведення фахових ігор та дискусій, підготовка доповідей, проєктів та презентацій на професійні теми).
8. Завдання з розвитку вмінь письма (написання розгорнутої відповіді на запитання, абзацу, оповіді, есе, тексту доповіді тощо) у межах ключових академічних жанрів.

Посібник побудований у такий спосіб, що забезпечує формування у студентів об’ємного тематичного словника, активне засвоєння професійної та академічної лексики, а також удосконалення продуктивних вмінь усного та писемного мовлення з фаху, що у підсумку уможливлює подальше використання сформованих компетентностей як на заняттях з іноземної мови, так і у професійно-зумовлених ситуаціях – міжнародних конференціях, симпозіумах, семінарах, діловому листуванні тощо.

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UNIT 1



L E A D – I N

Task 1. Discuss the following questions with a partner or in a small group.

- *What images come to mind when you hear the word "Earth"?*
- *Do you know any interesting facts about our planet?*
- *How many planets are there between us and the Sun? Can you name them?*
- *What makes Earth different from all the other planets?*
- *What three things make it possible for us to live on Earth?*

Task 2 A. Complete the sentences below and list what you already know about planet Earth.

Example: ***It is common knowledge that Earth is the only planet known to have life.***

1. I've heard that……
2. If I'm not mistaken……
3. As far as I know……
4. Scientists say……
5. It is a well-known fact that……
6. It is common knowledge that……
7. According to some research……

Task 2 B. What do these numbers stand for? Use the numbers to write sentences about Earth.

Example: 3 ***Earth is the third planet from the Sun.***

3 71 7 2 365

1 21 4 24 5

78 97

Task 2 C. Work with a partner to complete the sentences.

1. The largest continent is …….. and the smallest continent is ……
2. The highest mountain on Earth is ……
3. The deepest point on Earth is ……

4. ……is the saltiest ocean in the world.
5. The longest river is ……
6. The largest desert is ……
7. The largest animal in the world is……
8. …… is the world's fastest land animal.

VOCABULARY



Task 3 A. Match the words to the definitions below. Explain what these words have in common and what makes them different.

earth	*land*	*ground*	*soil*	*world*	*globe*

a) the material in which plants grow _____
b) the third planet from the Sun; the planet we live on _____
c) all the people, cities, and countries on our planet _____
d) the part of the earth's surface that is not covered by water _____
e) a spherical representation of the earth _____
f) the solid surface of the earth; firm or dry land _____

Task 3 B. Use the words from the box in 3 A to complete the sentences.

(1) The leaves were slowly fluttering to the ……
(2) The bush grows well in a sandy ……
(3) She has traveled all over the ……..
(4) The space shuttle is returning to ……
(5) At that time China was the most powerful country in the ……..
(6) We use a …….. in our geography class.
(7) The reptiles lay their eggs on ……..
(8) The thin…… is easily washed away.
(9) The network is accessible from any point on the ……
(10) After weeks at sea, the sailors saw ……



Task 4 A. Look at the words in the box. Which of them can you pronounce correctly?

Specialized & General Academic Vocabulary	*appear axis beyond cause complete core cover creature degree dinosaur edge entire evidence exist exploration extend extinct field flat fossil gravity harmful hemisphere horizon human being molten moon movement outer pole prove pull revolution revolve rotate rotation sailor satellite scientist shield*

	solar system space spin straight support surface survive tilted toward unique universe

Task 4 B. Practise reading the transcribed words below. Then, identify them in the box in Task 4 A.

/ˈdaɪnəsɔː/; /ˈkriːtʃə/; /ˈæksɪs/; /ʃiːld/; /səˈvaɪv/; /juːˈniːk/; /dɪˈgriː/; /ɪnˈtaɪə/; /streɪt/; /ˈhemɪsfɪə/; /ˈseɪlə/; /kɔːz/; /ˈsaɪəntɪst/; /əˈpɪə/; /ɪgˈzɪst/; /ˈsɜːfɪs/; /kəmˈpliːt/; /ˈsætəlaɪt/; /həˈraɪzn/.

Task 4 C. Write each word in the column that best describes what you know about it. Share your ideas with your partner. Then, consult a dictionary to check the meanings of the new words.

I don't know it at all	I think I know the meaning	I know the meaning
*I have no idea what the word **"revolve"** means*	***"edge"** is like an outside limit of an object, area, or surface*	***"exploration"** is the act of searching for the purpose of discovery of information or resources*

CORE BLOCK

READING & SPEAKING

BEFORE YOU READ, DISCUSS IN PAIRS TO CHECK IF YOU KNOW

- how people viewed Earth in early times
- the age of planet Earth
- how important gravity and the magnetic field are for Earth
- why Earth gets a change of seasons

Task 5. The following text will introduce you to the topic of Earth. Read the text and translate the phrases with the words in bold into Ukrainian.

PLANET EARTH

There was a time before global **exploration** by sea when people believed that the Earth was **flat**. **Sailors**, kings and queens thought that if someone sailed **beyond** the horizon, they would simply fall off the **edge** of the world. Early **scientists proved** that the Earth was round and that it was not the center of the **universe** but **revolved** around the Sun.

Earth is the third planet in our **solar system** in distance from the Sun, about 93 million miles away. Planet Earth is "just right" for life. It is not too close to the Sun and it is

not too far away. That means Earth does not get too hot or too cold, unlike all the other planets. Because of its comfortable temperatures, Earth is the only place in the **entire** universe where we know that life **exists**. That makes Earth very special.

Earth is **unique** in another way too. Living **creatures** must have water to **survive**. Since water **covers** about seventy percent of Earth's **surface**, our planet is an ideal place to **support** life in many different forms. The rest of Earth's surface is made up of seven land masses called continents.

Scientists say Earth is about four-and-a-half billion years old. **Fossils** show microscopic life first **appeared** about a billion years later. **Evidence** of the first **human beings** came much later – only about 200,000 years ago. That is many millions of years after the **dinosaurs** became **extinct**.

Earth revolves around the Sun in an elliptical orbit and it takes Earth 365 days to **complete** one **revolution** around the Sun. Earth is the closest planet to the Sun to have a **moon** (natural **satellite**). Just like the Earth revolves around the Sun, the Moon revolves around the Earth. **Gravity** keeps the Earth and Moon in their orbits. Earth's gravity **pulls** the Moon **toward** Earth's center. Without gravity, the Moon would continue moving in a **straight** line off into **space**.

Like other planets, the Earth **spins** on its **axis**, making one **rotation** every day. Earth's axis is an imaginary line passing through the North and South **Poles**. Earth's rotation is 24 hours. The rotation is what **causes** day and night. The Earth is **tilted** 23 **degrees** on its axis. This means that as the Earth **rotates**, one **hemisphere** has longer days with shorter nights. At the same time, the other hemisphere has shorter days and longer nights. Because the Earth's axis is tilted a little bit, we also get a change of seasons. If the axis of the Earth were straight up and down, the temperature where you live would stay almost the same all year round.

Earth has a magnetic **field,** which **extends** several thousand kilometres into space. Earth's magnetic field is created by the **movements** of **molten** metal in the **outer core**. The magnetic field **shields** us from **harmful** radiation from the Sun.

Task 6. Write down the question for each answer below.

Example: ***How does Earth revolve around the Sun? – In an elliptical orbit.***

1. …… – *Yes, it is.*
2. …… – *Because the Earth's axis is tilted a little bit.*
3. …… – *Early scientists.*
4. …… – *Movements of molten metal in the outer core.*
5. …… – *365 days.*
6. …… – *Gravity.*
7. …… – *Harmful radiation from the Sun.*
8. …… – *93 million miles away.*
9. …… – *4.5 billion years ago.*
10. …….. – *About seventy percent.*

Task 7. Match the words on the left with their Ukrainian equivalents on the right.

1.	appear *v.*	**a.**	підтримувати
2.	axis *n.*	**b.**	розплавлений
3.	beyond *prep.*	**c.**	істота
4.	cause *v.*	**d.**	обертатись (навколо Сонця)
5.	complete *v.*	**e.**	простягатися
6.	core *n.*	**f.**	вчений, науковець
7.	cover *v.*	**g.**	край
8.	creature *n.*	**h.**	полюс
9.	degree *n.*	**i.**	плоский
10.	dinosaur *n.*	**j.**	рух
11.	edge *n.*	**k.**	спричиняти, викликати
12.	entire *adj.*	**l.**	оберт
13.	evidence *n.*	**m.**	вимерлий
14.	exist *v.*	**n.**	доводити
15.	exploration *n.*	**o.**	півкуля
16.	extend *v.*	**p.**	з'являтися, виникати
17.	extinct *adj.*	**q.**	сила тяжіння
18.	field *n.*	**r.**	космос
19.	flat *adj.*	**s.**	покривати
20.	fossil *n.*	**t.**	захищати
21.	gravity *n.*	**u.**	здійснювати, завершувати
22.	harmful *adj.*	**v.**	зовнішній
23.	hemisphere *n.*	**w.**	існувати
24.	human being *phr.*	**x.**	повний оберт
25.	molten *adj.*	**y.**	вісь
26.	moon *n.*	**z.**	крутитись, обертатись
27.	movement *n.*	**aa.**	обертатись (навколо осі)
28.	outer *adj.*	**bb.**	нахилений
29.	pole *n.*	**cc.**	ядро
30.	prove *v.*	**dd.**	поверхня
31.	pull *v.*	**ee.**	шкідливий
32.	revolution *n.*	**ff.**	дослідження
33.	revolve *v.*	**gg.**	у напрямку, до
34.	rotate *v.*	**hh.**	динозавр
35.	rotation *n.*	**ii.**	виживати
36.	sailor *n.*	**jj.**	тягнути
37.	scientist *n.*	**kk.**	за межами
38.	shield *v.*	**ll.**	особливий, унікальний
39.	solar system *phr.*	**mm.**	поле
40.	space *n.*	**nn.**	місяць, супутник

41.	spin *v.*	**oo.**	градус
42.	straight *adj.*	**pp.**	скам'янілість
43.	support *v.*	**qq.**	доказ, свідчення
44.	surface *n.*	**rr.**	всесвіт
45.	survive *v.*	**ss.**	людина
46.	tilted *adj.*	**tt.**	прямий
47.	toward *prep.*	**uu.**	моряк
48.	unique *adj.*	**vv.**	цілий, увесь
49.	universe *n.*	**ww.**	сонячна система



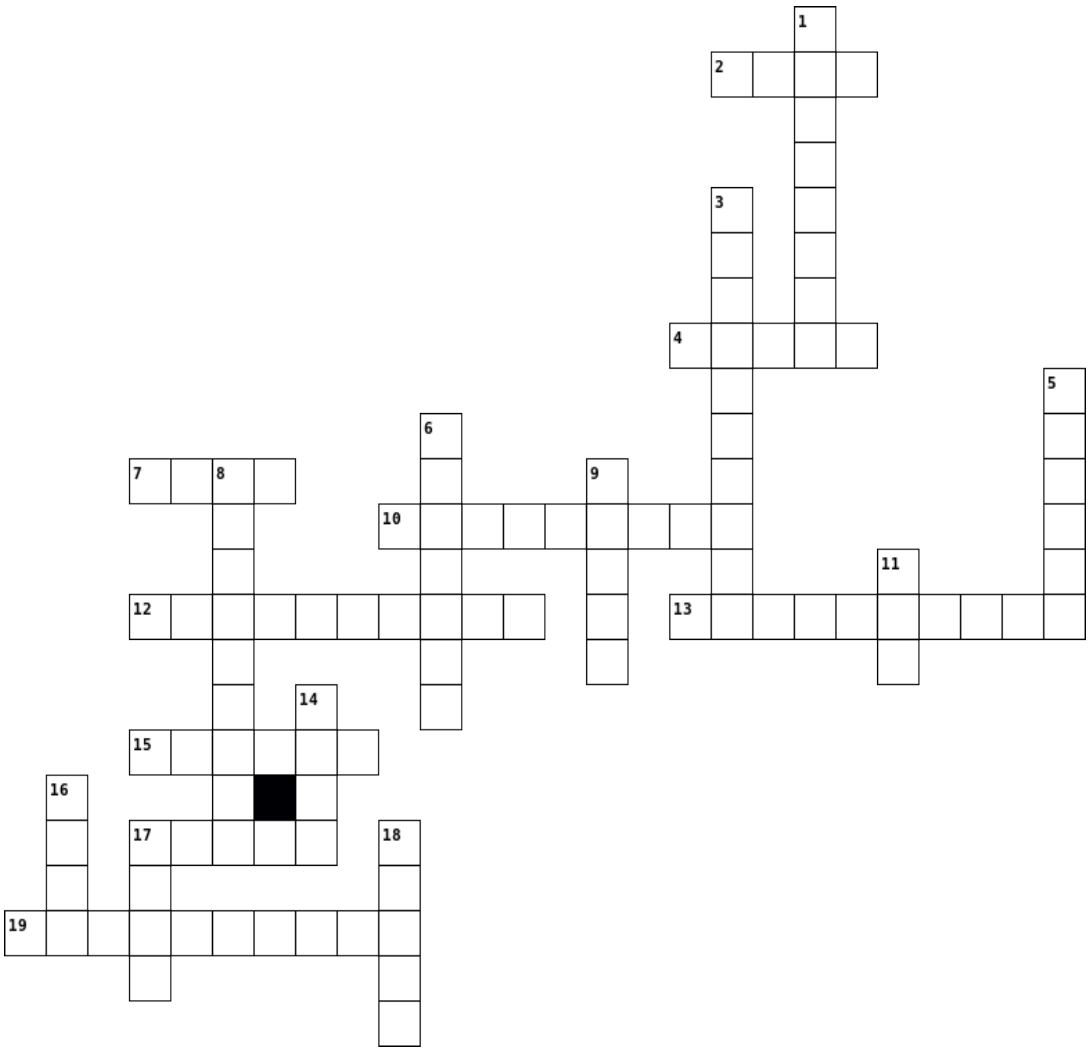
Task 8. Match the beginnings to the endings. Refer to the text "Planet Earth" to check the facts.

	A		**B**
1.	The Earth has a magnetic field which	**a.**	unlike all the other planets.
2.	The Earth is the only place in the entire universe	**b.**	making one rotation every day.
3.	Our planet is an ideal place	**c.**	to the Sun to have a moon.
4.	The Earth doesn't get too hot or too cold,	**d.**	just like the Earth revolves around the Sun.
5.	It takes the Earth 365 days	**e.**	where we know that life exists.
6.	The Earth is the closest planet	**f.**	moving in a straight line off into space.
7.	The Moon revolves around the Earth	**g.**	we get a change of seasons.
8.	Without gravity, the Moon would continue	**h.**	extends several thousand kilometers into space.
9.	The Earth spins on its axis	**i.**	to complete one revolution around the Sun.
10.	Because Earth's axis is tilted a little bit	**j.**	to support life in many different forms.



Task 9. Solve the crossword. Refer to the text "*Planet Earth*" and your essential vocabulary.

(Also available at: https://crosswordlabs.com/view/planet-earth-50)



Across

2. any part of the Earth's surface that is not covered with water *(n.)*
4. two points at the most northern and most southern ends of the Earth *(n.)*
7. People used to think that the Earth was this shape. *(adj.)*
10. a natural or artificial body that orbits a planet *(n.)*
12. It is the Earth's coldest continent *(n.)*
13. the Earth's orbital motion about the Sun, especially as distinguished from axial rotation *(n.)*
15. a large group of stars and planets held together by gravity *(n.)*
17. we can see millions of them using a telescope *(n.)*
19. one half of the Earth *(n.)*

Down

1. all existing matter and space considered as a whole *(n.)*
3. the mixture of gases surrounding the Earth *(n.)*
5. It makes up 21% of air *(n.)*
6. the force that attracts a body towards the centre of the earth *(n.)*
8. It is an island, country and continent *(n.)*
9. a sphere on which a map of the Earth is depicted *(n.)*
11. the closest star to the Earth *(n.)*
14. the imaginary line around which the Earth rotates *(n.)*
16. The Earth is called so because of its water *(n.)*
17. the surface layer of earth, supporting plant life *(n.)*

18. a huge body of salty water *(n.)*



Task 10. In the text "Planet Earth", find synonyms for the following:

1. very small, little ……..
2. dangerous, damaging ……..
3. total, full ……..
4. to protect, to save ……..
5. special, extraordinary ……..
6. lost, dead ……..
7. to think, to imagine ……..
8. outside, exterior ……..
9. study, research ……..
10. direct ……..
11. to turn round, to go round ……..
12. a sign, indication ……..
13. to stretch out ……..
14. a living thing ……



Task 11. Do a multiple-choice quiz. Choose the correct option.

1. Which is NOT a synonym for *"sailor"*?
a) swimmer
b) navigator
c) shipman
d) seaman

2. Which word is similar in meaning to *"appear"*?
a) happen
b) become
c) emerge
d) result

3. Which word is the opposite of *"shield"*?
a) protect
b) support
c) harm
d) cover

4. The word *"exist"* means
a) disappear or die
b) cause something to happen
c) create
d) live or be real

5. Which is a synonym for *"survive"*?

a) discover
b) stay
c) live on
d) remain

6. […] they would simply fall off the *edge* of the world.
a) sky
b) point
c) border
d) land

7. It takes Earth 365 days to *complete* one revolution around the Sun.
a) stop
b) carry out
c) close
d) form

8. Earth's gravity *pulls* the Moon *toward* Earth's center.
a) attracts
b) pushes off
c) moves away
d) keeps

 **Task 12. Use the words** *in italics* **to complete the sentences. You will not need two words.**

support cover fossils creature degrees survive entire hemisphere evidence gravity movements exploration extinct prove flat sailors moons harmful poles molten straight cause

1. Dinosaurs have been ……for millions of years.
2. Jupiter has 16 ……...
3. North and South America are in the Western …….
4. You cannot play the game with missing pieces. You need the …… set.
5. …….....of fish in the rock showed that the area had once been under water.
6. Scientists have not yet found ……of life on Mars.
7. Magma is ……rock.
8. Their ……of Antarctica was filled with danger.
9. Fish cannot …….. out of water.
10. The evidence failed to ……. the guilt of the prisoner.
11. The temperature today is 32 ……Fahrenheit.
12. It is important that a football field be ……..
13. The ballet dancers performed beautiful ……...
14. Parents ……..their families by working.
15. The earth is coldest at the north and south ……..

16. …….your bicycle, so it does not get rained on.
17. The ……were away at sea for a long time.
18. He drew a ……..line.
19. When I was young, I thought that there was a ……underneath my bed.
20. On Earth, objects fall to the ground because of …….

VIEWING & SPEAKING



Task 13. Watch a video about planet Earth's unique features, which make it a habitable place in the Solar system.

BEFORE YOU WATCH

- In pairs, list some facts you know about planet Earth and share them in class.
- Discuss in groups what you would like to tell an alien about life on planet Earth.

AFTER YOU WATCH

- Fill in the gaps (1-14) in the text with the words and expressions from the box below.
- Choose some facts about planet Earth you have learned to dwell on them in class.

exist	*orbit*	*gas giants*	*evaporate*	*liquid*	*freeze*	*covered*	*land*
rocky	*surface*	*Solar system*	*moon*	*inner planets*	*blue planet*		

The Earth is the third planet from the Sun. It is the largest of the **(1)** _____, or the four **(2)** _____ planets that **(3)** _____the Sun. The Earth is far smaller than the four **(4)** _____. The Earth is the first planet to travel around the Sun which has a **(5)** _____, and the only planet in the **(6)** _____ to have only one moon. The Earth is unique among the planets of the solar system, because Earth is the only planet to have **(7)** _____water on its **(8)** _____; other planets are either too hot, causing all their water to **(9)** _____ into gases, or too cold, causing any water to **(10)** _____ into ice. The Earth is about 150 million kilometers away from the Sun, which keeps it just at right temperatures to have liquid water. In addition, the Earth has a lot of water. More than 70 % of the Earth's surface is **(11)** _____by oceans. That means that the oceans are twice the size of all **(12)** _____ on Earth. Because the Earth has so much water on its surface, it is sometimes called the **(13)** _____. Liquid water is what allows life to **(14)** _____ on Earth. As far as we know, the Earth is the only place where life exists.

- Complete the second part of the text with the words and expressions from the box below.
- Take turns asking each other questions to check what you remember about planet Earth.

rotates oxygen meteors species blanket tilted space humans feature layer nitrogen heat harmful axis spins degrees

Millions of **(15)** _____ of plants and animals call the planet Earth home, including **(16)** _____. The Earth's atmosphere is another important **(17)** _____. The atmosphere is a thick **(18)** _____ of gases that covers the entire Earth. It is mostly made of **(19)** _____ and **(20)** _____. The atmosphere is what allows us to breathe. It also helps keep the Earth warm by acting like a **(21)** _____ to hold in the Sun's **(22)** _____. Another way the atmosphere helps us is by protecting the Earth from **(23)** _____ radiation from the Sun, and from **(24)** _____. Anything falling to the Earth from **(25)** _____ is grabbed into the Earth's atmosphere until it burns. Most things burn up completely before they reach the Sun. The Earth goes around the Sun. The time it takes to go around the Sun is called a year, it takes the Earth about 365 days to travel around the Sun once, that is why a year is usually 365 days. The Earth also **(26)** _____ or **(27)** _____; the time it takes the Earth to rotate once is called a day. The Earth rotates every 24 hours; that is why a day is 24 hours long. The Earth does not rotate straight up and down, it is **(28)** _____. There is an imaginary line through the Earth from the North Pole to the South Pole called the Earth's **(29)** _____. The axis is tilted at about 23 **(30)** _____. The tilt of the Earth's axis is what causes seasons. When a part of the Earth is tilted towards the Sun, it will be summer there. When it is tilted away from the Sun, it will be winter instead.

LEARN MORE!

Task 14. Match parts of the sentences in columns A and B to learn some more interesting facts about planet Earth.

1.	The Earth is the only planet	**a.**	1 million Earths could fit inside.
2.	The number of water molecules in ten drops of water	**b.**	a redwood tree in a California forest.
3.	Although the Sun is considered to be an average-sized star,	**c.**	to cover the entire surface of the Earth in 1.5 feet of the sparkling mineral.
4.	Because Antarctica has little vegetation and has a snowy landscape,	**d.**	about the same temperature as the Sun.
5.	There is enough gold in the Earth's core	**e.**	not named for a mythological god or goddess.
6.	The tallest known tree on Earth is	**f.**	home to one third of the planet's land species.
7.	The Earth's inner core is	**g.**	it is one of the best places to find meteorites.

8.	Earth's Amazon rainforest is	**h.**	is equal to all the stars in the known universe.



Task 15 A. Learn more facts about planet Earth. In pairs, work out WHAT numeric expressions and symbols in chart B stand for, then match figures in chart B to terms in chart A, and share your findings in class.

	A		B
1.	Earth's Orbit Distance -------	**a.**	------- 70.8% vs 29.2%
2.	Planet's Age -------	**b.**	------- 8′20″
3.	Water vs. Land -------	**c.**	------- 23.45°
4.	Nitrogen vs. Oxygen -------	**d.**	------- 149,597,890 km
5.	Span of Temperatures -------	**e.**	------- 42.72 km
6.	Axis Tilt -------	**f.**	------- 4.55 bln years
7.	Earth's Solar Day -------	**g.**	------- 2.8 g/cm3
8.	Earth's Orbit Speed -------	**h.**	------- 77% vs. 21%
9.	Earth's Orbit Period -------	**i.**	-------- 5.9736×10^{24} kg
10.	Speed of Light -------	**j.**	-------- from -88°C to +58°C
11.	Spheroid Bulge -------	**k.**	------- 40,075.16 km
12.	Earth's Circumference -------	**l.**	--------- 24 h
13.	Earth's Diameter -------	**m.**	--------- 29.8 km/s
14.	Earth's Mass -------	**n.**	-------- 365.2425 days
15.	Earth's Density-------	**o.**	-------- 12,756.1 km



Task 15 B. Work in groups of three. Use figures in Task 15 A to restore the missing information in the text bellow. Compare your ideas with those of the other teams.

PLANET EARTH BY FIGURES

Earth, with an average distance of **(1)** _____ km from the sun, is the third planet and one of the most unique planets in the solar system. It formed around **(2)** _____ bln years ago and is the only planet known to sustain life. This is because of the factors like its atmospheric composition and physical properties. The gas mixture we live in is **(3)** _____ % _____, _____% _____ with traces of argon and CO_2. The carbon dioxide levels are just right to keep hospitable temperatures on the Earth's surface ranging **(4)** _____°C. The presence of water, which covers over **(5)** _____% of the planet, allows life to thrive. The axis, the Earth rotates about, is tilted slightly – about **(6)** _____° – with respect to the plane in which the Earth orbits the Sun, which results in four seasons. In addition to the rotational speed of the Earth on its axis once each day **(7)** (_____h), the planet also revolves around the sun at **(8)** _____ km/s once every **(9)** _____ days. At this orbital distance it takes sunlight, on average, about **(10)** _____ to reach the Earth. Earth's circumference and diameter differ because Earth's shape is

an ellipsoid, rather than a true sphere. This means that the Earth is **(11)** ____ km swollen at the equator. In circumference, planet Earth is **(12)** _____ km, and the width from the Earth's western to the eastern side makes **(13)** _____ km on the equator. Planet Earth is estimated to weigh **(14)** _____ kg. In addition, because of the liquid outer core, it is the most dense **(15)** (_____ g/cm^3) of the terrestrial planets.

Task 16. Match parts of the questions in Columns A and B. There is an extra ending part in Column B you will not need. Can you answer the questions? Compare yours with your class-mates' answers.

A (Beginning)	*B (Ending)*
1. What is the leading explanation	**a)** to sustain life on the planet?
2. What is the length of time the Earth takes	**b)** on its orbit around the sun?
3. How fast does the Earth spin	**c)** different amount of light during a year?
4. If the Earth is round and spinning on its axis and around the sun,	**d)** for how Earth was formed?
5. What direction is	**e)** the North Pole tilted during the winter?
6. How have life forms changed	**f)** when comets and asteroids were flying around colliding with it?
7. Why do the Northern and Southern hemispheres receive	**g)** with traces of other minor gasses?
8. What conditions do you think were on early Earth,	**h)** why does the ground feel firm and solid under our feet?
9. Are Earth's temperatures on the surface and atmospheric composition just right	**i)** in Earth's evolution?
10. Why are gravity and magnetic field	**j)** to complete one full turn on its axis?
	k) of major importance for live Earth?

EXTENSION

VIEWING & SPEAKING

Task 17. The video you are going to watch discusses a theory of how planet Earth formed.

BEFORE YOU WATCH

- Work in pairs to check the meanings of the words below.

➢ Use the words from the box to guess what major events they might highlight in different stages of Earth's history.

molten coalesce bombardment contract violent spew out differentiate primitive helium hydrogen evolution condense glaciers valley sustaining abundance conducive

AFTER YOU WATCH

➢ Place the words and phrases below in a chronological chain.

planet planetesimal spinning disks of matter clumps, boulders, and balls of matter nebular cloud

➢ Arrange sentences from 1 to 11 to restore the order of Earth's evolution.

____ As early gasses interacted, helium and hydrogen released from the Earth's interior, and sunlight broke ammonia to emit nitrogen into the atmosphere.

____ Due to the start of plate tectonics, Earth's relief is being constantly reformed.

_____ Although first earth was covered by water, pressure and heat from underneath pushed solid portions to form land, which are known as plates.

_____ When toxic gasses started spewing out from Earth's inside, the primitive atmosphere formed.

_____ As the planet cooled, the elements differentiated to form the core, the mantle, and the crust, and to give rise to volcanic activity.

_____ The atmosphere obtained oxygen with the evolution of bacteria.

_____ In its early eons, planet Earth was bombarded by comets and meteorites which brought ice and more toxic gasses.

_____ By colliding matter, larger bodies (and the proto-earth) got gravity, collected more matter, and started orbiting the Sun.

_____ As the planet cooled more, water vapor condensed to form droplets and rain.

_____ The primitive Earth was extremely hot, much bigger than it is now, and contained solid and liquid rocks.

___**1**__Grains in the spinning disks of matter coalesced to form clumps, boulders and balls.



Task 18. Do the multiple-choice quiz below.

1. How did Earth probably form?

- a) it was originally part of another planet and it broke off to become its own planet
- c) from an interstellar cloud of dust and gas

- b) from nothing
- d) from a cloud of helium and hydrogen

2. What layers did Earth historically differentiate into?

- a) core, mantle, crust
- c) crust, molten, inner
- b) crust, lithosphere, mantle
- d) mantle, crust, core

3. How long ago did the Earth form?

- a) 3 million years ago
- c) 4.6 billion years ago
- b) 4.6 million years ago
- d) 1 billion years ago

4. Where in the Milky Way galaxy is our Solar system?

- a) in the center
- c) in one of the arms of the Milky Way
- b) on top
- d) at the bottom

5. In Earth's early history, what did comets bring to Earth?

- a) ice, methane, carbon dioxide, nitrogen and ammonia
- c) only nitrogen and ammonia
- b) only ice and carbon dioxide
- d) the comets added nothing to Earth

READING & SPEAKING

Task 19. Read a text about the past and predicted future of planet Earth.

BEFORE YOU READ

DISCUSS IN GROUPS AND SHARE IN CLASS

- any mythology connected with the origin of the Earth
- possible theories of the birth of planet Earth
- the hypotheses of the end of our planet
- the names of ancient and present-day planetary scientists

IN PAIRS, CHECK THE MEANINGS OF THE WORDS AND USE THEM IN APPROPRIATE CONTEXTS IN SENTENCES OF YOUR OWN

fertile interstellar molten crust planetesimal ride engulf single-celled species swell up temperate dwarf shrink

AFTER YOU READ

***MATCH HEADINGS** A-F **WITH PARAGRAPHS** 1-6*

A. *Humanity's View of the Earth*
B. *Earth's Origin*
C. *Earth's Future*
D. *Earth's Evolution*
E. *What is in the name?*
F. *From the microbe to man*

CHOOSE A HEADING FROM** A-F **TO CONVEY THE IDEA OF THE PARAGRAPH

OUR HOME PLANET

1. _____

The name of our planet comes from an Old English *"ertha"*, Anglo-Saxon *"erda"* and common Germanic term *eorðe,* which means ground or soil. The Earth is the only planet in the Solar system not called after a mythological being. However, in Roman mythology, the Earth goddess was Tellus, which means *the fertile soil*, while the Greek goddess was Gaia, *terra mater*, or Mother Earth. Today, we call it "Earth" and are working to study all its systems and features.

2. _____

Earth was born some 4.6 billion years ago as an interstellar cloud of gas and dust that came together to form the Sun and the rest of the solar system. The Sun formed at the center, and the planets appeared from the rest of the material. Over time, each planet migrated to its present position orbiting the Sun. The moons, rings, comets, and asteroids were also part of the solar system formation.

3. _____

Early Earth, like most of the other worlds, was a molten sphere at first. Over time, it cooled, its crust formed plates. Later its oceans formed from water contained in the planetesimals that made the early planet. It is also possible that comets played a role in supplying Earth with water. The continents and oceans started riding the plates, and the motion of the plates is what rearranges the larger surface features on the planet.

4. _____

The first life forms showed up more than 3.8 billion years ago. They were tiny single-celled organisms and microbial beings. Over time, they evolved to become more complex plants and animals. Today nearly 9 billion species of plants, animals, and insects are known to inhabit the planet. There are likely many more that have yet to be discovered and cataloged.

5. _____

Early philosophers once put Earth at the center of the universe. Aristarchus of Samos, 3rd century B.C., concluded that Earth orbited the Sun, an unpopular view until Polish astronomer Nicolaus Copernicus published his work called *On the Revolutions of the Celestial Spheres* in 1543. In the work he suggested a heliocentric theory that Earth was not the center of the Solar system but, instead, orbited the Sun. That scientific fact came to dominate astronomy and has since been proven by any number of missions to space.

6. _____

Our planet will not last forever. In about five to six billion years, the Sun will begin to swell up to become a red giant star. As its atmosphere expands, our aging star will engulf the inner planets. The outer planets may become more temperate, and some of their moons could spot liquid water on their surfaces, for a time. This is a popular thought in science fiction, giving rise to stories of how humans will finally migrate away from Earth, settling perhaps around Jupiter or even looking for new planetary homes in other star systems. No matter what humans do to survive, the Sun will become a white dwarf, slowly shrinking and cooling over 10-15 billion years. Earth will be long gone.

Task 20. Check your understanding of the text above by circling the letter of the best answer.

1. According to the text, which of the following is TRUE?

(A) The name "Earth" means *terra incognita*.
(B) The solar system bodies formed from the interstellar gas and dust.
(C) Ancient philosophers knew the Sun was in the centre of the solar system.
(D) Whatever the theories of the future of the Earth, it will survive.

2. According to the text, which is the MOST LIKELY future?

(A) Humanity will find water on other planets of the solar system.
(B) Humanity will colonize gas giants, like Saturn.
(C) The Earth will first become a red giant and then shrink to a white dwarf.
(D) Planet Earth will be absorbed by the Sun's expanding atmosphere.

3. Which line characterizes planet EARTH in the text?

(A) swell up, engulf, shrink
(B) migrate, settle, survive
(C) cool, ride, rearrange
(D) evolve, inhabit, catalogue

4. The word "planetesimal" means

(A) a frozen chunk of a comet
(B) a solid object in a protoplanetary disk
(C) Sun's atmosphere
(D) interstellar gas and dust

5. Both planetesimals and comets are likely

(A) to have been primary sources of water on the early Earth
(B) to have formed the crust and continents
(C) to cause Earth's plates to ride
(D) to make the Earth orbit the Sun

CONSOLIDATION

Task 21. Complete the text with suitable words. Some letters have been given for you.

The Earth is the third planet from the Sun. It is the fifth largest of the planets in the solar system, smaller than the four gas **(1) _ i_ _ _ s** – Jupiter, Saturn, Uranus and Neptune, but larger than the three other **(2) _ n _ e_** planets – Mercury, Mars and Venus. It takes the Earth 24 hours to complete a **(3) _ _t_ _i_ _** on its **(4) _ _i_**, and roughly 365 days to complete an **(5) _ r _ i_** around the Sun. The four seasons are the result of the Earth's axis of rotation being **(6) _ _ l _e_** more than 23 degrees. The Earth's orbit is not a perfect circle, but is rather an oval-shaped **(7) e_ _i_ _e**, like that of the orbits of all the other planets.

The Earth has one natural **(8) _ a _e _l _ _e** (the moon), while Mercury and Venus have none, and all the other planets in our solar system have two or more. The Earth's moon is 3,474 kilometers wide, about one-fourth of the Earth's diameter.

The Earth is a part of the Milky Way Galaxy and is thought to be some 15 to 20 billion light-years from the theoretical **(9) "_ d _e"** of the universe. The Earth and the other members of the solar system are orbiting the galaxy at about 225 kilometers per hour.

Scientists have been able to calculate the age of the Earth. They believe that the Sun and the planets **(10) _ _v_ _ _ i_ g** around it formed approximately 4.5 billion years ago.



Task 22. Complete the text about planet Earth with the most appropriate word from (A–N) for each gap. You will not need one word. The first one is done for you (0).

Our home planet Earth is the largest **(0)** ***terrestrial*** planet in the solar system. It has a rocky and active **(1)** …… with mountains, valleys, canyons, plains and so much more. Much of it is under water, but not all. Islands of rock **(2)**…… up out of the water. The biggest islands are called **(3)** ……, of which there are seven: North America, South America, Europe, Asia, Africa, Australia, and Antarctica. The biggest water forms oceans, of which there are four: Pacific, Atlantic, Indian, and Arctic. Some scientists classify the Southern as a fifth ocean. Earth is the only planet in the solar system with liquid water on its surface. It is also the only planet we know to have life on.

Earth's atmosphere is the right **(4)** …… to keep the planet warm, so living things like us can be here. It is mostly nitrogen and it has plenty of oxygen for us to **(5)** ……. The atmosphere also **(6)** …… us from incoming meteoroids, most of which **(7)** …… up in our atmosphere before they can strike the surface as meteorites. Earth has one moon we call the Moon. Sometimes it is called Luna so we do not get confused with other planets and their moons. The Moon has also been called Selene. There are many **(8)** …… orbiting Earth, which take **(9)** …… and measurements. This is how we can learn more about **(10)** ……, oceans, climate change, and many other important issues.

A year on Earth is 365.25 days long. That is how long it takes the Earth to orbit the Sun once. That 0.25 extra means every four years we need to add one day to our calendar. We call it a **(11)** …… year. A day on Earth is 24 hours long. That is daytime and nighttime. That is how long it takes the Earth to **(12)** …… around once.

A	Pictures	**B**	break	**C**	satellites
D	thickness	**E**	continents	**F**	surface
G	Weather	**H**	breathe	**I**	leap
J	**terrestrial**	**K**	rotation	**L**	protects
M	Spin	**N**	rise		

Task 23. Read the text and decide which answer (A, B, C, or D) best fits each gap. There is an example at the beginning (0).

Early in 2014 NASA scientists **(0) took** a significant step toward answering a question that people had wondered about for centuries: Are there worlds out there in space that can **(1)** _____ life as we know it? On April 17, NASA officially announced the **(2)** _____ of Kepler-186f, the first **(3)** _____ extrasolar planet (or exoplanet) to be found within its star's **(4)** _____ zone – the orbital region where an Earth-like planet could **(5)** _____ liquid water on its surface and thus possibly **(6)** _____ life similar to that found on Earth. The planet, which was discovered in data taken by the Kepler **(7)** _____ before its original mission ended in 2013, has a radius 1.11 times that of Earth. The mass of Kepler-186f is unknown; however, if it has an Earth-like **(8)** _____, its mass would be 1.44 times that of Earth. It was the fifth planet discovered around its star, a dim red dwarf 500 light-years from Earth with a mass 0.48 times that of the Sun. Kepler-186f **(9)** _____ its star every 129.9 days at a distance of 53.9 million km. It receives only 32% of the amount of light that Earth receives from the Sun, but water could exist in a liquid state if its atmosphere has **(10)** _____ amounts of carbon dioxide.

0	**A**	Did	**B**	proved	**C**	completed	**D**	**took**
1	**A**	Harbour	**B**	shield	**C**	exist	**D**	appear
2	**A**	Search	**B**	exploration	**C**	discovery	**D**	location
3	**A**	Inner	**B**	dwarf	**C**	distant	**D**	Earth-sized
4	**A**	Liquid	**B**	habitable	**C**	inner	**D**	harmful
5	**A**	Appear	**B**	create	**C**	possess	**D**	spin
6	**A**	Survive	**B**	stay	**C**	discover	**D**	support
7	**A**	Telescope	**B**	satellite	**C**	moon	**D**	shuttle
8	**A**	Radius	**B**	surface	**C**	view	**D**	cover
9	**A**	Tilts	**B**	extends	**C**	orbits	**D**	pulls
10	**A**	Entire	B	molten	**C**	thick	**D**	sufficient

Task 24. Give English equivalents of the words and word combinations below. Then, use them in a list of 10 questions you would like to ask a lecturer about the physical characteristics of planet Earth.

A (Text "Planet Earth") сплющена поверхня; край землі; доводити; третя планета за відстанню від Сонця; на відміну від інших планет; існувати у всесвіті; живі створіння; підтримувати життя; обертатися навколо Сонця по еліптичній орбіті; дані про перших людей; вимерлі динозаври; здійснити повний оберт; притягувати до центру землі; обертатися навколо своєї осі; проходити через Південний та Північний полюси; трохи нахилений; магнітне поле Землі; простягатися на декілька кілометрів у космос; рухи розплавленого металу у зовнішньому ядрі; захищати від шкідливого випромінювання.

B (Text "Our Home Planet") міжзоряна хмара пилу й газу; називати на честь міфологічних істот; навколопланетні кільця; розплавлена сфера; ковзати по

тектонічних плитах; крихітні одноклітинні організми та мікробні істоти; еволюціонувати у складні види; запропонувати геліоцентричну теорію; підтвердитися польотами у космос; збільшитися до розміру червоного гіганта; старіюча зірка; поглинути планети земного циклу; помірний; виявити на поверхнях інших планет воду у рідкому стані; породити припущення; перетворитися на білого карлика, що стискається.

 **Task 25. Render the following text in English. Make use of the essential vocabulary of the unit.**

Земля – третя від Сонця планета Сонячної системи, єдина планета, на якій відоме життя, домівка людства. Земля належить до планет земної групи і є найбільшою з цих планет у Сонячній системі. Землю іноді називають латинською назвою Терра або грецькою – Гея. Земля обертається навколо Сонця еліптичною орбітою із середньою швидкістю 29 785 м/с на середній відстані 149,6 млн км із періодом, що приблизно дорівнює 365,24 доби. Земля має супутник – Місяць, який обертається навколо Землі на середній відстані 384 400 км. Період обертання планети навколо своєї осі 23 год 56 хв. Обертання навколо своєї осі викликає зміну дня і ночі, а нахил осі разом із обертанням навколо Сонця – зміну пір року. Земля має магнітне і тісно пов'язане з ним електричне поле. Гравітаційне поле Землі зумовлює її близьку до сферичної форму й існування атмосфери.

За сучасними космогонічними уявленнями, Земля утворилася приблизно 4,6 млрд років тому з розсіяної в протосонячній системі газопилової речовини. Унаслідок диференціації речовини Землі, під дією гравітаційного поля, в умовах розігріву земних надр виникли й розвинулися різні за хімічним складом, агрегатним станом і фізичними властивостями оболонки – геосфери: ядро, мантія, земна кора, гідросфера, атмосфера і магнітосфера.



Task 26. Choose 5-7 key terms from the unit. Use a dictionary or your own words to define these terms. Write the definitions in the glossary.

moon fossil gravity hemisphere axis Pole molten tilted magnetic field core terrestrial revolution rotation spin ***planet*** *universe land crust plate heliocentric gas giant inner planet orbit rocky solar system evaporate freeze*

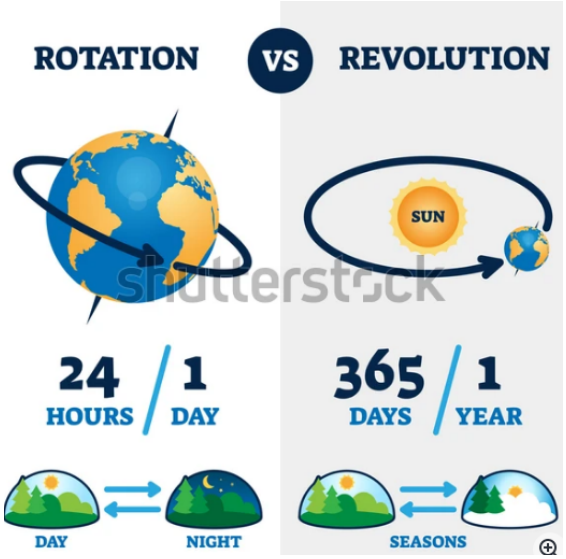
Example: ***Planet*** *is an extremely large, round mass of rock and metal, such as Earth, or of gas, such as Jupiter, that moves around the Sun or another star.*

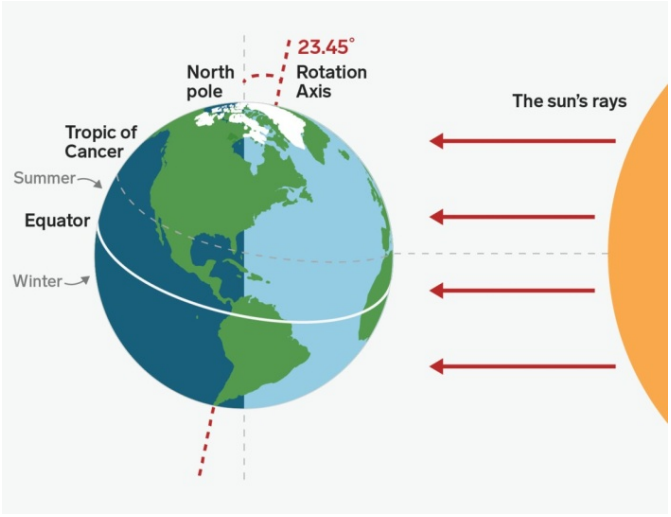


Task 27. Review the topics covered in this unit. Suppose you are to participate in an international scientific workshop. Be an expert in one of the topics below. Deliver a report.

1. Earth as a Planet of the Solar System
2. Earth's Unique Characteristics
3. Earth's Movement through Space
4. Theory of Earth's Formation
5. Earth's Distant Future
6. The Kepler Mission

Task 28. Speak on the topic "Planet Earth" for 3-4 minutes. Comment upon the supporting images below using the active vocabulary of the unit.





Task 29. Use the Internet to find out about NASA's Kepler mission. Imagine that the Kepler mission finds life on a distant planet. NASA wants to send some objects representing Earth to the new planet (e.g. an encyclopaedia, a computer, photographs of world leaders, a bottle of sea water, etc.). Add more items to NASA's list of objects. Explain your choice.

Task 30. Describe our location in the universe as precisely as you can. Use appropriate academic and specialized vocabulary, clear and complete sentences (120 – 150 words).

UNIT 2

SOLAR SYSTEM

L E A D – I N

Task 1. Discuss the following questions with a partner or in a small group.

- *What comes to mind when you hear the term "solar system"?*
- *What do the names of the planets mean?*
- *What interesting facts do you know about our solar system?*
- *Why do people want to go to Mars? Why did people want to go to the Moon?*
- *How are planets in our solar system different from exoplanets?*

Task 2. Before you begin learning about the topic, complete the sentences below and list what you already know about the solar system.

Example: ***Scientists say the solar system formed around 4.6 billion years ago.***

1. I've heard that ……
2. If I'm not mistaken……
3. As far as I know……
4. Scientists say……
5. It is a well-known fact that……
6. It is common knowledge that……
7. According to some research……

VOCABULARY

Task 3. Find 20 space words in the grid. The words go across or down.

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

C	T	W	R	T	T	E	E	A	Y
U	A	X	B	E	Y	Z	R	R	M
R	R	L	I	M	N	I	S	T	A
Y	O	P	T	Q	R	P	U	H	R
S	A	T	U	R	N	A	N	C	S
J	U	P	I	T	E	R	T	W	B

Task 4 A. Look at the words in the box. Which of them can you pronounce correctly?

Specialized & General Academic Vocabulary	*body circular clustered cross divide dust dwarf fuzzy galaxy giant heat huge Jupiter Mars melt Mercury molecule Pluto provide ring rocky Saturn solid spot stream away tail Neptune terrestrial Uranus vast Venus*

Task 4 B. Practise reading the transcribed words below. Then, identify them in the box of Task 4 A.

/'mɜː(r)kjʊri/; /mɑːz/; /'viːnəs/; /'ʤuːpɪtə/; /'pluːtəu/; /'juər(ə)nəs, jʊˈreɪnəs/; /ˈsɜːkjələ/; /dwɔːf/; /ˈmɒlɪkjuːl/; /ˈklʌstə/; /hjuːʤ/; /ˈfʌzi/; /ˈsætən/; /ˈʤaɪənt/; /ˈgæləksi/.

Task 4 C. Write each word in the column that best describes what you know about it. Share your ideas with your partner. Then, consult a dictionary to check the meanings of the new words.

Don't know at all	I think I know the meaning	I know the meaning
……	……	……
……	……	……
……	……	……

CORE BLOCK

READING & SPEAKING

Task 5. The following text will introduce you to the topic of the solar system. Read the text and translate the phrases with the words in bold into Ukrainian.

BEFORE YOU READ, DISCUSS IN PAIRS TO CHECK IF YOU KNOW

- what systems and bodies space is made up of
- the place of our solar system in space
- the difference between *planets, comets, asteroids, meteors, and meteoroids*
- two groups the planets of the solar system are divided into

FAMILY OF THE SUN

Imagine a **huge** black space. The Sun moves through this **vast** space, bringing many smaller **bodies** with it. These bodies include planets, asteroids, comets, meteoroids, and tiny molecules of gases. The Sun and its companions are known as a "solar system."

Astronomers do not know how far our solar system extends. They think that some objects may be as far as 9 trillion miles away from the Sun. The Sun **provides** energy for the rest of the solar system. It also provides the **heat** and light necessary for life on our planet. Besides, its gravity keeps the planets, comets, and other bodies in orbit.

The planets are the largest and most massive members of the solar system after the Sun. There are eight known planets: *Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus,* and *Neptune*. We can **divide** the planets into two groups: **terrestrial** planets and gas **giant** planets. Terrestrial, or Earth-like, planets have **solid**, **rocky** surfaces. Mercury, Venus, Earth, and Mars are terrestrial planets. Gas giant planets are much larger than terrestrial planets. All gas giant planets are made of gases, not solid rock. These planets have **rings** around them. Jupiter, Saturn, Uranus, and Neptune are gas giant planets. Jupiter is the largest planet. It is about a thousand times bigger than Earth.

Scientists used to think that there were nine planets. They thought that *Pluto* was a planet because it revolves around the Sun. However, in 2006 they decided that Pluto should be called a **dwarf** planet. Pluto differs from the other planets not only in size. It does not have a **circular** orbit, and it even **crosses** Neptune's orbit. In addition, Pluto is not strong enough to move objects out of its way as it orbits the Sun.

Other bodies that also orbit the Sun but are even smaller are called asteroids. Most asteroids lie between Mars and Jupiter. A comet appears in the sky as a **fuzzy spot** of light with a **tail streaming away** from it. It is made up of **dust** and frozen gases. As this giant dirty snowball moves closer to the Sun, the ice **melts** and makes what looks like a tail. *Halley's Comet* is probably the most famous of all.

Outside of our solar system, there are billions of other stars. Astronomers now know that some of these stars have planets, and the planets orbit these stars. This means that there are other solar systems in the universe in addition to our own. Many solar systems and stars **clustered** together make up galaxies.



Task 6. Match each English word or phrase with its Ukrainian equivalent.

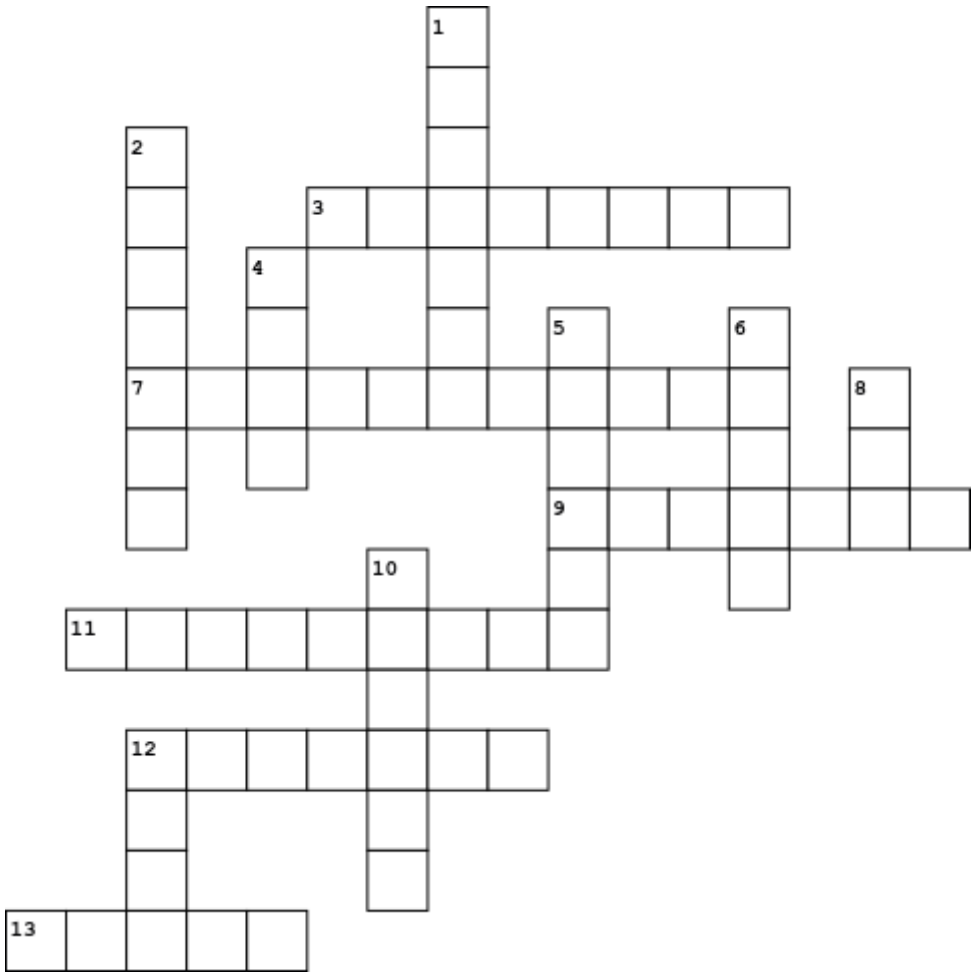
1.	body *n.*	**a.**	поділяти
2.	circular *adj.*	**b.**	надавати, забезпечувати

3.	clustered *adj.*	**c.**	гігант
4.	cross *v.*	**d.**	кам'янистий
5.	divide *v.*	**e.**	тягнутися шлейфом
6.	dust *n.*	**f.**	танути
7.	dwarf *adj.*	**g.**	хвіст
8.	fuzzy *adj.*	**h.**	твердий
9.	giant *n.*	**i.**	кільце
10.	heat *n.*	**j.**	нечіткий, розмитий
11.	huge *adj.*	**k.**	що рухається по колу
12.	melt *v.*	**l.**	пляма, точка
13.	provide *v.*	**m.**	перетинати
14.	ring *n.*	**n.**	величезний
15.	rocky *adj.*	**o.**	земний, земного типу
16.	solid *adj.*	**p.**	тіло
17.	spot *n.*	**q.**	пил
18.	stream away *phr.*	**r.**	широкий, неосяжний
19.	tail *n.*	**s.**	тепло
20.	terrestrial *adj.*	**t.**	скупчений, згрупований
21.	vast *adj.*	**u.**	карликовий

Task 7. Work with a partner. Ask and answer questions about the text. Add at least two more questions to the list.

1. What space bodies does the solar system contain?
2. What bigger systems are stars and planets included into?
3. How many planets are there in our solar system?
4. What are the two major groups the planets of our solar system can be divided into? How do they differ?
5. Would our solar system exist without the Sun?
6. ……..?
7. ……..?

Task 8. Solve the crossword. Refer to the text "*Family of the Sun*" and your essential vocabulary.
(Also available at: https://crosswordlabs.com/view/solar-system_2021)



Across

3. the name of our galaxy
7. planets composed mostly of metals or silica rocks
9. the farthest planet in the solar system
11. large planets mostly composed of helium and/or hydrogen
12. the closest planet to the Sun
13. the hottest planet in the solar system

Down

1. the most famous comet
2. the largest planet
4. known as the "red planet"
5. the coldest planet in the solar system
6. no longer officially considered a planet
8. its surface temperature is around 5,500 degrees Celsius
10. the planet famous for its rings
12. Neil Armstrong was the first person to walk on it

Task 9. Find the words in the text that correspond to the following definitions.

1. very small dry particles of matter *(n.)* ……
2. the part extending beyond the end of its body *(n.)* ……
3. shaped like a circle, round *(adj.)* ……
4. covered with or consisting of stones *(adj.)* ……
5. a path of a planet around the Sun *(n.)* ……

6. a group of atoms bonded together *(n.)* …….
7. the force that attracts a body towards the centre of the earth *(n.)* ……..
8. to give something that is needed, make available *(v.)* ……..
9. an object or substance that is in the shape of a circle *(n.)* ……..



Task 10. Do a multiple-choice quiz. Choose the correct option.

1. Which is NOT a synonym for *"provide"*?
a) deliver
b) supply
c) give
d) survive

2. Which word is similar in meaning to *"vast"*?
a) empty
b) unlimited
c) definite
d) total

3. Which word is the opposite of *"fuzzy"?*
a) single
b) dense
c) clear
d) glow

4. The word *"spot"* means
a) the central and most important part of an object
b) a cloud of dust and gas in space
c) a small mark on a surface which has a different colour
d) amount of light or heat from the Sun

5. Which word does NOT mean *"circular"*?
a) round
b) ring-shaped
c) spherical
d) planetary

6. Which word is the opposite of *"dwarf"?*
a) sizeable
b) tiny
c) outer
d) terrestrial

7. Which word is similar in meaning to *"solid"*?
a) massive

b) hard
c) tiny
d) global

8. Many solar systems and stars *clustered* together make up galaxies.
a) extended
b) grouped
c) spread
d) conducted

9. A comet has a tail that *streams away from* it.
a) dissolves
b) spills
c) follows behind
d) figures out

10. Pluto *crosses* Neptune's orbit.
a) Pluto goes in the opposite direction to Neptune's rotation.
b) Pluto passes within the orbit of Neptune.
c) Pluto's orbit is as tilted as Neptune's is.
d) Like the planet Neptune, Pluto rotates on its side.

 **Task 11. Complete the sentences using the words** *in italics*. **You will not need two words.**

spot terrestrial divided solid bodies circular clustered tail crosses ring galaxy provides dust vast rocky heat streamed huge dwarfs giant fuzzy melt

1. The existence of water makes …… life possible.
2. The wind was blowing …….. and leaves up from the ground.
3. They rode in a ……. around the village.
4. The Hubble Telescope has allowed astronomers to make significant discoveries about our ……...
5. The paths are often very ……., so strong boots are advisable.
6. The smallest stars, called M5 red ……., have about 5 percent of the mass of our Sun.
7. When the sun came out, the ice began to …….
8. We warmed ourselves by the …… of the fire.
9. There is a …… path in the park that goes around the lake.
10. Astrology extends back to the time when people worshipped the heavenly ……. as gods.
11. They drove past ……. fields of corn.
12. The train …… the border between France and Spain.
13. They ……. soldiers at each entry to the fortress.
14. We saw the …….. of the procession disappearing round the corner.
15. Some of the photos were so …… it was hard to tell who was who.

16. The ……. stadium could hold twice as many people as the old one.
17. She …….. the chicken into parts and put some of them in the freezer.
18. The store ……. shopping carts for the use of their customers.
19. He noticed that he had a dark …… on his yellow tie.
20. The match was shown on a ……. Screen outside the town hall.

VIEWING & SPEAKING

Task 12. Watch two parts of a video in which you will find out how the inner planets are different from the outer planets.

BEFORE YOU WATCH

- In pairs, discuss the order of the solar system planets from the Sun and write the names of the planets in the lines below.



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

1. Use a dictionary to check the meanings of the words and expressions you will hear in the videos, or ask your teacher / group mates for help where necessary.

VIDEO 1

breathtaking views *solid surface* *dense* *liquid cores* *satellites*
rings of ice *iron and nickel* *furnace* *tipped on one's side*
rotate clockwise / anticlockwise *captured by planet's gravity*

VIDEO 2

non-gaseous core *asteroid belt* *faint rings* *tilted* *methane*
band *fascinating* *weird orbit*

- Take turns to suggest how these words and expressions might be used to describe the solar system planets.

AFTER YOU WATCH

- Match **1-4** in column **A** with **A-D** in column **B**, and name the inner solar system planets that are described.

A	B
1 The third inner planet from the sun and the only one whose name does not derive from Greek or Roman mythology. The planet's atmosphere protects it from the dangerous radiation and helps keep sunlight in. It is the densest among the inner planets and the only place in the solar system,	**A** The planet's average temperature is minus 55^0 C. It has two small moons, which could be asteroids captured by the planet's gravity. There is a network of canyons and channels, which makes many believe there was once water and life on it. The planet has huge volcanoes, the largest of which is called Olympus Mons.
2 Named after the goddess of love and beauty, it is often called the "morning star." With an exception of Earth's Moon, it is the brightest planet in the sky. This planet is 80% of Earth's size and like Earth's twin, for example in densities and chemical composition. There is evidence that there used to be water, which had boiled away due to extreme heat.	**B** which keeps heat neither in, nor out. It is burning during the day, up to + 430^0 C, and freezing at night, as low as -187^0 C. Each day on Mercury lasts 58 days and 15 hours on Earth. The whole year is 88 Earth days. Although the planet is often visible, it is not very interesting to look at, because it has very few geological features other than impact craters.
3 In Roman mythology, the name of the planet means "god of commerce, travel and thievery." The closest planet to the Sun and the smallest in the Solar system, it is only 5% of Earth's size. This planet looks very much like Earth's moon, and it is even of similar greyish colour. It has no moons of its own and its core comprises mostly iron and nickel. It is one of the densest planets in the solar system. It has a very thin atmosphere,	**C** But in other features the planet is different from the Earth. It is the hottest planet in the solar system, with temperatures over + 400^0 C. Its atmosphere is a thick cloud of different gases, including carbon dioxide, which is hot enough to melt lead. The length of the day on Venus is 243 Earth days, while the year is shorter, only 224.7 Earth days. It rotates clockwise, unlike other solar system planets.
4 The planet is named for the god of war. It is also known as a red planet due to the rust iron materials on the surface. It is only 10% of Earth's mass. One day on it is nearly identical to Earth – 24 hours and 37 minutes, and its year is 687 Earth days.	**D** where life is known to exist. It is the only terrestrial planet with a large satellite – the Moon. Being the largest among the rocky planets, it is only ¼ the size of Neptune, the smallest gas giant.

- Match **5-9** in column **A** with **A-D** in column **B**, and name the inner solar system planets that are described.

A	B
5 The seventh planet from the Sun is 4 times the size of the Earth. The planet is tipped on its side, perhaps, because it was hit by a large object a long time ago, or because of the gravity of its large moons that is pulling it over to its side. Although it was discovered 200 years ago,	**E** Others say it may be a double planet with its moon Charon. The planet is made up of half rock and half ice. If it were closer to the Sun, it would melt and become a comet. Due to its weird orbit, it moves in front of Neptune every 2 years.
6 This planet has been kicked out of the category of planets and is classified as a dwarf planet. Some scientists think it was once Neptune's satellite, which had been pulled out of its orbit.	**F** However, its year is quite long, nearly 12 Earth years. The planet has colorful bands, faint rings and over 50 moons. It often changes the trajectory of passing comets, which protects other planets from being hit.
7 The first planet following the asteroid belt is the biggest one in the solar system, with the mass of all other planets combined. It spins very quickly on its orbit, with one day being 10 Earth hours.	**G** at its equator. It boasts 50 moons, including Titan, which is bigger than Mercury and has its own atmosphere. A day on the planet is 10.65 hours, and a year lasts 29.4 Earth years.
8 The eighth planet, known also as the blue planet because of methane gas in its atmosphere, is the windiest one, with wind speeds up to 2,000 km/h. Scientist have only once sent an unmanned ship to visit it, for it is almost at the edge of the solar system.	**H** As it is the farthest planet in the solar system, it is the coldest one. It is also the smallest among the gas giants, and it has surface gravity like Earth. The planet revolves around the Sun once every 165 Earth years, and its day is 16.1 Earth hours.
9 This is the second largest planet in the solar system known to most people by its bright rings. It is a windy place, with winds reaching 1,100 m/h	**I** it is not easy to study. It has at least 27 moons. A day on the planet is shorter than on the Earth – 17.25 Earth hours, and a year lasts almost a century – 84.3 Earth years.

- Restore what these figures say about the solar system planets.

687 Earth days	*10 Earth's hours*	*~100 Earth years*	*243 Earth days*	*165 Earth years*
¼	*5%*	*-187° C*	*10%*	*50*
24h 37min	*17h 14min*	*+>400°C*	*16h 6min*	*1,100mph*

➢ Do the multiple-choice quiz.

1. Which of the planets rotates backwards?
   A. Earth B. Venus C. Mars D. Mercury
2. Which planet is tipped on its side and spins nearly horizontally?
   A. Neptune B. Saturn C. Pluto D. Uranus
3. Which planet is known as the blue planet?
   A. Pluto B. Uranus C. Jupiter D. Neptune
4. Which planet is closest in size to the earth?
   A. Mars B. Uranus C. Mercury D. Venus
5. Which planets besides the earth have evidence that they once had water?
   A. Mars B. Mercury C. Neptune D. Venus
6. Which of the following planets is not a gas giant?
   A. Jupiter B. Neptune C. Pluto D. Saturn
7. Which two planets are gas giants?
   A. Venus and Mercury C. Saturn and Jupiter
   B. Saturn and Mars D. Jupiter and Mars.
8. Which planet's day is longer than its year?
   A. Mercury's B. Earth's C. Neptune's D. Venus'
9. Which planet has the largest satellite?
   A. Saturn B. Earth C. Pluto D. Jupiter
10. The further away from the Sun,
   A. the faster the planet moves C. the colder the planet is
   B. the hotter the planet is D. the longer the planet's orbit

LEARN MORE!



Task 13. Unscramble the letters to form the terms that match the descriptions below.

1. *otasedir*	2. *letalstei*	3. *tecork*	4. *yaxagl*
5. *meranortos*	6. *mecot*	7. *sepecolet*	8. *eroditemo*

a) a celestial object consisting of ice, dust, and gas .....
b) an extremely large group of stars and planets that extends over many billions of light years .....
c) equipment used for making distant objects look larger and closer .....
d) a piece of rock or other matter in space that has not yet entered the earth's atmosphere .....
e) one of the many small objects between Mars and Jupiter .....
f) a vehicle used for travelling into space .....

g) a person who studies space .....
h) a moon that moves around a planet .....

Task 14. Fill in the blanks below with words from the box. There is one extra word you will not need to use.

star	*rocky*	*largest*	*temperature*	*orbit*	*extinct*	*rings*
Jupiter	*ice*	*tiny*	*satellites*	*gas giants*	*live*	*Saturn*
dinosaurs	*red*	*frozen*	*sea*	*tail*	*surfaces*	*closest*

The Solar System

The solar system is the group of planets that **(1)** _____ our Sun. The list of planets now includes eight; in order from the Sun they are Mercury, Venus, Earth, Mars, Jupiter, **(2)** _____, Uranus, and Neptune. All except Mercury and Venus have **(3)** _____ satellites.

The Terrestrial Planets

Mercury, Venus, Earth, and Mars are called terrestrial planets because they have rocky **(4)** _____. Earth is the planet we **(5)** _____ on. Mercury is the **(6)** _____ planet to the sun. Venus, which is also called the evening **(7)** _____, has a **(8)** _____ of 500 degrees Celsius and clouds of sulfuric acid. Mars is known as the **(9)** _____ planet. Recently, **(10)** _____ water was discovered there.

The Gaseous Planets

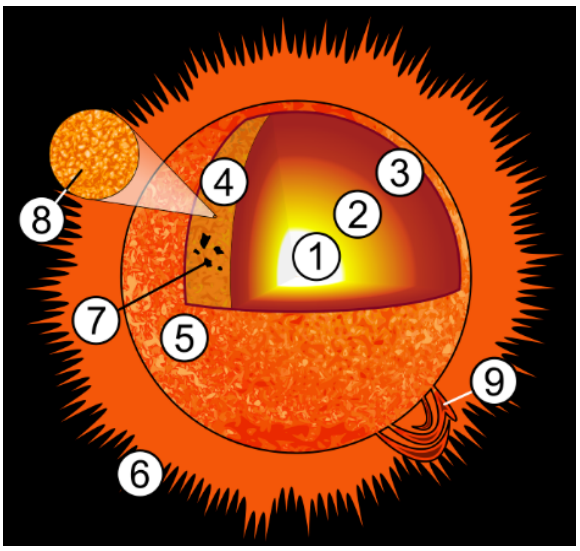
Jupiter, Saturn, Uranus, and Neptune are called **(11)** _____ because they are big and made mostly of gas. Jupiter is the **(12)** _____ planet in the solar system. Saturn is famous for its **(13)** _____. Uranus also has rings but is not as famous as Saturn. Neptune is named after the god of the **(14)** _____.

Planetoids: Asteroids and Comets

There are many other planetoids in the solar system. Between Mars and **(15)** _____ there is a belt of small **(16)** _____ objects called asteroids. Besides, balls of **(17)** _____ and rock called comets occasionally come close to the sun creating a bright **(18)** _____ that can be seen from Earth. Some scientists think the **(19)** _____ became **(20)** _____ when one of these comets came crashing into the Earth.

Task 15 A. Recall what you know about the Sun. Write the missing term for each number, using the words from the box.

chromosphere	*convective zone*	*sunspots*	*core*	*radiative zone*
	solar flares	*photosphere*	*corona*	



1……....
2……
3……
4……
5……..
6……..…
7. ……
8. granules
9. prominence or ……

Task 15 B. Read the text and fill in the gaps with the missing words and phrases.

darker	*dense*	*nuclear*	*corona*	*helium*	*burning*
photosphere		*extreme*	*convective*		*core*
solar flares		*cooler*	*sunspots*		*convective*
magnetic field		*photons*	*heat*		*eclipse*

The Sun is a massive **(1)** …….. ball of gases held together by **(2)** …….. It is primarily composed of **(3)** …….. and hydrogen gases. The Sun has three main layers: the **(4)** ……..., the radiative zone, and the **(5)** ……. zone.

The core at the centre of the Sun produces the Sun's **(6)** ……... This energy is produced by hydrogen **(7)** …… fusion reactions. Energy produced in the Sun's core is carried to the Sun's surface in the form of light energy called **(8)** ……... This energy moves from the core into a very **(9)** ……. radiative zone. It can take thousands of years for the light energy to move through this layer and into the **(10)** …….. zone. Hot gases in the convective zone rise towards the surface where they become **(11)** ……. and denser. The gases then descend back into the Sun. This circulating movement is called convection.

The Sun's atmosphere is made up of the photosphere, chromosphere, and **(12)** ……... When we look at the Sun, we see the **(13)** ……... The chromosphere can be seen during a total solar **(14)** ……., when the moon covers the Sun. **(15)** ……. are cooler, **(16)** ……. areas of gas on the Sun's surface. These areas are caused by the Sun's **(17)** ……. affecting the convection heat. **(18)** ……. are enormous areas of **(19)** ……. temperature on the Sun's surface, caused by magnetic fields. Solar flares typically occur near sunspots.

Task 16 A. Study the word parts from Latin and Greek. Give your own examples of the words formed from foreign prefixes, roots, and suffixes. Then, make up sentences with some of the terms.

Word part from Latin or Greek	Meaning	English example
terr-	earth, land	*terra, terrain,……*
geo-	Earth	*geophysics, geocentric, ……*
sol-	Sun	*solar, solstice,……*
astro-	star	*astrophysics, astronaut,……*
tele-	distant	*telescope,……*
extra-	beyond	*extragalactic,……*
-ology, -nomy	the study of	*geology, astronomy, ……*

Task 16 B. Match the terms to the definitions.

1.	terrain	**a.**	someone who travels and works in a spacecraft
2.	astrophysics	**b.**	a tube-like piece of scientific equipment used for making distant objects look larger and closer
3.	terrestrial	**c.**	the time of either the longest or the shortest day of the year
4.	telescope	**d.**	the study of the movements of parts of the Earth, and the forces involved in it, including the weather, the sea beds etc.
5.	astronaut	**e.**	the specific physical features of an area of land
6.	extraterrestrial	**f.**	the scientific study of the chemical structure of the stars and the forces that influence them
7.	geophysics	**g.**	connected with the Earth rather than with the Moon or other planets
8.	geocentric	**h.**	having the Earth as the central point, or measured from the centre of the Earth
9.	solstice	**i.**	connected with things that exist outside the Earth

Task 16 C. Write the correct word from the box to complete each sentence.

astronauts geocentric astrophysics terrestrial geophysics terrain solstice telescope extraterrestrial

1. Details on the Moon's surface can only be seen through a _____.
2. It is based on the technology that was developed to help _____ cope with weightlessness.
3. The _____ on the island varies quite a bit.

4. The day of my visit was the summer _____, June 21.
5. The theory of plate tectonics explains these phenomena and is commonly regarded as one of the cornerstones of modern _____.
6. Astronomy and _____ study the formation, structure and evolution of stars and galaxies, and of the Universe itself.
7. NASA has started a 10-year search for _____ intelligence.
8. An ancient _____ map of space shows earth in the center and everything else surrounding it.
9. _____ animals spend most of or their life on land, in contrast to animals that live predominantly in water.

**Task 17. Pick up more information about asteroids, meteoroids and comets from any reliable source to fill out the chart below.**

	Asteroid	Meteoroid	Comet
What does it look like from Earth?			
How was it found / noticed?			
How big is it?			
What is it made of?			
How was it formed?			
How far is it from Earth?			
How dangerous is it for Earth?			
Can it be used in national economies?			

**Task 18 A. You are planning a new space probe mission to the solar system. Decide on one or more moons, comets, or asteroids that you would like to study. Explain what you expect to see and learn about each object.**

**Task 18 B. Become an expert on one planet and present your findings to the class. Follow the steps below.**

Step 1: Choose a planet: Mercury, Venus, Mars, Jupiter, Saturn, Uranus, or Neptune.
Step 2: Research. Take notes on the planet's size, appearance, moons, distance from the sun, atmosphere, materials, and unique features.
Step 3: Pick an activity to present what you have learned. Here are some ideas:
Imagine you are an explorer who has just arrived on the planet. Create a journal of your experience. Include facts you have learned in your research, but use your imagination, too! Visuals: make sketches in your journal that connect your journal entries.
Step 4: Write a short story that is set on the planet. Include facts you have learned in your research. Visuals: Illustrate your story.

Step 5: Create a travel brochure. Persuade your audience to visit the planet using writing and illustration.
Step 6: Write a speech that will entertain and inform your group mates. Visuals: create a three-dimensional model of the planet or create a movie that simulates life on the planet.
Step 7: Come up with your own great idea!

EXTENSION

LISTENING AND SPEAKING



Task 19 A. Listen to an audio lecture about the major processes that affect the surfaces of the inner planets in the solar system. Take notes.

BEFORE YOU LISTEN

- In small groups, discuss what terrestrial planets have in common. Compare your findings in class.
- Check the meanings of the unknown words and expressions in the box below to make predictions on which of the planet shaping processes *(tectonics, volcanism, weathering / erosion, impact cratering, or atmosphere)* they may relate to. Suggest examples.

rocky crusts *dense mantle and core* *fast winds* *stiff* *luna maria* *twisted and wrinkled up* *dunes* *batter at rocks* *erased from the surface* *expand into flash floods* *slow the loss of energy* *Mariner Valleys* *rotate and orbit in opposite directions* *droplets of sulfuric acid* *gigantic dust storms*

AFTER YOU LISTEN

- Identify the planet shaping processes by the definitions given below.
  1. _____ a process of changing the crust due to the motion of hot material underneath
  2. _____ a process when molten rock moves from hot interior onto its surface
  3. _____ a process of breaking up rocks (by water, wind, temperature changes, etc.) and moving them by gravity
  4. _____ a process of hitting a planet from outside and producing an explosion
  5. _____ a cover of gasses that are poured out of volcanoes and pulled near a planet surface by gravity.
- Fill in the content frame with the information from the audio and the vocabulary in the box above. Add more facts to the nests in place of _____.

Planet	Tectonics	Volcanism	Weathering and Erosion	Impact Cratering	Atmosphere	Others
Mercury	*the surface was once wrinkled* _____ _____	*large smooth plains similar to luna maria* *some parts used to be covered by lava*	_____	*numerous craters* _____	*no atmosphere to move energy from hot to cold areas* _____	*3 months of daylight and 3 months of darkness*
Venus	*patterns of cracks and cliffs due to mantle stretching and twisting the surface*	*mountain building* _____	*no liquid water or fast wind to promote breaking or transporting material* _____	*presence of round craters* _____ *no small impacts due to planet's thick atmosphere*	*air pressure 90 times higher than that on Earth* *dense CO^2-rich atmosphere, which slows the loss of energy and makes the surface very hot* _____ _____	*a little smaller than Earth* *often referred to as "Earth's sister-planet"* _____ _____ _____
Earth	*presence of tectonic plates* _____	_____ *formation of chains of volcanoes rather than single ones due to the*	_____	*no traces of ancient craters left on the surface*	*ancient CO_2-rich atmosphere keeping water above the surface liquid* _____	*polar caps growing in winter and shrinking in summer* *similar to Mars*

		movement of plate tectonics				
Mars	*valleys and raised areas formed due to the movement in mantle* _____	_____ *volcanoes higher than any mountains on Earth* _____ *no lava released over a long period of time*	*rocks broken down by fast winds and sand* _____	_____ _____ *a few impact craters*	_____ *1% air pressure of Earth's* *no circulation of air masses because of low gas density* _____ _____ *CO^2 frozen ice caps* _____ _____ *no liquid water*	*half third of Earth in diameter* _____ _____ *land-forms resulting from gigantic ancient flash floods* _____



Task 19 B. Listen to an audio lecture to learn how the outer solar system planets' orbits and atmospheres make them different. Take notes.

BEFORE YOU LISTEN

- In small groups, compare gas giants to rocky planets. Share your ideas in class.
- Discuss which outer solar system planet(s) the following are characteristic of: *solid core, strong winds, stormy weather, frozen ammonia, hydrogen and helium, bands of wind, planetary rings, great red spot, great dark spot.*

AFTER YOU LISTEN

- Add detail notes for the main ideas on each planet as shown in the examples.

Main Idea	Detail Notes

1. **Jupiter** is a world of storms and clouds.	A. *ROTATION AND SPIN*: Jupiter takes 12 Earth years to go once around the Sun. It takes Jupiter less than 10 hours to turn once on its axis, which is why there are strong winds and stormy weather. B. *SIZE, VOLUME, AND MASS*: C. *LAYERS OF CLOUDS*: D. *JUPITER'S LARGEST STORM:*
2. **Saturn** has large rings.	A. *SIZE AND MASS:* Saturn is a little smaller than Jupiter, but its mass is less than 1/3 that of Jupiter, because of which gravitational pull is weaker. Saturn has a much lower density than Jupiter. B. *CLOUDS AND STORMS:* C. *SATURN'S RINGS:* D. *SATURN'S SEASONS:* E. *DISTANCE AND ROTATION:*
3. **Uranus** is about twice Saturn's distance from the Sun.	A. *ROTATION:* It takes Uranus 84 Earth years to travel around the Sun once. B. *RINGS AND MOONS:* C. *SPIN:*
4. **Neptune** orbits about 10 AU farther from the Sun than Uranus.	A. *TEMPERATURE:* Neptune is hotter inside, which is why it has the same outside temperature as Uranus. B. *COLOUR*: C. *STORM SYSTEMS:*

- Name some things that Uranus and Neptune have in common.

READING & SPEAKING

Task 20. Read the text to find out how stars are born and die.

BEFORE YOU READ

DISCUSS IN PAIRS AND EXPLAIN IN CLASS

- how stars are different from planets
- what gasses stars are made up of
- why the Sun is hot, while many other stars are cold
- when a star becomes a red giant, and when a dwarf

IN PAIRS, CHECK THE MEANINGS OF THE WORDS AND EXPRESSIONS AND USE THEM IN APPROPRIATE CONTEXTS IN SENTENCES OF YOUR OWN

Proxima Centauri *enormous* *give off* *pull to the centre* *power* *glow* *atomic bombs* *fusion* *run out* *expand* *span billions of years* *blast* *suck up*

AFTER YOU READ

***FILL IN** 1-7 **WITH THE CORRECT WORDS OR PHRASES FROM** A-G.*

A	*element helium*	***D***	*"supernova"*	***G***	*spinning ball*
B	*young star*	***E***	*sun*		
C	*nuclear energy*	***F***	*hydrogen gas*		

CHAIN THE FOLLOWING EXPRESSIONS LOGICALLY TO SPEAK ABOUT THE LIFE SPAN OF A STAR

cooling after hydrogen runout	*glowing gas ball*
release of heat and light	*black holes*
fusion process	*explosion of a red supergiant into a supernova*
cloud of dust and hydrogen	*spinning ball becoming dense, thick and hot*

DISTANT FIRE

People have always been interested in the night sky. They used to think that the stars were gods: indeed, some of the planets have been named after Roman gods since Roman times. The sky we look at is full of stars, the closest of which (after the **1** _____) is Proxima Centauri (which is 40 million km away). The reason we can see the stars from so far away is because they have very hot surfaces, like the Sun.

All stars are basically enormous balls of fire. They are made up of gases that give off both heat and light as they burn. Their power comes from **2** _____, the same source that both powers atomic bombs and produces electricity in many parts of the world.

The life of a star spans billions of years. A star is born from clouds of dust and the element hydrogen. This cloud mass forms a **3** _____ which pulls all the material toward the center. It becomes more and more dense, or thick, as the material comes together. It also becomes extremely hot. Eventually it becomes so hot that the **4** _____ begins to glow. The glowing gas ball is called a "protostar" ("proto" means "beginning" or "first").

A protostar becomes a star when it starts a process called fusion. This happens when hydrogen atoms combine to form the **5** _____. The fusion process releases a huge amount of energy in the form of heat and light. A star can continue to glow for millions of years.

When the star finally runs out of hydrogen for the fusion reaction, it starts to cool. Some stars expand into "red supergiants" when they run out of hydrogen. If the conditions are right, these red supergiants then explode in a huge, violent blast called a **6** _____. In some cases, what is left may become a black hole. Black holes are like giant vacuum cleaners in space that suck up everything around them, including light.

Our Sun is still a **7** _____, though it is already billions of years old. It will be many more billions of years before it begins to die.

Task 21. Check your understanding of the text above by circling the letter of the best answer.

1. A "protostar" becomes a star
- **(A)** after it grows into a red giant
- **(B)** after it explodes as a supernova
- **(C)** when helium appears in its core as a result of hydrogen fusion
- **(D)** when a spinning ball of dust and hydrogen becomes dense enough to start glowing

2. When hydrogen fusion in the core ceases for the most part except a thin layer outward,
- **(A)** a star turns into a red supergiant
- **(B)** hydrogen takes up the entire core of a star
- **(C)** a "protostar" is born
- **(D)** a star becomes a dwarf

3. 40 million km is the distance
- **(A)** from the Earth to the Sun
- **(B)** to the centre of the universe
- **(C)** to the second nearest to the Earth star
- **(D)** from the Earth to the nearest planet

4. Which of these is NOT true about a star?
- **(A)** A star originates from a "protostar" in the process of hydrogen fusion.
- **(B)** Because of radioactive reactions, stars are extremely hot.
- **(C)** Stars emit light and heat when burning hydrogen into helium.
- **(D)** When a "protostar" runs out of hydrogen, it explodes.

5. "Glowing gas" in paragraph 3 denotes
- **(A)** hydrogen
- **(B)** helium
- **(C)** black hole
- **(D)** light

CONSOLIDATION

Task 22. Complete the text with suitable words. Some letters have been given for you.

The solar system is the Sun and the objects that travel around it. The Sun is a star similar to other stars in the sky but it is much **(1) _ l_ _ _r** to the Earth. The Sun is mostly a big ball of gases composed mainly of hydrogen and **(2) _ e _ i _ _**.

There are eight planets that **(3) _r_ v_ _** around the Sun. It takes Mercury less than two months or 88 days to travel around the Sun. It is the **(4) _ _o _t_ _t** time compared to

the other planets. The planet taking the longest time to go around the Sun is Neptune. It takes Neptune almost 165 years to revolve around the Sun.

The planets of the solar system are also a variety of **(5) _ _z _ s** and are made up of different **(6) _ _b_ _ a _ c_ _**. The largest planet in the solar system is Jupiter. Over 1,000 Earths could fill the size of Jupiter. The smallest planet is Mercury, which is also the closest planet to the Sun. Earth and Venus are **(7) _ _ m _ l_ r** in size to each other.

The four inner planets, Mercury, Venus, Earth, and Mars are made of rock containing many different **(8) _ _ n _ r _ _s**. The four outer planets, Jupiter, Saturn, Uranus, and Neptune are mostly made up of different gases. Jupiter is mainly helium, **(9) _ _ d _o_ _ _**, and water. The four outer planets also have rings that encircle them, with Saturn having the most rings.

Other objects in space include the moons of six planets. A moon is a **(10) _e _e _t _ _l** object that orbits another body in space. There are approximately 173 moons throughout the solar system. Earth has a single moon; Mercury and Venus have none, and the planet with the most moons is Jupiter, with 63. Not far behind Jupiter is Saturn, with 62 moons.



Task 23. Complete the text with the most appropriate word from (A – N) for each gap. You will not need one word. The first one is done for you (0).

The four planets closest to the Sun are grouped together as the **(0)** ***inner*** planets. They have **(1) …..** surfaces and are often called terrestrial planets.

Mercury has neither **(2) …..** nor an atmosphere. Its surface is covered with **(3) …..** . A magnetic field suggests that it has an **(4) …..** core. Venus is often called Earth's sister or twin planet due to a similar composition, **(5) …..** and size. Venus rotates very slowly in a **(6) …..** direction called retrograde rotation. Venus is surrounded by a very dense atmosphere composed of carbon dioxide and **(7) …..** acid clouds. Due to the greenhouse effect, Venus has the hottest **(8) …..** temperature among the planets. Craters and active volcanoes cover the surface of the planet.

The presence of liquid water and its **(9) …..** atmosphere make Earth habitable for millions of living organisms. The Earth rotates in a **(10) …..** direction. Mars has a very thin **(11) …..**, composed primarily of carbon dioxide. The surface is cold, dry, and dusty, with frozen ice caps found at the Poles. Landforms and rover samples indicate that in the past there were large amounts of liquid water on its surface. The largest **(12) …..** in the solar system, Olympus Mons, is in Mars' western hemisphere.

A	atmosphere	**B**	sulfuric	**C**	volcano
D	gravity	**E**	rocky	**F**	frozen
G	craters	**H**	clockwise	**I**	moons
J	surface	**K**	oxygen-rich	**L**	iron
M	counterclockwise	**N**	**inner**		



Task 24. Read the text about the outer solar system planets and decide which answer (A, B, C, or D) best fits each gap. There is an example at the beginning (0).

The outer planets beyond Mars are the giant planets. Known as **(0) Jovian** planets, they are much larger and spaced further apart than the inner planets.

Jupiter is primarily composed of **(1) _____**, and its magnetic field indicates that it may have a rocky core. It has a giant **(2) _____** that is, actually, an enormous storm in its atmosphere. Saturn is known for its moons, strong **(3) _____**, and rings, which contain **(4) _____** particles with some dust and rock mixed in.

Uranus's cloudy atmosphere is mostly made up of helium and hydrogen, but also it has higher concentrations of **(5) _____** ammonia, water and methane. Like Venus, Uranus **(6) _____** on its axis in a clockwise direction called retrograde rotation.

Neptune is similar to Uranus in that it has a larger amount of frozen gases like **(7) _____**, water and ammonia, and therefore, it is also called an ice giant. The highest known wind **(8) _____** in the solar system are found on Neptune.

Up until 2006 Pluto was considered the ninth planet from the Sun. After intense studies, astronomers concluded that Pluto was actually a **(9) _____** planet in a region called the Kuiper Belt. **(10) _____** and other planetesimals are found in this region of our solar system.

0	**A**	Halley's	**B**	**Jovian**	**C**	Martian	**D**	Kuiper's
1	**A**	gases	**B**	iron	**C**	atmosphere	**D**	heat
2	**A**	helium	**B**	red spot	**C**	hydrogen	**D**	magnetic
3	**A**	volcanoes	**B**	convection	**C**	winds	**D**	magnetism
4	**A**	ice	**B**	electric	**C**	ozone	**D**	comet
5	**A**	dense	**B**	liquid	**C**	molecule	**D**	frozen
6	**A**	travels	**B**	spins	**C**	orbit	**D**	move
7	**A**	methane	**B**	bacteria	**C**	rock	**D**	ice
8	**A**	hurricane	**B**	thunder	**C**	speeds	**D**	rotates
9	**A**	meteor	**B**	sister	**C**	twin	**D**	dwarf
10	**A**	The Milky Way	B	asteroids	**C**	Sun	**D**	The Andromeda



Task 25. Give English equivalents of the words and word combinations below. Then, use them in a list of 10 questions you would like to ask a lecturer about the structure of the solar system and space bodies features.

A (Text "Family of the Sun") неосяжний простір; планети; астероїди; метеорити; крихітні молекули газу; сонячна система; простягатись; постачати енергію, світло й тепло; утримувати планети, комети й інші тіла на орбіті; планети земної групи; газові гіганти; кам'яниста поверхня; обертатись навколо Сонця; карликова планета**;** невиразна пляма світла; хвіст комети; струменіти(ся) /

випромінювати(сь); планета-гігант; Меркурій; Венера; Земля; Марс; Юпітер; Сатурн; Уран; Нептун; Плутон; згруповані зірки; галактика.

B (Text "Distant Fire") цікавитись нічним небом; називати(сь) на честь римських богів; величезна вогняна куля; виділяти тепло й світло (2) при згорянні; народитись із хмари пилу; притягувати до центру; водень; розжарена й крутна куля газу; вичерпати запас водню; щільний; світитись; синтез; гелій; охолоджувати(сь); розширитись до розмірів червоного надгігінта; потужно вибухнути; чорна діра; усмоктувати / поглинати світло.



Task 26. Render the following text in English. Make use of the essential vocabulary of the unit.

Всесвіт – це весь безмежний простір і все те, що його заповнює: небесні тіла (зірки, планети, комети тощо), газ, пил. Усі небесні тіла в космічному просторі взаємодіють між собою. Цю взаємодію називають всесвітнім тяжінням.

Сонячну систему утворюють Сонце і небесні тіла, що рухаються навколо нього. До її складу входить вісім великих планет: Меркурій, Венера, Земля, Марс, Юпітер, Сатурн, Уран, Нептун, їхні супутники, велика кількість малих планет (астероїдів), а також комети. Кожна планета рухається навколо Сонця своїм шляхом – орбітою. Сильне гравітаційне поле Сонця утримує планети на своїх орбітах. Від енергії Сонця залежать погодні умови і клімат на планетах, а також біологічне життя на Землі. Без Сонця життя на Землі було б неможливе. Планети обертаються також навколо своєї осі, причому у всіх планет, крім Венери й Урана, обертання відбувається проти годинникової стрілки. Усі планети, крім Меркурія та Венери, мають супутники.

Планети поділяються на дві групи, які відрізняються масою, хімічним складом, температурою на поверхні, швидкістю обертання та кількістю супутників. До земної групи належать ближчі до Сонця планети: Меркурій, Венера, Земля, Марс. Ці внутрішні планети мають порівняно невелику швидкість обертання, складаються здебільшого зі щільної кам'янистої речовини та металів, мають мало супутників, у них відсутні кільця. У трьох внутрішніх планет – Венери, Землі та Марса – є атмосфера; у всіх планет є кратери та вулкани. Земля має лише один супутник – Місяць, а Марс – два.

Чотири зовнішні планети – Юпітер, Сатурн, Уран, Нептун, які також називають газовими гігантами, – віддалені від Сонця, мають великі розміри, значною мірою складаються з водню й гелію, мають малу густину та є набагато масивнішими, ніж планети земної групи. Кожна з зовнішніх планет оточена кільцями пилу та інших часток. Юпітер має 16 супутників, Сатурн – 17.

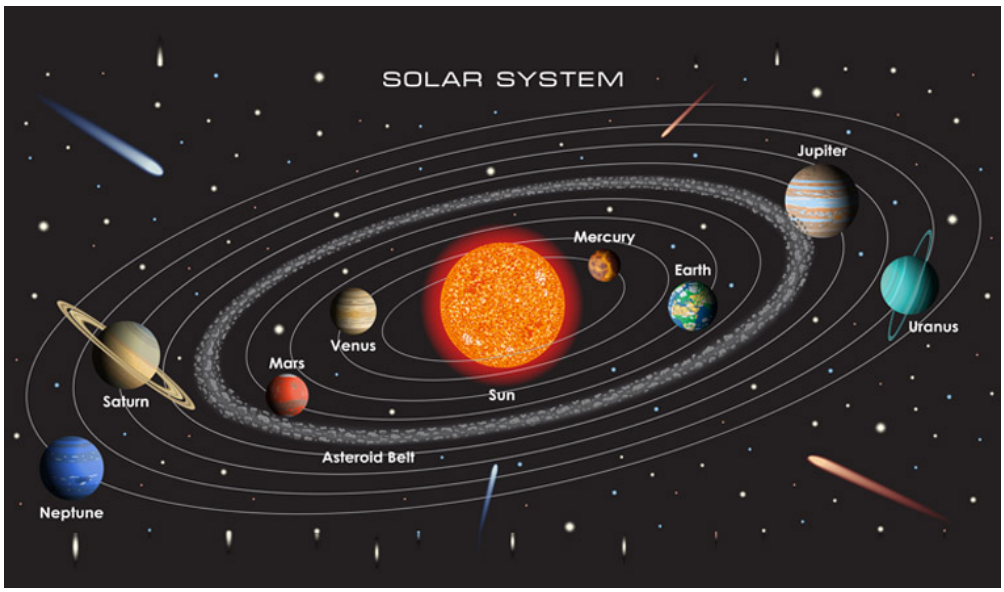


Task 27. Choose 5-7 key terms from the unit. Use a dictionary or your own words to define these terms. Write the definitions in the glossary.

Task 28. Review the topics covered in this unit. Suppose you are to participate in an international scientific workshop. Be an expert in one of the topics below. Deliver a report.

1. Groups of Planets in the Solar System
2. Moons in the Solar System
3. Stars: Formation, Classification, and Life Cycle
4. The Structure of the Sun and its Atmosphere
5. Minor Bodies of the Solar System
6. Galaxies and the Universe

Task 29. Speak on the topic "Solar System" for 3-4 minutes. Comment upon the supporting image below using the active vocabulary of the unit.



Task 30. Answer the question below in writing (up to 120 words). Use appropriate academic and specialized vocabulary. Consult any reference material if you need help.

Explain if and when it might become possible for humanity to inhabit other planets in the Universe.

UNIT 3

MATTER

L E A D – I N



Task 1. Discuss the following questions with a partner or in a small group.

- *What is matter? What meanings of the word do you know?*
- *What words and ideas do you expect to find in the reading and viewing about matter?*
- *Think about something you can hold in your hand. How is it different from something you pour (spill)? How is it different from the air you breathe?*



Task 2. Each row below contains words that are material and nonmaterial substances. Tick those you think are matter. Share your ideas in class.

1.	thought	milk	planet	dream	peach
2.	cloud	oxygen	heaven	philosophy	joy
3.	mud	light	glue	rock	heat
4.	star	ash	anger	CO_2	vine
5.	diamond	spirit	steel	skin	hair
6.	tree	leaf	brain	mind	emotion
7.	neon	fashion	traffic	jam	pollution
8.	blood	paper	idea	energy	sand

VOCABULARY



Task 3. Read and translate the sentences that contain the word "matter". Then, match each sentence to its proper meaning:

1. ***What's the matter with*** *Derek these days? He's acting so strangely.*
2. *I forgot to buy milk when I was in town. –* ***It doesn't matter****. We've got enough till tomorrow.*
3. *This is a* ***matter*** *for the police. We cannot deal with it ourselves.*
4. *These organisms feed mostly on decaying organic* ***matter****.*
5. *How much* ***matter*** *is there in the entire universe? – Scientists are not absolutely sure.*
6. *The interview was over* ***in a matter of*** *minutes.*
7. *He never answers emails,* ***no matter*** *how many you send him.*

(a) not important or significant;
(b) a particular type of substance;
(c) a little quantity or amount;
(d) a problem, trouble, or difficulty;
(e) a subject of concern; affair or question;
(f) regardless; irrespective of;
(g) physical substance in the universe.

Task 4 A. Look at the words in the box. Which of them can you pronounce correctly?

Specialized Content & General Academic Vocabulary	*amount artificial aurora charged conduct container definite empty examine figure out fit in flowing glow hold lack lightning liquid matter packed particle property resemble respond shape solid space spill spread take up tiny volume*

Task 4 B. Practise reading the transcribed words below. Then, identify them in the box in Task 4 A.

/ɔːˈrɔːrə/; /ˈlaɪtnɪŋ/; /ˈprɒpətɪ/; /ˌɑːtɪˈfɪʃəl/; /ˈvɒljuːm/; /kənˈdʌkt/; /ʃeɪp/; /ˈtaɪni/; /tʃɑːdʒd/; /əˈmaʊnt/; /ˈlɪkwɪd/; /kənˈteɪnə/; /spred/; /ˈpɑːtɪkəl; /ˈdefɪnət/.

Task 4 C. Write each word in the column that best describes what you know about it. Share your ideas with your partner. Then, consult a dictionary to check the meanings of the new words.

Don't know at all	I think I know the meaning	I know the meaning
…….	…….	…….
…….	…….	…….
…….	…….	…….

CORE BLOCK

READING & SPEAKING

Task 5. The following text will introduce you to the topic of matter. Read the text and translate the phrases with the words in bold into Ukrainian.

BEFORE YOU READ, DISCUSS IN PAIRS TO CHECK IF YOU KNOW

- in what forms water can exist
- how these words can be defined: *shape, mass, volume, empty space, electricity, charged particles, ions, fluorescent lights, auroras, lightning*
- what substances can spill, defuse, glow with light, remain in the same shape whether in a container or not
- why liquids and gases spread differently

FORMS OF MATTER

Everything found on Earth can be grouped into one of the four states of matter: **solid**, **liquid**, gas, or plasma. In order to **figure out** which state of matter an object **fits in**, we have to **examine** its **properties**. The properties we look at are **shape**, mass, and **volume**. Shape is the outer form of something that you see or feel, mass is the **amount** of matter an object has, and volume is the amount of **space** the matter **takes up**.

Solids have **definite** shape, mass, and volume. They are made up of **tiny particles** called atoms. These atoms are **packed** closely together, and they **hold** the solid in a definite shape that does not change. If you look around your house, you will see lots of solids: beds, tables, chairs, and even the food you eat.

Liquids do not have definite shape, but they do have definite mass and volume. Liquids are similar to solids because their atoms are close together, but what makes a liquid different is that those atoms can move around. Liquids can change shape by **flowing**.

Since liquids do not have a definite shape of their own, they will take the shape of their **containers**. If you have ever **spilled** a glass of milk, then you know it **spreads** out across the floor. It does this because the milk is taking the shape of the floor.

Gases do not have definite shape or volume. Like liquids, gases will take the shape of their containers. If a gas is not in a container, it will spread out indefinitely. This is because the atoms in a gas are spaced farther apart than in a solid or a liquid. Being spread out like this allows them to move around freely. Think about the air you breathe every day. That air is spread across the **empty** space around the earth. You have probably also noticed that you usually cannot see the air. This is another property of gases. Even though we cannot see them, you come in contact with them every day.

Most of the universe consists of plasma. Plasma is a state of matter that **resembles** a gas but has certain properties that a gas does not have. Like a gas, plasma **lacks** a fixed volume and shape. Unlike a gas, plasma can **conduct** electricity and **respond** to magnetism. That is because plasma contains **charged** particles called ions. This gives plasma other interesting properties. For example, it **glows** with light. Where can you find plasmas? The sun and other stars consist of plasma. Plasmas are also found naturally in **lightning** and the polar **auroras** (northern and southern lights). **Artificial** plasmas are found in fluorescent lights and plasma TV screens.

Task 6. Answer the following questions.

1. What is the most common state of matter in the universe?
2. What are the properties of matter?

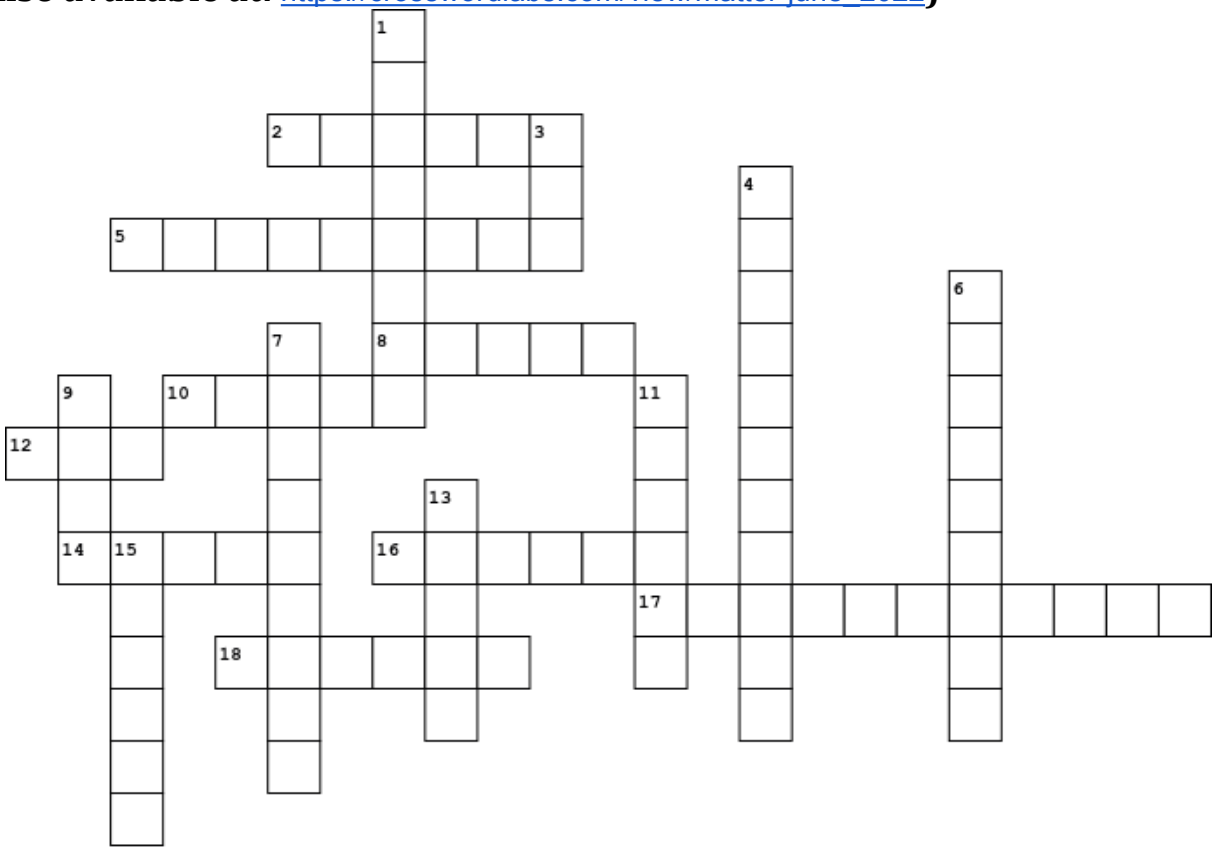
3. How are the particles arranged in solids?
4. How do the particles in a liquid move?
5. Which state of matter has the strongest forces of attraction between the particles?
6. Which state of matter has a definite volume, but does not have a definite shape?
7. Which state(s) of matter take(s) the shape of the container they are placed in?
8. What property do liquids and gases have in common?
9. Decide whether the following are a solid, liquid, gas, or plasma: *rock, mercury, methane, ice cube, neon sign, salt, soda, the Sun, nitrogen, carbon dioxide, sand, cell, oil, lightning, helium, flame, gasoline, water vapor.*



Task 7. Match each English word or phrase with its Ukrainian equivalent.

1.	solid *n.*	**a.**	блискавка
2.	liquid *n.*	**b.**	вміщувати, утримувати
3.	figure out *phr. v.*	**c.**	полярне сяйво
4.	fit *v.*	**d.**	крихітний
5.	examine *v.*	**e.**	реагувати, відповідати
6.	property *n.*	**f.**	нестача, відсутність
7.	shape *n.*	**g.**	світитися
8.	volume *n.*	**h.**	ємність, резервуар
9.	amount *n.*	**i.**	бути подібним, схожим
10.	space *n.*	**j.**	порожній
11.	take up *phr. v.*	**k.**	розливати
12.	definite *adj.*	**l.**	проводити
13.	tiny *adj.*	**m.**	текти
14.	particle *n.*	**n.**	скупчений
15.	packed *p.p.*	**o.**	тверда речовина
16.	hold *v.*	**p.**	заряджений
17.	flow *v.*	**q.**	простір
18.	container *n.*	**r.**	об’єм
19.	spill *v.*	**s.**	рідина
20.	spread *v.*	**t.**	штучний
21.	empty *adj.*	**u.**	підходити
22.	resemble *v.*	**v.**	кількість
23.	lack *adj.*	**w.**	усвідомлювати, вираховувати
24.	conduct *v.*	**x.**	властивість
25.	respond *v.*	**y.**	досліджувати, вивчати
26.	charged *p.p.*	**z.**	частинка
27.	glow *v.*	**aa.**	розповсюджуватися
28.	lightning *n.*	**bb.**	визначений, певний
29.	aurora *n.*	**cc.**	форма
30.	artificial *adj.*	**dd.**	займати

Task 8. Solve the crossword. Refer to the text "*Forms of Matter*" and your essential vocabulary.
(Also available at: https://crosswordlabs.com/view/matter-june_2022**)**



Across

2. a natural light display in the sky that is caused by particles from the Sun interacting with the planet's magnetic field
5. something such as a box or bottle that is used to hold or store things in
8. the energy from the Sun or fire and from electrical devices that allows you to see clearly
10. the particular physical form or appearance of something
12. a substance (such as oxygen or hydrogen) that is like air and has no fixed shape
14. an empty area that is available to be used
16. the amount of space that a substance or object occupies

Down

1. extremely small piece of matter
3. a mixture of gases (especially oxygen) required for breathing
4. producing bright light by using some forms of radiation
6. the flashes of light that are produced in the sky during a storm
7. the natural power of some objects and substances, especially iron, to attract other objects towards them
9. the quantity of matter which a body contains
11. a flat panel or area on an electronic device such as a television, computer, or smartphone, on which images and data are displayed

17. a form of energy that provides power to motors and devices that create light or heat

18. a substance that is able to flow freely like water

13. a firm object or substance that has a fixed shape, not a gas or liquid

15. a substance that is similar to a gas but that can carry electricity



Task 9. Find words in the text which have these meanings.

1. having or containing nothing *(adj.)* .....

2. react quickly to a stimulus *(v.)* .....

3. the smallest particle of a chemical element that can exist *n.)* .....

4. made or produced by human beings rather than occurring aturally *(adj.)* .....

5. cause or allow liquid to flow over the edge of its container *v.)* .....

6. without fixed or specified limit *(adv.)* .....

7. have similar qualities in common with something; look or eem like *(v.)* .....

8. move apart so as to cover a wider area *(v.)* .....



Task 10. Find words or phrases in the text that are synonyms for the following:

1. quality, characteristics ……

2. keep, control ……..

3. understand, calculate ……..

4. shine, flush …….

5. inspect, study ……..

6. occupy, fill up …….

7. quantity ……

8. area, place ……



Task 11. Do a multiple-choice quiz. Choose the correct option.

1. Which is NOT matter?

a) something that you can touch, see, feel, or smell

b) any type of energy or abstract concept

c) everything that has mass and takes up space

d) the substance of which any physical object consists of

2. ..... have a definite shape and volume. They maintain their shape.

a) liquids

b) gases

c) plasmas

d) solids

3. ..... produce electric currents.

a) solids
b) liquids
c) gases
d) plasmas

4. Which is a synonym for *"glow"*?
a) charge
b) electricity
c) shine
d) lightning

5. The word *"property"* means
a) owner
b) feature
c) research
d) container

6. Which does NOT mean *"to figure out"?*
a) take up
b) calculate
c) understand
d) discover



Task 12. Use the words *in italics* **to complete the sentences. You will not need two words.**

flow solids tiny examined conduct properties lightning shape definite responded empty aurora fit spill liquid lack artificial hold spread container amount resemble

1. The ……was so close, we were afraid it might strike a tree or the house.
2. This bookcase is too unstable to …….. so many books.
3. We put our cans and bottles in a(n) …… for recycling.
4. The milk will …….. if you aren't careful.
5. While camping in the north one summer, we enjoyed the beautiful sight of a(n) ……. in the night sky.
6. I have no …….. plans for Friday night.
7. He can walk now with a(n) …… leg.
8. Her dolls live in a …….. house.
9. She had to cancel her vacation because of a(n) …… of money.
10. The patient ……. well to the treatment.
11. They stopped the ……. of water by building a dam.
12. This …… of snow is not enough for skiing.
13. Wood and steel are …….
14. The house will be …… while we are on vacation.
15. I like the song, but it does not …… the occasion.

16. Those wires …….. electricity to our house.
17. Strength is one of the useful ……. of steel.
18. They both have brown eyes but do not otherwise …….. each other.
19. We …… an insect with a magnifying glass.
20. Anne sorted the blocks by ……, cubes on the left and cylinders on the right.

VIEWING & SPEAKING



Task 13. Watch a video to learn how the four states of matter differ in shape and volume.

BEFORE YOU WATCH

- In groups or pairs, decide how many properties of solids, liquids, gases, and plasmas you can list. Share your findings in class.
- Can you predict which states of matter the words and expressions below will characterize?

very slowly	*positively charged*	*density*	*energy*	*surface tension*
tightly packed	*set free*	*slower*	*compressible*	*negatively charged*
diffuses	*incompressible*	*mix*	*high*	*conduct*	*easily*

AFTER YOU WATCH

- Check how many predictions of yours were true.
- The summary of the video is given below. Use the prompts in the table above to complete the text.

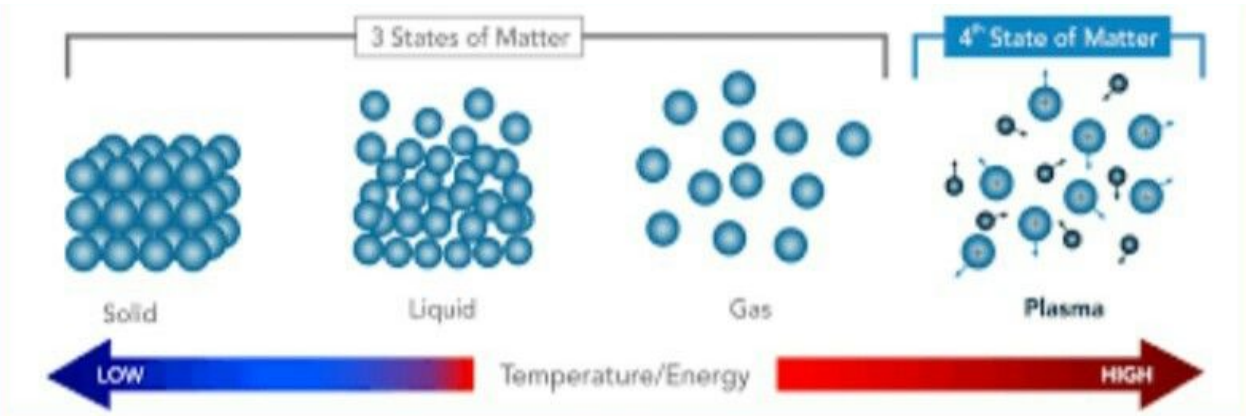
Gas is easily **(1)** _____, has a very low **(2)** _____ and **(3)** _____ quite easily. Liquid is **(4)** _____, diffuses fairly **(5)** _____ and has a unique quality called **(6)** _____. Liquids are able to **(7)** _____ with other liquids, but it is a **(8)** _____ mixing than in gases. In a liquid, the molecules are more **(9)** _____ than in gas, but can still move and flow past each other. Solids have **(10)** _____ density and are incompressible. They diffuse **(11)** _____. Plasmas contain so much **(12)** _____ that the electrons in the atoms are **(13)** _____, which enables the plasma to easily **(14)** _____ energy. In plasma **(15)** _____ free electrons and **(16)** _____ ions exist together.

LEARN MORE!

Task 14. One of the students has put properties of solids, liquids, gases, and plasma in a table, but he / she has got some of the information wrong. Correct the student's table.

	Solids	Liquids	Gases	Plasma
1.	do not change shape	take the shape of their containers	are hard to contain with no shape	has indefinite shape or volume unless enclosed in a container
2.	there is little space between particles	particles are at a great distance from each other	there is little space between particles	particles carry electrical currents and generate magnetic fields
3.	particles move freely and slowly	particles are fast moving and spread apart from each other	particles do not move and have fixed positions	
4.	have no volume	have no volume	have fixed volume	

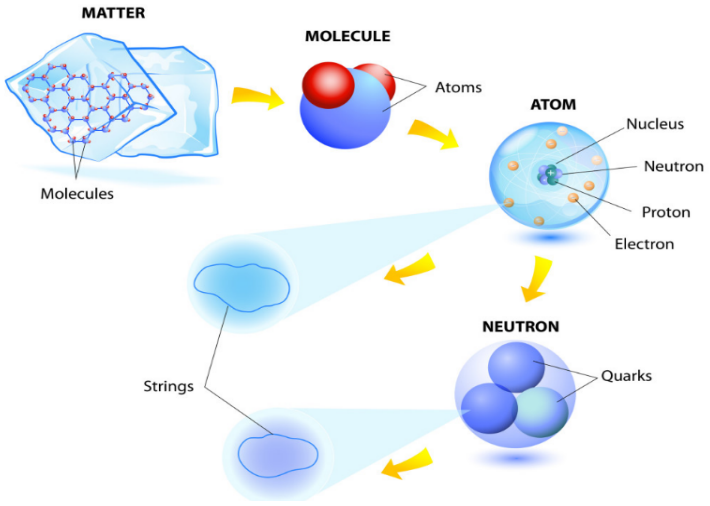
Task 15. Look at the image and describe each state of matter (solid, liquid, gas, or plasma) using the ideas from the chart below.



		Solid	Liquid	Gas	Plasma
1.	It is too energetic and hot.				
2.	The particles move quickly.				
3.	It fills any container you put it in.				
4.	It flows from one container to another.				
5.	It produces electric currents.				
6.	It feels hard.				
7.	It is wet.				
8.	It is usually invisible.				
9.	The particles move slowly about.				

10.	It does not have a fixed volume or shape.				
11.	It spreads to fill the bottom of a container.				
12.	It spreads out in all directions.				
13.	It is affected by magnetic field.				
14.	It has a fixed volume, but it changes shape.				
15.	The particles are spread far apart.				
16.	The particles are fairly close together.				
17.	The particles are packed close together.				
19.	The particles do not attract each other.				
20.	The particles attract each other weakly.				
21.	The particles attract each other strongly.				
22.	The particles are not in a pattern.				
23.	The particles have almost no movement energy.				
24.	The particles have a weak pattern.				
25.	The particles are in a fixed pattern.				
26.	It emits radiation.				
27.	We cannot feel it.				
28.	It keeps its own shape.				

Task 16. Comment upon the image. What is the structure of matter? Match the terms with the proper definitions.



· *atom* · *compound* · *electron* · *ion* · *molecule* ·*neutron* ·*nucleus* ·*proton* ·*quark*

1. a positively charged subatomic particle ……

2. a particle with an atomic nucleus and no electrical charge ……

3. the smallest unit of any chemical element, consisting of a nucleus surrounded by electrons, neutrons, and protons ……..
4. a negatively charged subatomic particle ……
5. one of the basic constituents of matter that make up protons and neutrons …….
6. the centre of the atom, it contains protons and neutrons …….
7. an electrically charged atom ……
8. a pure substance composed of two or more elements whose composition is constant
……
9. a group of atoms bonded together which represent the smallest fundamental unit of a chemical compound that can take part in a chemical reaction ……

EXTENSION

VIEWING AND SPEAKING



Task 17. Watch a video about the states and properties of matter.

BEFORE YOU WATCH

- Note down three things you know about matter. Compare your list with your desk-mate's.
- Use a dictionary to check the meanings of the words in the box. Ask your teacher or group mates for help where necessary.

chemical makeup mass color texture flexibility invisible density magnetism reactivity flammability iron oxide evaporation condensation

- Think how each state of matter can be characterized. Place three suggestions under each heading. Share your findings in class.

Solids	*Liquids*	*Gases*
		Example: 1. Gases are invisible and often flammable.

AFTER YOU WATCH

- As you watch, add other properties to each state of matter.
- Make TRUE statements with the words below. *Some of the words may be used more than once.*

gases liquids solids substance condensation physical properties matter chemical properties evaporation

1. _____is everything that takes up space and has mass.
2. _____ is a type of matter that is pure and has a specific chemical makeup.
3._____ include mass, color, texture, flexibility, density, and magnetism.
4. _____ are related to how matter can react and change into other materials.
5. _____ of wood are that it is flammable and can change into smoke and ash.
6. _____ can be measured and observed and do not change the composition of matter.
7. _____ are the states of matter – solid, liquid or gas.
8._____can change from one state to another through a change and temperature.
9. _____ keep up shape and always take up the same amount of space.
10. _____ can flow and change their shape depending on the container they are in.
11. _____ are often invisible and fill up a container they are in.
12. _____ turns water into water vapor when it boils.
13. _____ takes place when water vapor cools and changes vapor to liquid.

READING & SPEAKING

Task 18. Read the text about how matter can be characterized and what changes can affect it.

BEFORE YOU READ

DISCUSS IN GROUPS AND SHARE IN CLASS

- whether matter and substance mean the same
- how a substance can respond to change
- if solids, liquids, and gasses have identical properties
- what properties water has

IN PAIRS, CHECK THE MEANINGS OF THE WORDS. HOW CAN YOU USE THEM TO DESCRIBE MATTER?

measure density length width height atomic molecular mixture odour firewood ash rust

AFTER YOU READ

MATCH THE HEADINGS FROM A-G WITH PARAGRAPHS 1-7.

A. *A New Substance*
B. *$Fe+H_2O$*
C. *Like Salads or Burgers*
D. *New Properties*
E. *What is in a Change: Visible vs Hidden*
F. *One Thing in All States of Matter*
G. *A Change of Size and Shape*

CHOOSE ANY HEADING AND ASK YOUR PARTNER TO DWELL ON IT.

PROPERTIES AND CHANGES

1. ___ Matter can be described and identified by physical and chemical properties. Physical properties have to do with appearance. You can observe many physical properties with your senses and by measuring the length, width, height, mass and density of a substance. Physical properties include color, shape, smell, texture, taste and size. The state of matter (whether it is a solid, liquid, or gas) and the temperature at which the substance boils, melts or freezes are also physical properties. Magnetic properties are physical properties as well. Chemical properties, on the other hand, have more to do with the atomic or molecular composition of matter. Chemical properties deal with how substances react with other substances such as water, air, or fire.

2. ___ Changes to matter happen all the time. A physical change to matter is a change that does not create a new substance, or object. A physical change in matter only changes the form of the substance. For example, think about using scissors to cut a piece of paper in half. The scissors change the size of the paper into smaller pieces. However, the object is still paper. Another example of a physical change to matter is chopping wood. When a tree is chopped into smaller pieces for building materials or firewood, this is a physical change. The wood from the tree is in smaller pieces. However, it is still wood. Also, think about what would happen if you accidentally dropped a glass jar. The pieces of glass may break into small parts, yet they are still glass.

3. ___ Water can go through several physical changes. When water is frozen, it turns into its solid state of matter known as ice. The ice is still made of water. Therefore, it is a physical change. Ice can melt and turn into a liquid form of water. The liquid form of water can also be heated and turned into a gas called water vapor.

4. ___ Physical changes to matter can also happen when different objects are mixed together. This is a physical change only if the objects are not permanently combined. For instance, to make the snack trail mix, people combine nuts, raisins, and candy. This is a physical change because all of these objects remained the same and can be separated from the mixture.

5. ___ A chemical change in matter is a change that creates a new substance. Usually, a chemical change is irreversible, or cannot be changed back. Often, scientists call chemical changes chemical reactions. Some chemical changes happen very slowly and are difficult to notice just by looking with your eyes. At other times you can tell a chemical change has occurred because a gas, light, odor, heat, or different color is produced.

6. ___ When a chemical change occurs, objects have new properties. Properties can include color, luster, hardness, odor, and how they interact with other substances. An example of a chemical change is burning fire wood. When wood is lit on fire, it causes the wood to burn. A chemical change occurs and the wood turns into ash. The properties of wood, such as hard and brown, have now changed to black and a powder-like softness.

7. ___ Another example of a chemical change is when rust forms. The iron in metal objects such as cars reacts with oxygen to form rust. The water and oxygen cause a chemical change to the iron and rust forms.



Task 19. Check your understanding of the text above by ticking the letter of the best answer.

1. A physical change to matter DOES NOT
- **(A)** change the shape of a substance
- **(B)** form a new substance
- **(C)** change the state of a substance
- **(D)** break the wholeness of a substance

2. Which of the following IS an example of a chemical change to matter?
- **(A)** chopping wood
- **(B)** cutting paper
- **(C)** breaking glass
- **(D)** rusting of metal

3. Which of these does NOT refer to physical properties of matter?
- **(A)** boiling, melting, and freezing temperatures of a substance
- **(B)** mass and density of a substance
- **(C)** reactivity and atomic composition of a substance
- **(D)** color, shape, smell, and texture of a substance

4. A chemical change to matter occurs when
- **(A)** two substances combine to produce a different substance with new properties
- **(B)** a solid disintegrates into smaller pieces
- **(C)** a liquid melts or freezes
- **(D)** a gas is condensed into a liquid

5. Chemical changes to matter
- **(A)** are irreversible and cannot be changed back
- **(B)** are a melting or freezing point of a substance
- **(C)** can be observed, sensed or measured
- **(D)** have to do with a substance appearance



Task 20. Identify the following as a chemical (C) or physical property (P).

1. blue color _____
2. density _____
3. flammability _____
4. solubility _____
5. reacts with acid _____
6. sour taste _____
7. melting point _____
8. hardness _____
9. boiling point _____
10. luster _____
11. odor _____
12. reacts with air _____
13. reacts with water _____
14. scratches glass _____

Task 21. Match each example of a physical property of matter with its definition. Use the terms in sentences of your own. Let your group-mates judge if they are true or false.

1.	density	**a.**	the ability to be pressed or pounded into a thin sheet
2.	ductility	**b.**	how well a substance allows electricity to flow through it
3.	malleability	**c.**	the temperature at which a substance changes from a solid to a liquid
4.	boiling point	**d.**	the ability to dissolve in another substance
5.	melting point	**e.**	the ability to be pulled into a thin strand, like a wire
6.	electrical conductivity	**f.**	the temperature at which a substance changes from a liquid to a gas
7.	solubility	**g.**	the amount of matter in a given volume

Task 22. Some of the following chemical properties of matter are mixed up. Write *TRUE* if the statement is correct or *FALSE* if it is wrong. Correct any false statements.

1. Oxidation is any process in which oxygen combines with an element or substance. ___
2. Toxicity is the ability of a substance to sustain fire. ___
3. Radioactivity is the rate at which a substance tends to undergo a chemical reaction. ___
4. Biodegradability is the quality or degree of being poisonous. ___
5. Flammability is the ability of some substances to give off rays which can be dangerous, but which can also be used, e.g. in medicine. ___
6. Ionization is the process of converting neutral atoms or molecules into charged particles. ___
7. Reactivity is the capability of a substance to decay through the action of living organisms. ___

Task 23. Identify the following as physical (P) or chemical (C) changes.

1. NaCl (table salt) dissolves in water. _____
2. Ag (silver) tarnishes. _____
3. An apple is cut. _____
4. Heat changes H_2O to steam. _____
5. Baking soda reacts to vinegar. _____
6. Fe (iron) rusts. _____
9. Milk sours. _____
10. Sugar dissolves in water. _____
11. Wood rots. _____
12. Pancakes are cooked. _____
13. Mixing salt and pepper. _____
14. A tire is inflated. _____

7. Alcohol evaporates. _____
8. Ice melts. _____
15. Food is digested. _____
16. Paper towel absorbs water. _____

CONSOLIDATION



Task 24. Complete the text with suitable words. Some letters have been given for you.

All matter is made of simple **(1) _ u _ _t_n_ _s** called elements. An element is a substance that cannot be **(2) br_ _e_** down into a simpler substance. There are about 120 known elements on Earth. Substances can be made of a **(3) _ i_ g _e** element. Pure iron, gold, and **(4) _ i l_ _r** are each made of a single element. They cannot be made into simpler substances.

But most substances we know of are a combination of two or more elements. Sugar is a substance made of three elements, while **(5) s _l _** is a substance made of two elements. This means that both sugar and salt can be broken down into the simpler elements they are made of. Each element can be identified using a symbol. Many symbols are the first one or two letters of the element's name. For example, helium is "He," carbon is "C," and oxygen is "O." Atoms are the smallest part of an element. If you could look into a gold coin, you would see that it is made of millions of gold atoms. If you could see inside a **(6) _ _l_o_n** filled with helium, you would see that the helium gas is made of millions of helium atoms.

The structure of an atom is in some ways like the structure of the solar system. In the solar system, planets orbit, or go around, the Sun. In an atom, **(7) _i_ y** particles called electrons orbit the **(8) _u_ _e_s**, or center of the atom. The nucleus of an atom is like the Sun around which planets revolve. The nucleus is made of two kinds of particles – protons and **(9) _ e_t_o_s**. All atoms of the same element have the same number of protons and **(10) _ _e _ _r_ _s**.



Task 25. Read the text and decide which answer (A, B, C, or D) best fits each gap. There is an example at the beginning (0).

Elements are substances that cannot be **(0)** ***decomposed*** or transformed into one another by ordinary chemical or physical means. The Earth **(1)** _____ only a limited number of elements, and all other materials consist of two or more of them combined in various ways. Of the 105 known elements (not all found on the Earth), 11 are gases, 2 are liquids, and the rest are solids at room temperature and atmospheric **(2)** _____. Hydrogen, oxygen, chlorine are familiar **(3)** _____ elements; **(4)** _____ and mercury are the two liquids; iron, zinc, tin, aluminum, copper, lead, silver, gold, carbon, and sulfur are among the solid elements. The **(5)** _____ particles of an element are called atoms. A molecule is a group of atoms that **(6)** _____ together **(7)** _____ enough to act as a unit. When two or more elements are combined

(8) _____, a compound is formed. Most compounds have physical and chemical properties that are different from the physical and chemical properties of the elements that formed them. Many common substances are made up of combinations of elements. Water is made up of hydrogen and oxygen. Sugar is made up of hydrogen, oxygen, and carbon. Sodium is a **(9) _____** metal that can be cut with a knife. Chlorine is a green gas. Both sodium and chlorine are **(10) _____** elements. Combined, they form a solid compound that can be eaten. You know this compound, sodium chloride, as table salt.

0	**A**	packed	**B**	grouped	**C**	**decomposed**	**D**	charged
1	**A**	consists	**B**	contains	**C**	fits	**D**	takes up
2	**A**	tension	**B**	stress	**C**	strain	**D**	pressure
3	**A**	spreading	**B**	flowing	**C**	gaseous	**D**	vapor
4	**A**	bromine	**B**	bromid	**C**	bromme	**D**	bromo
5	**A**	definite	**B**	ultimate	**C**	charged	**D**	artificial
6	**A**	resemble	**B**	spill	**C**	lack	**D**	stick
7	**A**	freely	**B**	slowly	**C**	tightly	**D**	definitely
8	**A**	chemically	**B**	naturally	**C**	artificially	**D**	physically
9	**A**	smooth	**B**	soft	**C**	easy	**D**	flexible
10	**A**	explosive	B	invisible	**C**	sticky	**D**	poisonous



Task 26. Complete the text about energy and states of matter with the most appropriate word from (A–N) for each gap. You will not need one word. The first one is done for you (0).

Why do different states of matter have different **(0) properties**? It is because of differences in energy at the level of atoms and molecules, the tiny **(1)** ..... that make up matter. Energy is the **(2)** …… to cause changes in matter. Energy that causes matter to move is called kinetic energy. According to the kinetic theory of matter, the particles that make up matter have kinetic energy and are **(3)** …… moving.

So why don't all the particles move **(4)** ……? Particles of matter of the same **(5)** ……, such as the same element, are attracted to one another. This force of attraction tends to **(6)** …… the particles closer together. The particles need a lot of kinetic energy to overcome the force of attraction and move apart. It is like a tug of war between opposing forces. The kinetic energy of **(7)** …… particles is on one side, and the force of attraction between different particles is on the other side. The outcome of the "war" depends on the state of matter.

In solids, particles do not have enough kinetic energy to overcome the force of attraction between them. The particles are **(8)** ..... closely together and cannot move around. All they can do is wiggle, or **(9)** ……, in place. This explains why solids have a fixed volume and a fixed shape.

In liquids, particles have enough kinetic energy to partly overcome the force of attraction between them. They can **(10)** …… past one another but not pull apart. This explains why liquids can **(11)** …… shape but have a fixed volume.

In gases, particles have a lot of kinetic energy. They can **(12)** …… overcome the force of attraction between them and move apart. This explains why gases have neither a fixed volume nor a fixed shape.

A	change	**B**	packed	**C**	substance
D	individual	**E**	spread	**F**	**properties**
G	particles	**H**	completely	**I**	vibrate
J	slide	**K**	pull	**L**	constantly
M	ability	**N**	apart		

 **Task 27. Give English equivalents of the words and word combinations below. Then, use them in a list of 5 questions you would like to ask a lecturer about matter, its states and properties.**

A (Text "Forms of Matter") стан матерії; текти; тверда речовина; розливатись / розсипатись; рідина; незаповнений простір; атом; містити; заряджені частки; газ; вільно переміщатись довкола; йон; штучний; певний / сталий; плазма; хаотично розосереджуватись; займати (місце, простір); з'ясувати / зрозуміти; дихати; дослідити / вивчити; об'єм; бракувати / не вистачати; проводити струм; властивість; розміщений більш віддалено; утримувати; реагувати на намагніченість; форма (х2); зовнішній; маса; флуоресцентне світло; щільно стиснуті один до одного; взаємодіяти; кількість матерії; обсяг простору; утворений / складений; крихітні частки; бути подібним (х2); розтікатись по підлозі; сяяти / випромінювати світло; блискавка; північне сяйво (х2); екран плазмового телевізора.

B (Text "Properties and Changes") фізичні й хімічні властивості; дрова; перетворюватись на водяну пару; зовнішній вигляд; попіл; тимчасово поєднаний; створити нову речовину; важко помітити; підпалити; горіти; впустити скляну банку; вимірювати довжину, ширину, висоту, масу і густину речовини; колір і текстура; форма і розмір; спалювання дров; виникати / траплятися; запах і смак; кипіти; взаємодіяти; замерзати; атомний (молекулярний) склад матерії; вступати в реакцію з іншими речовинами; рубати дрова; лід; нагрівати і танути; змішаний; поєднати горішки, родзинки й цукерки; роз'єднати; незворотний; хімічна реакція; аромат / неприємний запах; блиск; твердість / міцність; порошкоподібна пухка речовина; вступати в реакцію з киснем; утворювати іржу.



Task 28. Translate the following using the essential vocabulary of the topic.

1. Речовина – вид матерії, яка характеризується масою та складається з елементарних частинок (електронів, протонів, нейтронів, тощо). Терміном

хімічна речовина позначають головним чином матерію – речовину, організовану в атоми, молекули, тощо.

2. Фізичні та хімічні властивості речовин зумовлюються взаємодією між електронами та атомними ядрами, а також між атомами, молекулами, йонами. Хімічні речовини, що складаються з атомів одного виду, є простими, з атомів різних видів – складними. Складні хімічні речовини розділяються на органічні та неорганічні.

3. Відомі 4 агрегатні стани речовини: гази, тверді тіла, рідини, плазма. Кожна речовина має свої специфічні властивості, тобто ознаки, які визначають її індивідуальність і дають змогу відрізнити її від інших речовин.

4. Розрізняють фізичні й хімічні властивості речовин. До найважливіших фізичних властивостей належать запах, колір, смак, твердість, температури кипіння та плавлення, густина, розчинність у воді, ковкість, пластичність, здатність проводити тепло та електричний струм. Ці властивості виявляються при безпосередньому спостереженні.

5. Мідь можна відрізнити від інших речовин за її блиском і кольором. Деякі речовини легко впізнати за запахом, наприклад оцет, нашатирний спирт. Хімічні властивості речовин виявляються лише в процесі перетворення одних речовин на інші. Деякі метали, включаючи калій, за певних умов можуть перебувати у твердому та рідкому стані одночасно.



Task 29. Review the topics covered in this unit. Suppose you are to participate in an international scientific workshop. Be an expert in one of the topics below. Deliver a report.

1. Solid as a State of Matter
2. Liquid as a State of Matter
3. Gas as a State of Matter
4. Plasma as a State of Matter
5. The Structure of Matter
6. Physical Properties and Changes of Matter
7. Chemical Properties and Changes of Matter
8. Elements and Compounds



Task 30. Find a sample of matter in your house/ flat to observe. Describe some of its physical and chemical properties. How can it change, both physically and chemically? Give a couple of examples.

Examples: *furniture, a plant, a computer, a glass, a book, a shirt, a thermometer, a TV set, jewelry, a golden ring, a silver necklace, a dish, juice, soap, perfume, etc.*

Example: *I chose …….. Here is a description of its physical / chemical properties.*

UNIT 4



L E A D – I N

Task 1. Discuss the following questions with a partner or in a small group.

- *What do scientists do?*
- *How does scientific activity differ from other occupations?*
- *What do Earth scientists study?*
- *What jobs in Earth Science can you name?*
- *What research area are you most interested in?*

Task 2. Report briefly what you know about the discoveries made by these scientists.

Alfred Wegener *Charles Francis Richter* *Friedrich Mohs* *Inge Lehmann*
Louis Agassiz *Galileo Galilei* *Marie Tharp* *John Murray*
Anders Celsius *Gabriel Fahrenheit* *Andrija Mohorovičić*

VOCABULARY

Task 3. Describe what people are studying in each photo. What are their jobs?

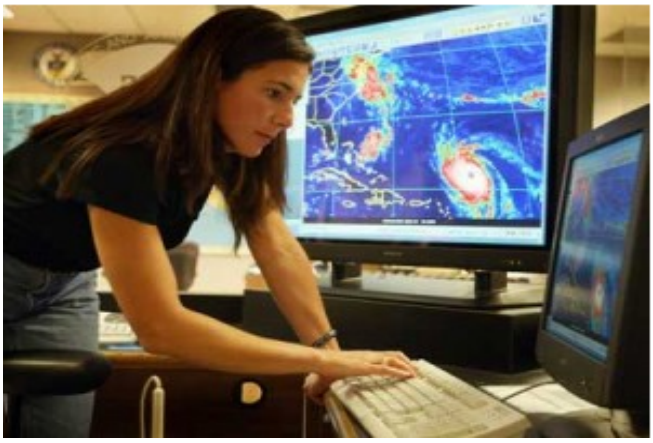




1



2



3



4



5

6

Task 4 A. Look at the words in the box. Which of them can you pronounce correctly?

Specialized Content & General Academic Vocabulary	*ancient area branch certain coal compare concern creature crust current deal depend distant earthquake enormous field force forecast fossil fuel hidden hurricane major marine oil pattern piece predict preserve response seismologist study turn*

Task 4 B. Practise reading the transcribed words below. Then, identify them in the box of Task 4 A.

/ˈpætn/; /ˈhʌrɪkən, -keɪn, ˈhɜːrɪkeɪn/; /ɪˈnɔːməs/; /ˈkriːtʃə(r)/; /kənˈsɜːn/; /ˈɜːθkweɪk/; /ˈkʌrənt, kɜːrənt/; /ˌsaɪzˈmɒlədʒɪst/; /məˈriːn/; /ˈfɔːkɑːst/; /ˈeɪnʃənt/; /ˈhɪdn/; /kəmˈpeə/; /piːs/; /ˈmeɪdʒə/.



Task 4 C. Write each word in the column that best describes what you know about it. Share your ideas with your partner. Then, consult a dictionary to check the meanings of the new words.

I don't know it at all	I think I know the meaning	I know the meaning
.....	.....	.....
.....	.....	.....
.....	.....	.....

CORE BLOCK

READING & SPEAKING

Task 5. The following text will introduce you to the topic of Earth Science. Read the text and translate the phrases with the words in bold into Ukrainian.

BEFORE YOU READ, DISCUSS IN PAIRS TO CHECK IF YOU KNOW

- how these notions can be defined: *fossil fuels, ocean basins, ocean currents, weather patterns, clouds, hurricanes, tornadoes, stars, asteroids, planets, rock*
- different specialists who study the Earth
- if Geology can explain the evolution of planet Earth in the past and future
- how the knowledge of Earth Science can be useful for people

STUDYING THE EARTH

The three **major fields** of science are Earth Science, Life Science, and Physical Science. Earth Science is the study of Earth and its history. It is also the study of changes on Earth and Earth's place in the universe.

Earth Science is like a jigsaw puzzle made up of four **pieces**. Each piece of the puzzle is a major **branch** of Earth Science. The four main branches of Earth Science are geology, oceanography, meteorology, and astronomy. Together, they make up the field of Earth Science.

Geologists study the **forces** that shape Earth. Geology is divided into many individual **areas**. For instance, the study of physical geology looks at the changes that take place inside the Earth and the reasons for those changes. Volcanologists study volcanoes. **Seismologists** study **earthquakes**. Mineralogists study minerals. Geochemistry is

concerned with the chemical elements that make up rocks, soil, and minerals. Petrology **deals** with rocks themselves. Paleontologists study life forms that existed on Earth millions of years ago, from the tiniest bacteria to the most **enormous** dinosaurs. But because these **creatures** died so many millions of years ago, their bodies have **turned** into fossils – living things **preserved** as rock. Petroleum geologists help locate **fossil fuels** such as **oil** and **coal** that lie **hidden** in the Earth's **crust**. Scientists who **compare** the geology of other planets to Earth are planetary geologists.

Another branch of Earth Science is oceanography. Oceanography is the study of the sea. Scientists who study oceanography are called oceanographers. Like geologists, oceanographers may focus on **certain** areas of oceanography. There are many branches of oceanography. Physical oceanography is the study of water movement, like **waves** and ocean **currents**. **Marine** geology looks at rocks and structures in the ocean basins. Chemical oceanography studies the natural elements in ocean water. Biological oceanography studies the living things in the oceans.

Meteorology includes the study of weather **patterns**, clouds, **hurricanes**, and tornadoes. Using radars and satellites, meteorologists work to **predict**, or **forecast**, the weather. Climatologists study the atmosphere. These scientists work to understand the climate as it is now. They also study how climate will change in **response** to global warming.

Astronomy is the **study** of the universe. Astronomers are scientists who study stars, asteroids, planets, and other objects in space. Most objects in space are very far away. Therefore, astronomers **depend** on technology to help them study these objects. For example, astronomers may use telescopes to study **distant** stars and planets. Astronomers use information about other planets and stars to learn more about the Earth. For example, some astronomers study **ancient** stars in the universe. The information they gather can help them predict how changes in our Sun may affect the Earth.

Task 6. Work with a partner. Ask and answer questions about the text to complete the table. Supply your own reasoning where necessary. Share your ideas in class.

	Subject	Earth Scientist	Purpose
1.	oil and coal	_____	_____
2.	changes inside the earth	_____	_____
3.	_____	seismologist	_____
4.	_____	volcanologist	to predict most probable eruptions
5.	bacteria	_____	_____
6.	rocks	_____	_____
7.	minerals	_____	_____
8.	_____	oceanographer	_____

9.	waves and water currents	_____	_____
10.	ocean basins	_____	_____
11.	atmosphere	_____	to understand the climate as it is now and study how it will change
12.	_____	biological oceanographer	_____
13.	_____	meteorologist	_____
14.	stars, planets, asteroids	_____	to study the history of the universe



Task 7. Match each English word or phrase with its Ukrainian equivalent.

1.	ancient *adj.*	**a.**	сила
2.	area *n.*	**b.**	залежати
3.	branch *n.*	**c.**	порівнювати
4.	certain *adj.*	**d.**	схований
5.	coal *n.*	**e.**	земна кора
6.	compare *v.*	**f.**	нафта
7.	concerned *adj.*	**g.**	віддалений
8.	creature *n.*	**h.**	дослідження
9.	crust *n.*	**i.**	хвиля
10.	current *n.*	**j.**	морський
11.	deal *v.*	**k.**	передбачати
12.	depend *v.*	**l.**	значний, великий
13.	distant *adj.*	**m.**	модель, шаблон
14.	earthquake *n.*	**n.**	паливо
15.	enormous *adj.*	**o.**	зберігати
16.	field *n.*	**p.**	область
17.	force *n.*	**q.**	частина, шматок
18.	forecast *v.*	**r.**	відповідь, реакція
19.	fossil *n.*	**s.**	перетворювати
20.	fuel *n.*	**t.**	стародавній
21.	glaciology *n.*	**u.**	потік
22.	hidden *adj.*	**v.**	землетрус
23.	hurricane *n.*	**w.**	зацікавлений
24.	major *adj.*	**x.**	сфера
25.	marine *adj.*	**y.**	мати справу з
26.	oil *n.*	**z.**	галузь
27.	pattern *n.*	**aa.**	викопні рештки
28.	piece *n.*	**bb.**	величезний
29.	predict *v.*	**cc.**	ураган

30.	preserve *v.*	**dd.**	наука, яка вивчає льодовики
31.	response *n.*	**ee.**	певний
32.	study n.	**ff.**	прогнозувати
33.	turn *v.*	**gg.**	вугілля
34.	wave *n.*	**hh.**	істота



Task 8. Match the words and definitions.

1.	branch *(n.)*	**a.**	say that something will happen in the future
2.	distant *(adj.)*	**b.**	change in nature, state, form, or colour
3.	predict *(v.)*	**c.**	animal or person
4.	pattern *(n.)*	**d.**	extremely large in size or amount
5.	creature *(n.)*	**e.**	a hardened layer on the surface of something
6.	turn into *(v.)*	**f.**	a part of something larger
7.	crust *(n.)*	**g.**	the repeated or regular way in which something happens
8.	enormous *(adj.)*	**h.**	far away in space or time

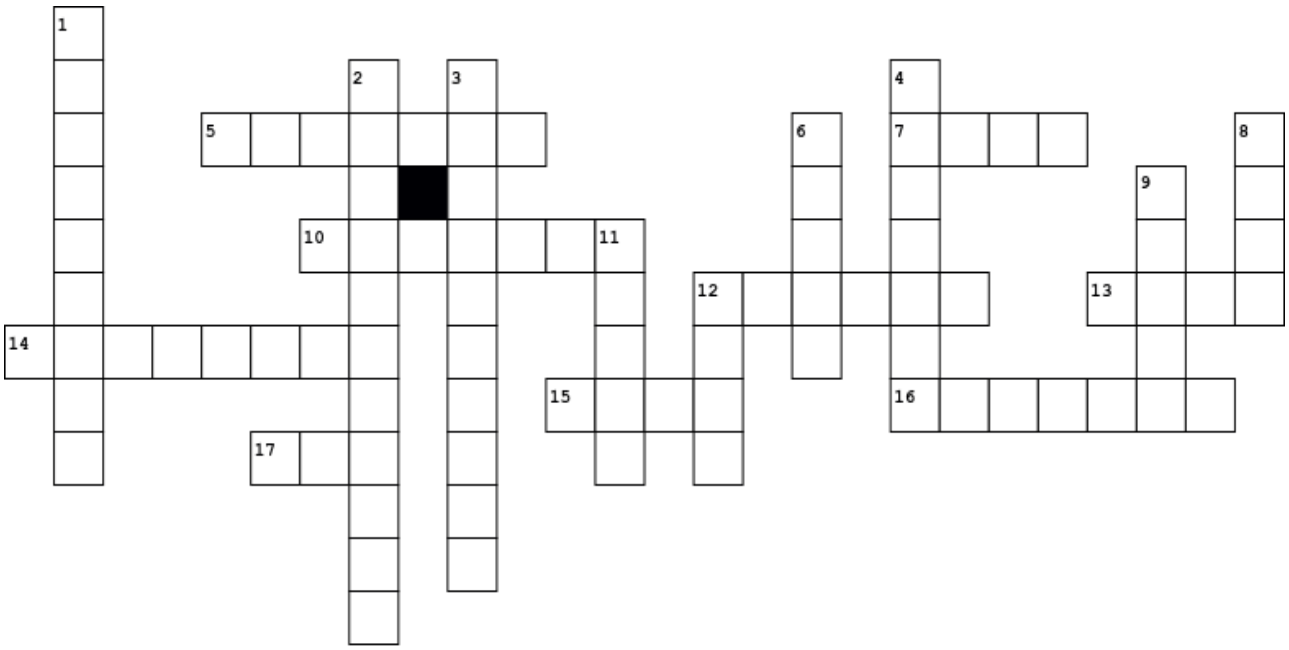


Task 9. Find words in the text which have these meanings.

a) a mountain from which hot melted rock, gas, steam, and ash from inside the earth sometimes burst *(n.)*	……
b) a sudden violent shaking of the ground *(n.)*	……
c) that most people do not know about *(adj.)*	……
d) an extremely violent wind or storm *(n.)*	……
e) a steady and continuous flowing movement of some of the water in a river, lake, or sea *(n.)*	……
f) relating to or found in the sea *(adj.)*	……



Task 10. Solve the crossword (refer to the text *"Studying the Earth"*).
(Also available at: https://crosswordlabs.com/view/earth-science_1-32)



Across

5. a substance that is naturally present in the earth and is not formed from animal or vegetable matter, for example gold and salt

7. the hard solid material that forms part of the surface of the Earth and some other planets

10. the condition of the atmosphere at a particular place and time, such as the temperature, and if there is wind, rain, sun, etc.

12. the parts of a dead animal or a plant that have become hard and turned into rock

13. a hard black mineral that is found below the ground and burnt to produce heat

14. an animal that lived millions of years ago but now no longer exists

15. a raised line of water that moves across the surface of the sea, ocean, etc.

16. a violent storm with very strong winds that move in a circle

Down

1. someone whose job is to do research in science

2. the scientific study of the Earth's atmosphere and its changes, used especially in predicting what the weather will be like

3. a sudden, violent shaking of the Earth's surface

4. to say that something will happen in the future

6. the outer layer of rock that forms the surface of the Earth or another planet

8. the top layer of the earth in which plants, trees, etc. grow

9. a grey or white mass that floats in the sky, made of very small drops of water

11. a system that uses radio waves to find the positions of objects and watch their movement

12. any material that produces heat or power, usually when it is burnt

17. a thick liquid that is found in rock underground



Task 11. Do a multiple-choice quiz. Choose the correct option.

1. …….. are the parts of a dead animal or a plant that have become hard and turned into rock
a) creatures
b) dinosaurs
c) fossils
d) forces

2. Which is a synonym for *"to predict"*?
a) mitigate
b) deal with
c) forecast
d) focus on

3. Which word is similar in meaning to *"composition"*?
a) crust
b) content
c) concern
d) current

4. Which word is the opposite of *"major"?*
a) tiny
b) essential
c) integrated
d) preserved

5. Which does NOT mean *"branch"*?
a) area
b) sphere
c) field
d) pattern

6. Earth Science ……..
a) is a branch of geology
b) is made up of 4 branches
c) examines every living thing on Earth
d) focuses on matter, energy and the way the universe behaves

7. A geologist would be most likely to investigate how
a) mountains form
b) people affect Earth
c) tornadoes occur
d) stars form and evolve

8. A petrologist studies……

a) the processes of sediment formation
b) rocks and the conditions under which they form
c) how water interacts with the natural environment of rocks and soils
d) the physical properties and movement of ice sheets

9. Chemical oceanography is the study of the ……
a) human pollution of ocean water
b) rising levels of ocean water
c) naturally occurring elements in ocean water
d) rocks on the ocean floor

10. ……. are scientists who study space.
a) astronauts
b) meteorologists
c) astronomers
d) rocket scientists



Task 12. Use the words *in italics* to complete the sentences. You will not need two words.

compared deal hides force response major crust enormous distant currents turn areas fuels pieces depends certain forecasts concerned preserve earthquake ancient marine

1. The weather report …… rain for this afternoon.
2. The blue whale is an …….. animal that can be over one hundred feet in length.
3. Fossils of …….. life in the rock showed that the area had once been under water.
4. …… members of the audience may disagree with what I'm about to say.
5. Using this polish will help …… the wood.
6. The ……. caused roads to crack, buildings to topple, and hundreds of fires to break out in the city.
7. The ocean …….. affect the speed of the ship.
8. Smoking is one of the …… causes of cancer.
9. Their future ……. on how well they do in these exams.
10. Archaeologists study the remains of …….. civilizations.
11. Global warming may be caused by burning fossil ……...
12. There was more rainfall than usual this summer in the mountains …….
13. As a cook, he never has to ……. with the customers.
14. During this time, the Earth's …….. cooled enough that rocks and continental plates began to form.
15. The artificial Christmas tree came in several …… in the box.
16. Dinosaurs roamed the Earth in the …….. past.
17. The cat always ……. in the closet when guests come.
18. The police …… the two sets of fingerprints and found that they didn't match.
19. The …….. of the hurricane knocked down the trees.

20. Many politicians are more …… with power and control than with the good of the people.

VIEWING & SPEAKING



Task 13. Watch a video about Earth Science to learn how diverse it is and how advances in its branches help our lives.

BEFORE YOU WATCH

- Can you guess what these sciences are about by reading their names?

Biology *Geology* *Meteorology* *Oceanography* *Astronomy* *Limnology* *Volcanology* *Seismology*

- Use a dictionary to check the meanings of the words and expressions in the box or ask your teacher / class mates for help where necessary.

impending storm *issue a warning* *save property* *critical for survival* *reconstruct the sequence of events* *uncover sources of fuels* *commodities* *conserve natural treasures* *elucidate* *physical events* *search for life*

- Make up sentences with the words and expressions above you think you will hear in the video. Share your ideas in class.

AFTER YOU WATCH

- As you watch the video, make a chart describing the branches of Earth Science.

EARTH SCIENCE

- Organize information about the topics each kind of scientist studies in the table below.

Scientist	*Topics*
Astronomer	
Meteorologist	
Geologist	
Oceanographer	

LEARN MORE!



Task 14. Complete the table adding appropriate suffixes. Write some more examples in each column.

Science	Jobs
-logy / -graphy / -omy / -ics / -try	***-er / ist***
petrology	*petrologist*
strati-	……
astro-	……
geophys-	……
geochemis-	……
……	……
……	……
……	……
……	……



Task 15. Fill in the missing gaps with the proper letters.

	Description	Specialists
1.	They study the location and force of earthquakes and trace the behavior of earthquake waves to interpret the structure of the Earth.	**_ _i_ m _l_ _ _ _ _s**
2.	They study the characteristics of fresh-water systems such as lakes, rivers, streams, ponds, and wetlands.	**_ _ _ n o_o_ _ s _ _**
3.	They are involved in the search for rock and mineral deposits of economic value.	**e _p_o_ _t_ _n _e_l_ g _ _ t _**
4.	They are concerned with all aspects of map-making.	**_ _ r _ _g_ _p_ _ _s**
5.	They study the properties of Earth's magnetic, electric, and gravitational fields.	**_e_ _h_ _i_i_ _s**
6.	They study how water interacts with the natural environment of rocks and soils.	**_ _d_ _ _e_l_ _ _s_ _**
7.	They study sedimentary rocks and the processes of sediment formation, transportation and deposition.	**_ e _i_ _n_ _ _o_ _ _ _s**
8.	They explore the Earth for oil and gas deposits.	**_ _t_o_ _u_ _ e _ _ o _ i _ _ s**
9.	They study the physical properties and movement of glaciers and ice sheets.	**_ l _ _ _o_o_ _ _ts**
10.	They study fossils found in geological formations in order to trace the evolution of plant and animal life and the geologic history of the Earth.	**_ _ _(a)e_ n _ _l_ g_ _ _ _**



Task 16. Fill in the blanks with the area of study for each of the following scientists. Then cross out the letters in the puzzle that spell the names of each study area. Answers are listed from left to right in the puzzle.

1. A Geologist studies the _ _ _ _ _.
2. A Seismologist studies _ _ _ _ _ _ _ _ _ _ _.
3. A Cartographer studies _ _ _ _.
4. A Stratigrapher studies the Earth's rock _ _ _ _ _ _.
5. A Limnologist studies lakes and _ _ _ _ _.
6. An Astronomer studies the _ _ _ _ _ _ _ _.
7. A Tectonophysicist studies the Earth's _ _ _ _ _ and _ _ _ _ _ _ that shape the Earth.
8. An Archaeologist studies ancient _ _ _ _ _ _ and _ _ _ _ _ _ _ _ _.
9. A Petrologist studies _ _ _ _ _.
10. A Paleontologist studies the preserved evidence of _ _ _ _ _ _ _ _.

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



Task 17. Decide in which branch of Earth Science you would study each of these subjects. Write the name of the branch in the space provided.

1. soil quality _____
2. lightning _____
3. mantle _____
4. Mars _____
5. tornado _____
6. trilobites _____
7. Mississippi river _____
8. P-waves _____
9. sandstones _____
10. fuels _____
11. coral reefs _____
12. fossils _____
13. lava flows _____
14. Mount St. Helens _____
15. solutions _____
16. quartz _____



Task 18. Discuss the following questions with your partner.

1) Why is Earth Science so important?
2) Describe at least three ways people use Earth Science.
3) Do the branches of Earth Science overlap? Is it important for the branches to be independent of each other?

4) What specialties or disciplines of Earth Science do you expect to be in demand in the near future? Why?
5) Which branches and specialties of Earth Science might focus on the problems of rising ocean temperatures, the thinning ozone layer, spreading San Andreas Fault, and increased concentrations of CO^2 in the air?

 **Task 19. Surf the Internet for current news that would be of interest to an Earth scientist. Choose an article and write a summary following the plan below.**

ARTICLE TEMPLATE

Date of publication: ……
Title of the article: ……..
Website: ……..... .

https://phys.org/earth-news/earth-sciences/
https://scitechdaily.com/news/earth/
https://www.sciencenews.org/topic/earth
https://theconversation.com/us/topics/earth-science-70
https://www.sciencemag.org/category/earth

Write 5-6 questions that cover the contents of the article:

WHO: ……
WHAT: ……
WHEN: ……
WHERE: ……...
WHY: ……
HOW: ……

Summarize the article using the answers to the questions that cover the key message of the research / news. In the final sentence, give your personal opinion about the importance of this study to Earth Science.

 **Task 20. Work in groups of four students. Discuss what skills are required for an Earth scientist. Which one is the most important? Why? Prove your point of view.**

Role A – Physical fitness
You think physical fitness is the most important personal quality for an earth scientist. Give the others three reasons why. Tell them why their skills are not so important. Also, tell the others which is the least important of these (and why): being a team player, engineering skills, or IT skills.

Role B – Team player
You think being a team player is the most important personal quality for an earth scientist. Give the others three reasons why. Tell them why their skills are not so

important. Also, tell the others which is the least important of these (and why): physical fitness, engineering skills, or IT skills.

Role C – Engineering skills
You think engineering skills are the most important professional skill for an earth scientist. Give the others three reasons why. Tell them why their skills are not so important. Also, tell the others which is the least important of these (and why): being a team player, physical fitness, or IT skills.

Role D – IT skills
You think IT skills are the most important professional skill for an earth scientist. Give the others three reasons why. Tell them why their skills are not so important. Also, tell the others which is the least important of these (and why): being a team player, engineering skills, or physical fitness.

EXTENSION

VIEWING AND SPEAKING



Task 21. Watch a video about the hard and soft skills and their value for employment.

BEFORE YOU WATCH

- In small groups, discuss and share your ideas on the following:
  - What information is usually included in a CV?
  - What makes a good employee?
  - What questions might your potential employer ask you at a job interview?
  - What are skills? What skills do employers look at?
- Check the meanings of the words and expressions in the box below. How can they be used in the context of employment? Suggest examples.

work skills adaptability hard skills previous soft skills resume work experience possess evaluate cover letter job interview hir(e)able

AFTER YOU WATCH

- Write HS for hard skills and SS for soft skills, or WSS for both in the sentences below.
  - **a)** _____ are concrete skills that are specific and necessary to do one's wok.
  - **b)** _____ are inner personal or people skills that can be used in any job.
  - **c)** _____ include communication, teamwork, and adaptability.
  - **d)** _____ are learned through school, training, or previous work experience.
  - **e)** _____ are possessed by learning the information.

f) _____ should be practised over time in the real world with others to be developed.

g) _____ can be measured through education, previous experience, and certifications.

h) _____ are hard to evaluate through a cover letter or a resume.

i) _____ may be revealed at the interview or following a few weeks on the job.

j) _____ are required to be more hireable or successful on a job.

- Name the categories that work skills can be described in.
- State which skills are more difficult to check.
- Give examples of specific skills required for a particular job.
- Give examples of skills that can be used at any job.
- Name three occupations that you could do.
- Name three occupations that you could never do.
- Write three adjectives that you would use to describe yourself as a worker.

READING & SPEAKING

 **Task 22. Read the text about various skills required to perform a scientific activity.**

BEFORE YOU READ

DISCUSS IN GROUPS AND SHARE IN CLASS

- Which topics would you like the text below to cover? Why?
  - how people become scientists
  - methods, principles, and tools scientists use
  - how scientific knowledge is different from common knowledge
  - scientific and technological breakthroughs

IN PAIRS, CHECK THE MEANINGS OF THE WORDS AND EXPRESSIONS BELOW. MAKE SENTENCES WITH EACH AS A RESEARCHER.

track inquiry tool measure charts three-dimensional experiment simulation outcome metric units graphs diagrams workshop

AFTER YOU READ

COMPLETE THE TABLE WITH THE WORDS FROM THE TEXT.

Inquiry skills	Measurements	Experimenting	Visuals	Activities
observe *u . . s . . s . s* *c . . p . . e* *c . . t r . . t* *c l . . s . . y* *a . . . y z .* *i . t . . p . . t*	*size* *l . . . . h* *s . . e* *w . . t h* *c . . o . r* *m . . s* *v . b r . t . . n* *w . . g h .* *v . . u . e* *t .m . . r . t. . . e*	*3-D modeling* *s . m . l . . . n g* *c . m p . t . n g*	*picture* *g . . p h* *d . . w . ng* *d . . g . . m* *t . b . e* *ch . . t*	*writing books* *a . t . . l . s* *con . . r e . . . s* *w . . k . h . . s* *c . e . t . . g* *W . b s . . . s*

REFLECT ON WHICH INQUIRY SKILLS YOU HAVE ALREADY DEVELOPED AND WHICH YOU STILL REQUIRE.

WHAT ARE SCIENTIFIC SKILLS?

People are naturally curious. They want to understand the world around them. They want to understand what causes earthquakes, and where is the best place to search for useful minerals. People also want to be able to make good guesses about the future. They want to be able to track severe storms such as hurricanes and to find ways to protect their homes against flooding.

Scientists use many skills to explore the world and gather information about it. These skills are called science process skills or science inquiry skills. An important part of solving any problem is observing, or using your senses to find out what is going on around you. The five senses are sight, hearing, touch, smell, and taste. When you look at a pebble and feel its smoothness, you are observing. When you observe, you pay close attention to everything that happens around you.

Part of observing is comparing and contrasting. When you compare data, you observe the characteristics of several things or events to see how they are alike. When you contrast data, you look for ways that similar things are different from one another. Sometimes an object is too small to see with your eyes alone. You need a special tool to help you make observations. One tool that scientists use to observe is the seismograph. A seismograph detects earthquakes by measuring the vibrations of Earth's crust.

The data from an experiment or from observations you have made are first recorded, or written down. Then, they are classified. When you classify data, you group things together based on how they are alike. You may classify by size, shape, color, use, or any other important feature. Classification makes studying large groups of things easier. For example, earth scientists use classification to organize different types of rocks and minerals.

Modeling is a good way to show what a very small or a very large object looks like. A model can be used to represent a process or an object that is hard to explain with words.

A model can be a three-dimensional picture, a drawing, a computer image, or a diagram. A simulation is a kind of model that shows a process. It is often done using a computer. You can use a simulation to predict the outcome of an experiment. Scientists use simulations to study everything from the insides of a volcano to the development of a tornado.

When you measure, you compare an unknown value with a known value using standard units. Examples of metric units are the gram, the kilometer, and the liter. Examples of units in the English system are the pound, the foot, and the gallon. You can measure the length, the width, the mass, the weight, the volume, and the temperature.

Scientists often organize information visually by using data tables, charts, graphs, and diagrams. By using tables, charts, graphs, and diagrams, scientists can display a lot of information in a small space. They also make it easier to analyze and interpret data.

Scientists can share results, information, and opinions. They participate in conferences and workshops, write books and journal articles. They may also create Web sites about their work.

Task 23. Check your understanding of the text above by circling the letter of the best answer.

1. According to the text, which of the following is NOT TRUE?

(A) Scientific communication helps sharing findings.
(B) Measuring is based on comparing values.
(C) One can predict an earthquake by exploring an area.
(D) Tools are used to help a researcher observe or carry out an experiment.

2. Which is NOT mentioned in the text?

(A) Scientific knowledge helps predicting disasters.
(B) Visualizing research data is fundamental for participating in conferences.
(C) Organizing data in classes eases up a scientific process.
(D) Scientific study involves an array of processes and operations.

3. Which line contains an odd word?

(A) sight, hearing, smell
(B) information, data, standard
(C) earthquake, hurricane, flooding
(D) gram, kilometre, litter

4. The word "*curious*" in "People are naturally *curious*" DOES NOT mean

(A) eager
(B) bored
(C) interested
(D) intrigued

5. The best order of a scientific study is to

(A) observe, record, classify, model
(B) simulate, visualize, share, contrast
(C) participate, measure, explore, conclude

(D) graph, experiment, write, picture

CONSOLIDATION



Task 24. Complete the text with suitable words. Some letters have been given for you.

WHAT IS A DAY IN THE LIFE OF A GEOSCIENTIST LIKE?

Most geoscientists say that they enjoy the challenge and diversity of their work and that there is no "typical" day. Geoscientists work with people, data, information, ideas, and **(1) _ e_ _ n _ l _ g _**. Geoscientists often work with other scientists and engineers in **(2) _ _ a _ s**, reflecting the complexity of the problems they address. Information technology and the Internet have greatly increased the accessibility of data and the speed of **(3) _ o_ m u _ i _ a _ i _ _** among people worldwide, and has likewise affected the pace and diversity of the geosciences.

Geoscience work often includes an interesting mix of **(4) _ _ d _ o_** and outdoor duties which are seldom found in any other profession. Geoscientists divide their time among the joys of working in the outdoor environment, the **(5) _ _b_ ra _o _ _** and the office. **(6) _i_ld** work may entail the preparation of geologic maps and collecting samples that will later be analyzed in the laboratory. For example, rock samples may be x-rayed, studied under a polarizing or electron microscope and analyzed for chemical content. Geoscientists may also conduct **(7) _ _ p _ r _ m _ n _ s** or design computer models to test theories in order to provide data that will mitigate the effects of earthquakes, volcanic eruptions, and flooding.

In the office, they gather and **(8) _ n _e_ _ r _t** data, generate ideas, and communicate the results of their work in written reports and oral presentations that include maps and diagrams that illustrate the results of their **(9) _ _v _ s t _ g _ _i _ _s**. Such maps can pinpoint areas favorable to the occurrence of ores, **(10) _o_ _**, oil, natural gas or underground water, or indicate subsurface conditions of construction sites.



Task 25. Complete the text about the importance of Earth Science with the most appropriate word from (A–N) for each gap. You will not need *one word***. The first one is done for you (0).**

Earth Science plays a unique and **(0)** ***essential*** role in today's rapidly changing world. It is an **(1)** …….. study of the Earth's history, **(2)** ……, and structure, its atmosphere and oceans, and its **(3)** …….. in space. Knowledge of Earth Science is important because most human activities are related to **(4)** …… with the planet Earth. Today we live in a time when the Earth and its **(5)** …… face many challenges. Our climate is changing, and that change is being caused by human activity. Earth scientists recognized this problem and will play a key role in efforts to resolve it. We are also challenged to: **(6)** …… new sources of energy that will have

minimal impact on climate; **(7)** …….. new sources of metals and other mineral resources as known sources are **(8)** ……..; and, determine how Earth's increasing population can live and avoid serious threats such as volcanic activity, **(9)** ……., landslides, floods and more.

The **(10)** …….. and discoveries made by Earth scientists affect us in many ways. Exploring space and experiments done in space have led to new medicines and technologies. They have also led to **(11)** …… in radios, televisions, and telephones. The development of the space shuttle led to improvements in **(12)** ……. materials.

A	locate	**B**	composition	**C**	depleted
D	interaction	**E**	earthquakes	**F**	inhabitants
G	fire-resistant	**H**	develop	**I**	improvements
J	***essential***	**K**	observations	**L**	integrated
M	warning	**N**	environment		



Task 26. Read the text and decide which answer (A, B, C, or D) best fits each gap. There is an example at the beginning (0).

Why study Earth Sciences? Earth Science is the best option for those who are interested in Earth, had passion for Geography and other Natural Sciences in high school and wish to start a fascinating **(0)** ***career*** with research and travelling. There are a lot of advantages of studying Earth Sciences in a university.

Earth scientists may work anywhere on Earth – and also with material from the Moon, and with planetary **(1)** _____. They may travel widely, working in many different countries and climates: on an exploration drilling **(2)** _____ in the cold of Alaska or the heat of the Persian Gulf, in Antarctica, the Himalayas, at sea drilling the ocean **(3)** _____, in arid environments seeking **(4)** _____, and in the many naturally **(5)** _____ volcanic and tectonically active regions of the world. Geoscientists work in the field, laboratory and office gathering rock samples and making **(6)** _____, applying many and varied analytical techniques, interpreting results, computer **(7)** _____, presenting reports, and contributing to the development of policy on the Earth's vital resources and life-sustaining environment.

Although Earth Science is a rather research-oriented discipline, graduates receive a lot of skills which will be useful in many other career **(8)** _____ – analysis and presentation skills, **(9)** _____ and ability to work in unusual conditions, time-management, and IT skills. A strong knowledge **(10)** _____ in Mathematics and Chemistry is also developed.

0	**A**	job	**B**	**career**	**C**	work	**D**	occupation
1	**A**	observations	**B**	portraits	**C**	images	**D**	views
2	**A**	rig	**B**	stand	**C**	column	**D**	highrise
3	**A**	ground	**B**	depth	**C**	floor	**D**	plate
4	**A**	earthquakes	**B**	pebbles	**C**	currents	**D**	groundwater

5	**A**	hidden	**B**	hazardous	**C**	unknown	**D**	distant
6	**A**	measurements	**B**	surveys	**C**	reports	**D**	discoveries
7	**A**	observing	**B**	comparing	**C**	contrasting	**D**	modelling
8	**A**	ways	**B**	paths	**C**	roads	**D**	routs
9	**A**	teamwork	**B**	network	**C**	fieldwork	**D**	groundwork
10	**A**	rules	**B**	laws	**C**	background	**D**	principles

 **Task 27. Give English equivalents of the words and word combinations below. Then, use them in a list of 10 questions you would like to ask a lecturer about different fields of Earth Science.**

A (Text *"Studying the Earth")* напрям / сфера наукової діяльності; виявляти поклади викопного палива; океанографія; зосереджувати увагу; перетворитись на скам'янілості; збережений; величезний; віддалені зірки і планети; передбачати й прогнозувати погоду; наука про Землю; телескоп; океанограф; сейсмолог; порівнювати; впливати на Землю; вивчати зіркий астероїди; басейн океану; покладатись на технології; мнералог; хвилі і течії; планетарний геолог; вугілля; фізична океанографія; змінюватись у відповідь на глобальне потепління; хімічна океанографія; погодні умови; морська геологія; бактерії; урагани і торнадо; використовувати радари і супутники; нафтопродукт; біологічна океанографія; древні зірки у всесвіті; кліматолог; наука про життя; створіння; нафта; фізичні (природничі) науки; динозавр; галузь/ напрям дослідження; геологія; метеорологія; астрономія; формувати Землю; фізична геологія; вулканолог; геохімія; стосуватися (х2); хімічні елементи; мінерали; петрологія; палеонтолог; форми життя.

B (Text "What are Scientific Skills?") допитливий; пошук корисних копалин; досліджувати світ; науково-пошукові навички; спостереження; порівняння й зіставлення; шукати подібність / відмінність; вимірювати вібрації; записувати дані експерименту; класифікувати / угруповувати за подібністю; моделювання; відобразити важко пояснюваний процес; застосувати комп'ютерну модель для прогностичних результатів; метричні одиниці; виміряти довжину, ширину, масу, вагу, об'єм, температуру; візуалізувати інформацію у вигляді таблиць, схем, графіків, діаграм; демонструвати дані на семінарах і конференціях.

 **Task 28. Render the following text in English. Make use of the essential vocabulary of the unit.**

Геологія – це велика фундаментальна галузь науки. Від інших наук про Землю, таких як океанографія чи метеорологія, геологія відрізняється тим, що досліджує тверду оболонку Землі – літосферу і те, що знаходиться під нею. Геологія об'єднує велику кількість наук. Нижче перераховані розділи геології. Геологія корисних копалин вивчає типи родовищ, методи їх пошуку й розвідки. Мінералогія – розділ геології, що вивчає мінерали, питання їх походження,

кваліфікації. Вивченням порід, утворених у процесах, пов'язаних з атмосферою, біосферою та гідросферою Землі, займається літологія. Петрологія – розділ геології, що вивчає походження гірських порід. Петрографія – розділ геології, що вивчає походження гірських порід, утворених за високих температур і тиску. Структурна геологія – розділ геології, що вивчає геологічні структури земної кори та їхню зміну протягом геологічної історії.

Тектоніка – розділ геології, що вивчає рух Земної кори. Палеонтологія вивчає давні викопні форми життя і займається описом скам'янілих залишків, а також слідів життєдіяльності організмів. Стратиграфія – наука про визначення відносного геологічного віку осадових гірських порід, поділ на товщі порід і кореляції різних геологічних утворень. Одним із основних джерел даних для стратиграфії є палеонтологічні визначення. Геохронологія – розділ геології, що визначає вік порід та мінералів. Еволюційна геологія – розділ геології, що вивчає зміну земної кори.

Планетарна геологія (астрогеологія) – розділ геології, що досліджує планетарно-астрономічні фактори геологічного розвитку Землі та інших планет, а також геологію твердих небесних тіл, таких як планети та їхні супутники, астероїди, комети та метеорити. Морська геологія – розділ геології, що вивчає геологічну будову океанічного дна. Вулканологія – галузь геології, яка вивчає вулкани та вулканічні гірські породи. Інженерна геологія – розділ геології, що вивчає взаємодії геологічного середовища та інженерних споруд. Гідрогеологія – розділ геології, що вивчає геологічні аспекти розвідки, пошуку та утворення підземних вод. Геологічна гляціологія – розділ геології, що вивчає геологічні процеси руху та утворення льодовиків.

 **Task 29. Choose one of the following careers related to Earth Science. Create a PowerPoint presentation about that career. Your PowerPoint will need to include the following information about your chosen career:**

- Career/ Job Title
- What does a person in this career do?
- What hard skills are needed to pursue this career?
- Are there different fields within this career?
- Where can a specialist be employed in this career?
- What tools are generally used on the job?
- How much do they get paid?
- Is there a high demand for this career?
- What soft skills are essential to be successful in this career?
- What are the strong and weak points of making a career in the chosen field?

Career choices:

• *environmental geologist*	• *paleontologist*	• *hydrogeologist*
• *mineralogist*	• *seismologist*	• *structural geologist*
• *planetary geologist*	• *volcanologist*	• *marine geologist*

• *petrologist*	• *climatologist*	• *tectonophysicist*
• *oceanographer*	• *meteorologist*	• *exploration geologist*
• *stratigrapher*	• *limnologist*	• *mining engineer*
• *geochemist*	• *cartographer*	• *glaciologist*
• *geophysicist*	• *petroleum geologist*	• *geomorphologist*

 **Task 30. Write an extended answer to the question below (120-150 words). Use appropriate academic and specialized vocabulary in clear and complete sentences.**

Which branch(es) of Earth science is (are) the most relevant to human life? Explain.

UNIT 5

SPHERES OF EARTH

L E A D – I N

Task 1. Discuss the following questions with a partner or in a small group.

- *What is a system?*
- *Why is Earth considered as a system?*
- *What are the four major parts of the Earth's system?*
- *How are the parts of the Earth's system related?*
- *Could the Earth function if one of the components did not exist?*

Task 2. Look at the image. What are the components of the Earth's system? What sphere does each component represent?



VOCABULARY

Task 3. Study the meanings of the word parts below. Combine the roots with proper suffixes to make new words. Work out your own definition for each term.

	root	meaning	term
1.	litho –	rock, stone	*lithology,* ……
2.	hydro –	water	*hydroelectric,* ……

3.	atmo –	gas, vapor	*atmometer,* ……
4.	bio –	life	*biodiesel,* ……

Task 4 A. Look at the words in the box. Which of them can you pronounce correctly?

Specialized & General Academic Vocabulary	*absorb aquatic aquifer coastal considerably drought estimate flood glacier gradually habitat identity impact inhabit interaction layer mantle moisture one-celled outermost overlap photosynthesis plate redistribute roughly significant source stretch sustainability thickness*

Task 4 B. Practise reading the transcribed words below. Then, identify them in the box of Task 4 A.

/flʌd/; /ˈɒksɪdʒən/; /ˈleɪə/; /ˈhæbɪtæt/; /ˈkəʊst(ə)l/; /fəʊtəʊˈsɪnθɪsɪs /; /ˈrʌfli/; /ˈmɔɪstʃə/; /səˌsteɪməˈbɪləti/; /əˈkwætɪk/; /ˌriːdɪˈstrɪbjuːt/; /ˈθɪknəs/; /draʊt/; /ˈmæntl/; /ˈglæsiə ˌˈgleɪʃər/; /aɪˈdentəti/; /əbˈsɔːb , əbˈzɔːb/; /sɪgˈnɪfɪkənt/.

Task 4 C. Write each word in the column that best describes what you know about it. Share your ideas with your partner. Then, consult a dictionary to check the meanings of the new words.

I don't know the meaning	I think I know the meaning	I know the meaning
……	……	……
……	……	……
……	……	……

CORE BLOCK

READING & SPEAKING

Task 5. The following text will introduce you to the topic of the Earth's systems. Read the text and translate the phrases with the words in bold into Ukrainian.

BEFORE YOU READ, DISCUSS IN PAIRS TO CHECK IF YOU KNOW

- what spheres belong to the Earth's system
- what layers compose the lithosphere

- what makes up the biosphere
- how important the atmosphere is for our planet
- how the changes in one sphere can affect the other spheres

EARTH'S FOUR SYSTEMS

Planet Earth is made up of four **overlapping** systems that contain all of the world's landmasses, water **sources**, living organisms, and gases. These four systems are known as spheres. Specifically, they are the "lithosphere", "hydrosphere", "biosphere", and "atmosphere". Each of these four spheres can be further divided into sub-spheres.

The lithosphere refers to all of the rocks of the Earth. It includes the planet's **mantle** and crust, the two **outermost** layers. The actual **thickness** of the lithosphere varies **considerably** and can **range** from **roughly** 40 km to 280 km. The lithosphere is not one solid piece of rock. It is made up of many smaller pieces called **plates.**

The hydrosphere is composed of all the water on or near the planet's surface. This includes oceans, rivers, and lakes, as well as underground **aquifers** and the **moisture** in the atmosphere. Scientists **estimate** the total amount of water at about 1.3 billion cubic kilometers. Overall, the hydrosphere is very large, with the oceans alone covering about 71% of the surface area of Earth.

The biosphere is composed of all living organisms: plants, animals, and **one-celled** organisms. Most of the planet's terrestrial life is found in a zone that **stretches** from 3 meters below ground to 30 meters above it. In the oceans and seas, most **aquatic** life **inhabits** a zone that stretches from the surface to about 200 meters below.

The atmosphere is the gaseous layer surrounding the Earth and held to its surface by gravity. It protects Earth from the Sun's ultraviolet radiation, provides oxygen for **breathing** and carbon dioxide for photosynthesis. The atmosphere also **absorbs** water from the Earth's surface via the process of evaporation; it then acts to **redistribute** heat and moisture across the Earth's surface.

Although the four systems have their individual **identities**, there is important **interaction** between them. Earth's systems interact in many ways. Changes within one system can have a **significant impact** on one or more of the others. For example, in times of **drought**, the change in the hydrosphere will have an effect on living things (**shortage** of water and food), and on the lithosphere (low **sustainability** to support plant life). Changes in the atmosphere in the form of global warming can affect the biosphere and the hydrosphere. **Glaciers** melt and ocean levels rise. The polar bear is **gradually** losing its natural **habitat** because of warming temperatures in the Arctic. People who live in **coastal** areas along the ocean are in danger of losing their homes because of **floods**.

 **Task 6. Work with a partner. Ask and answer questions about the text. Add three more questions of your own.**

1. What systems is Earth made up of?
2. How thick is the lithosphere?

3. What does the hydrosphere include?
4. ……?
5. ……..?
6. ……..?

Task 7 Match each English word or phrase with its Ukrainian equivalent.

1.	absorb *v.*	**a.**	найвіддаленіший від центру
2.	aquatic *adj.*	**b.**	варіюватись
3.	aquifer *n.*	**c.**	поступово
4.	breathing *n.*	**d.**	взаємопов'язаний
5.	coastal *adj.*	**e.**	вологість
6.	considerably *adv.*	**f.**	нестача, дефіцит
7.	drought *n.*	**g.**	повінь
8.	estimate *v.*	**h.**	мантія
9.	flood *n.*	**i.**	вплив
10.	glacier *n.*	**j.**	джерело
11.	gradually *adv.*	**k.**	взаємодія
12.	habitat *n.*	**l.**	дихання
13.	identity *n.*	**m.**	значно, суттєво
14.	impact *n.*	**n.**	перерозподіляти
15.	inhabit *v.*	**o.**	поглинати
16.	interaction *n.*	**p.**	товщина
17.	mantle *n.*	**q.**	плита
18.	moisture *n.*	**r.**	сталість
19.	one-celled *adj.*	**s.**	приблизно
20.	outermost *adj.*	**t.**	населяти
21.	overlapping *adj.*	**u.**	простягатися
22.	plate *n.*	**v.**	водний
23.	range *v.*	**w.**	льодовик
24.	redistribute *v.*	**x.**	природне середовище
25.	roughly *adv.*	**y.**	посуха
26.	shortage *n.*	**z.**	особливість
27.	significant *adj.*	**aa.**	прибережний
28.	source *n.*	**bb.**	значний, істотний
29.	stretch *v.*	**cc.**	оцінювати
30.	sustainability *n.*	**dd.**	одноклітинний
31.	thickness *n.*	**ee.**	водоносний шар (горизонт)



Task 8. Match the words and definitions.

1.	mantle	**a.**	the process of a liquid changing into a gas, especially by heating *(n.)*
2.	source	**b.**	situated on or relating to the land along the edge of the sea or ocean *(adj.)*
3.	moisture	**c.**	the part of the Earth that is deep below the surface and surrounds the core *(n.)*
4.	evaporation	**d.**	the distance between the opposite sides of something *(n.)*
5.	aquifer	**e.**	growing or living in water *(adj.)*
6.	coastal	**f.**	a place, or a thing that provides something that you need or want *(n.)*
7.	thickness	**g.**	a layer of rock, sand, or soil that contains water or allows water to pass through it *(n.)*
8.	aquatic	**h.**	very small drops of water, either in the air or on a surface *(n.)*



Task 9. Find words in the text that have these meanings.

a) the effect or influence that an event, situation etc. has on someone or something *(n.)* ……

b) a large mass of ice that moves slowly over land *(n.)* ……

c) slowly, over a long period of time, rather than suddenly *(adv.)* ……

d) a long period of dry weather when there is not enough water for plants and animals to live *(n.)* ……

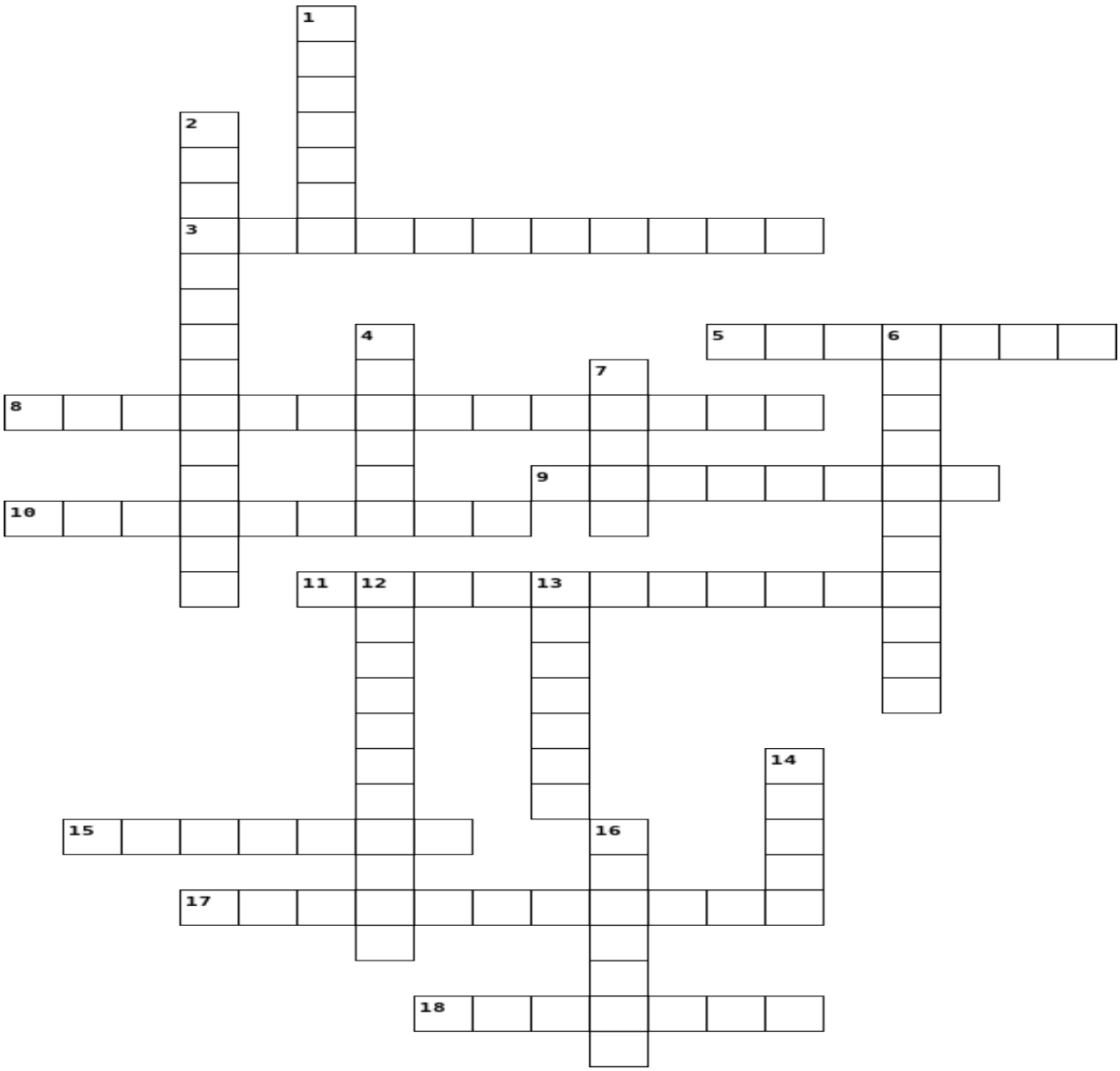
e) an overflow of a large amount of water beyond its normal limits *(n.)* ……

f) close to a particular number although not exactly that number *(adv.)* ……

g) to guess or calculate the number, amount, size, etc. of something *(v.)* ……



Task 10. Solve the crossword (refer to the text *"Earth's Four Systems")* (Also available at https://crosswordlabs.com/view/earths-spheres-39



Across

3. living on land rather than in the water or air *(adj.)*

5. a layer of rock, sand or soil that contains water or allows water to pass through it *(n.)*

8. the quality of being able to continue over a period of time *(n.)*

9. a liquid such as water in the form of very small drops, either in the air, in a substance, or on a surface *(n.)*

10. the part of the Earth's environment where life exists *(n.)*

11. consisting of rays from the invisible part of the spectrum beyond the purple, that have an effect on the skin *(n.)*

Down

1. a large mass of ice that moves slowly *(n.)*

2. the process by which a plant uses the energy from the light of the Sun to produce its own food *(n.)*

4. the part of the Earth that surrounds the central core *(n.)*

6. a kind of action that occurs as two or more objects have an effect upon one another *(n.)*

7. a large amount of water covering an area that is usually dry *(n.)*

12. the solid outer layer of the Earth *(n.)*

15. a long period when there is little or no rain *(n.)*

17. all of the water and water vapor at or near the surface of the Earth, such as the seas, clouds, and the water in and under the ground *(n.)*

18. the natural environment in which an animal or plant usually lives *(n.)*

13. living or growing in, happening in, or connected with water *(adj.)*

14. one of the large moving layers of rock that the Earth's surface is believed to be made of *(n.)*

16. to live or dwell in (a place), as people or animals *(v.)*



Task 11. Do a multiple-choice quiz. Choose the correct option.

1. Which is a synonym for *"roughly"*?
a) mostly
b) exactly
c) approximately
d) specifically

2. Which word is similar in meaning to *"estimate"*?
a) affect
b) determine
c) refer
d) vary

3. Which word is the opposite of *"gradually"?*
a) slowly
b) progressively
c) slightly
d) suddenly

4. The word *"considerably"* means
a) entirely
b) great**ly**
c) individually
d) closely

5. Which does NOT mean *"significant"*?
a) minor
b) substantial
c) notable
d) considerable

6. Planet Earth is made up of four *overlapping* systems.
a) they have individual features
b) they tend to change often
c) they support life on Earth
d) they have some shared aspects

7. *Moisture* in the atmosphere is

a) a layer
b) water vapor
c) solid particles
d) life forms

8. The atmosphere *absorbs* water from the Earth's surface
a) circulates
b) maintains
c) evaporates
d) transforms

Task 12. Use the words *in italics* to complete the sentences. You will not need two words.

drought stretch absorb estimated shortages gradually habitat thickness considerably source overlap inhabit flood roughly coastal aquatic outermost identities interaction significant redistribute aquifers

1. The long hot summer has led to serious water …….
2. An animal may suffer if it is removed from its …….
3. The …… of the Mississippi River is Lake Itasca in Minnesota.
4. …… erosion is a major concern for the island's residents.
5. Jaguars still ……. this part of the rainforest.
6. They …….. that their drinking water would last for just two more days.
7. Most public water supplies obtain their water from underground ……....
8. The weather is ……. getting warmer.
9. The geology and geography courses tend to ……..
10. Most of their possessions were lost in the …….
11. This thin rag cannot ……. all this liquid.
12. Just feel the …… of this carpet!
13. Farmers are facing ruin after two years of severe ……...
14. Painting the room white made it seem …….. larger.
15. Let us …….. the work more fairly.
16. I have always enjoyed ……. sports such as scuba diving.
17. It takes …… an hour to make this dish.
18. There is not enough ……. between the management and the workers.
19. Other than price, there is no ……. difference between these products.
20. The countries have kept their own distinct political and cultural ……

VIEWING & SPEAKING



Task 13. Watch a video about the four spheres of Earth to learn how they help maintain life on the planet.

BEFORE YOU WATCH

- In pairs, decide which spheres the words and expressions in the box may characterize. Check the meanings where necessary. Share your ideas in class.

weather	*fresh water*	*UV radiation*	*inner cores*	*vegetation*	
minerals	*fungi*	*groundwater*	*moisture*	*solid ground*	*mountains*
lakes	*nitrogen*	*liquid rock*	*ocean floor*	*biomes*	*polar ice caps*
sand	*Greek words*	*single-celled organisms*			

AFTER YOU WATCH

- Check your predictions against the video. Fill in the gaps with the missing words.

Earth is a very complex place. All of the processes on Earth are driven by four spheres, which we describe individually but are really all connected. The names of the spheres come from the **(1)** _____ that describe what they are made of: *Geo* – for ground, *Hydro* – for water, *Bio* – for life, and *Atmo* – for air.

The **Geosphere** describes all of the rocks, **(2)** _____ and ground that are found on and in Earth. This includes all of the **(3)** _____ on the surface, as well as all of the **(4)** _____ in the mantle below us, and the minerals and metals of the outer and **(5)** _____. The continents, the **(6)** _____, and all of the rocks on the surface, and all of the **(7)** _____ in the deserts, are all considered part of the Geosphere. Basically, if it looks like **(8)** _____, it is part of the ground sphere.

The **Hydrosphere** is made up of all of the water on Earth. This includes all of the rivers, **(9)** _____, streams, oceans, groundwater, polar ice caps, glaciers, and **(10)** _____ in the air like rain and snow. The hydrosphere is found on the surface of Earth, but also extends down several miles below, as well as several miles up into the atmosphere. Most Earth's water is salty; it is in the oceans (about 97%). Two thirds of the remaining 3% is frozen in glaciers and **(11)** _____. Only 1% is the liquid **(12)** _____ and even most of this exists as **(13)** _____ down in the soil.

Earth's **Biosphere** is composed of all of the living organisms on the planet. This includes all of the plants, animals, bacteria, **(14)** _____, and **(15)** _____ found on Earth. Most of this life exists no deeper than 10 feet into the ground or about 600 feet above it. Because each individual is so small in relation to the overall planet, organisms are often grouped into **(16)** _____, which are regional communities characterized by **(17)** _____ and climate (e.g. deserts, grasslands, and rain forests).

The **Atmosphere** is the air that surrounds Earth. This air sphere is made up of mostly **(18)** _____, some oxygen, and small amounts of many other molecules. Most of the atmosphere is densely packed near the surface, which is where all of our

(19) _____ occurs. But it extends to over 300 miles above ground. However, exactly where air ends and space begins is difficult to say. The atmosphere acts like a giant blanket protecting us from harmful **(20)** _____ and keeping our planet warm.

While the spheres are described individually, they often occur in the same location and interact to drive the Earth's processes.

LEARN MORE!



Task 14. Complete the missing gaps with the proper letters. Consult any reference material if you need help.

1.	If you take water from the hydrosphere and freeze it, then it becomes part of it.	**_ r_ _s_ h_re**
2.	The innermost layer of the atmosphere	**_ r _ p_ _p_e_e**
3.	The outermost part of the atmosphere	**_x _s_h_r_**
4.	It is bound by the extent of Earth's magnetic field.	**m_ _n _ _o_ _ h_r_**
5.	The crust of the Earth floats on it.	**_ st _e_o_ _ _e_e**
6.	The layer of the Earth' s atmosphere that is ionized by solar and cosmic radiation	**_o_o_ _ _ _r_**
7.	It is the third layer of the atmosphere, directly above the stratosphere and directly below the thermosphere.	**m_ _o_p_ _ _e**
8.	It consists of the core, mantle and crust of the Earth.	**_ e _s_ _e_ _**
9.	It is the soil cover of the Earth.	**p _d_ _ _ h _ r _**
10.	It is located just outside the upper ionosphere.	**p _a_ _a_ _ _ _e_ _**



Task 15. Fill in the blanks below with words from the box. There is one extra word you will not need to use.

oxygen spheres living mountains matter cryosphere space floating organic thing lakes

Some scientists suggest the Earth be divided into two main systems. These two systems include all the **(1)** _____ and inorganic **(2)** _____ of the world. Every living and non-living **(3)** _____ on Earth falls under one of these two main **(4)** _____, which are the Earth's geosphere and biosphere. As with the four-system organization, the biosphere represents all of the Earth's **(5)** _____ organisms. The geosphere is the collective name for the Earth's atmosphere, lithosphere, hydrosphere, and **(6)** _____. The atmosphere is the **(7)** _____ above the Earth's surface. This includes the air that we all breathe. The lithosphere is the solid part of the Earth such as rocks and **(8)** _____. The hydrosphere is the liquid water such as the rivers, **(9)** _____, and oceans. The cryosphere is the frozen water of the earth and is

further broken into four types: glaciers, snow cover, **(10)** _____ ice, and permafrost.

Task 16. Work with a partner. Look at the words in each row. Choose the word that is odd in each row and explain why it should not be there.

1.	mantle	plate	crust	core
2.	ocean	glacier	river	groundwater
3.	thunder	rain	snow	air
4.	biosphere	animals	plants	humans
5.	lithosphere	hydrosphere	atmosphere	outer space

Task 17. Beside each example, write the names of the spheres that are interacting.

1. On a sunny day, you see a puddle of water disappear. …….
2. A tornado destroys a zoo.……
3. A penguin finishes hunting for a fish and stands on a rock. ……..
4. A severe rain storm is causing the river to flood its banks. ……
5. An earthquake has damaged homes in California. …….
6. The grey whale is migrating north for the summer. ……
7. The farmer is planting his field of corn. ……
8. Waves are crashing on the shore. ……..
9. A tree is blown down by wind. ……
10. An underground aquifer is providing drinking water for the town. …….

Task 18. Which is the best example of a human impact on the Earth's spheres? Complete the table by placing a tick in the correct column. Add three more examples of your own.

		Biosphere	Atmosphere	Lithosphere	Hydrosphere
1.	mining for minerals				
2.	burning fossil fuels				
3.	building a dam for hydroelectric energy				
4.	hunting passenger pigeons to extinction				
5.	……				
6.	……				
7.	……				

Task 19. Discuss the following questions with a partner.

1. Do you think clouds should be classified as part of the atmosphere, or part of the hydrosphere? Explain why.
2. Why do you think life is found only in the biosphere?
3. Sometimes, fires burn large areas of forest that are part of the biosphere. Other than the biosphere, which of Earth's spheres is a forest fire most likely to affect?
4. Explain how a bird uses the biosphere, atmosphere, hydrosphere, and lithosphere.
5. Which of Earth's four spheres is involved when a volcano erupts?
6. How might the sphere interactions have been different before there were cities? Before there were people?
7. Will all the four spheres of the Earth persist in the future? How can they change?

EXTENSION

LISTENING AND SPEAKING



Task 20. Listen to an audio lecture about Earth's spheres to help you understand how the parts of the Earth's system shape the surface.

BEFORE YOU LISTEN

- In groups, think to give examples of open and closed systems. Explain what they differ in.
- Use a dictionary to check the meanings of the words and expressions in the box or ask your teacher / classmates for help where necessary.

enter leave float into / out of sunlight fertile soil particles abundant satellite images collect data interact circulate accurately vehicles currents track environments absorb release decay nutrients sea floor crust mantle outer / inner core sound waves wear away withstand wind carve earthworms dam rivers mudslide wear away collapse expose

- Make sentences with the words and expressions from the box to describe a certain sphere of the Earth. Let your classmates agree or disagree.

AFTER YOU LISTEN

- Answer the questions.
  1. Are the Earth's four spheres themselves open or closed systems?
  2. How does the hydrosphere affect the atmosphere?
  3. How are ocean currents formed?
  4. Name some ways the biosphere and the atmosphere interact.
  5. Give examples of matter moving from the geosphere into the atmosphere.
  6. How often is Earth reshaped?

7. How does a person change Earth?
8. What natural processes change Earth's surface?

- Split into four groups and each complete a row in the table with the information from the audio lecture. Contribute your results to the rest of the group.

Sphere	***Where***	***What***	***Technologies used***	***Discoveries***	***Changes / Interaction***
Atmosphere	*surrounds the s--f--e of Earth*	*n--r---n; o-y-- n; CO_2; w---r ---- (u)r; few other g----s*	*from the g----d; weather b-l----s; specially equipped p---es; s---ll--e i----s;*	*complex w--th-r patterns predicting l---l weather*	*c-r--l-tion of weather p-t--r-s*
Hydrosphere	*on Earth and u---rg----d*	*o----s; l---s; gl-c---s; r----s; st-ea-s; p---r ice c--s;*	*deep-sea v-hi---s; s--c--l buoys; satellite im---s; d-v--g s-i-s;*	*several l-y--s of cold and warm w-t--r; formation of c--- and w--- ocean c-rr---s;*	*interaction with w--d p-tt-r-s aff--t--g earth's w--th-r*
Biosphere	*in the a--; on l--d; in the w---rs;*	*all l-f- on Earth*	*satellite ph---s*	*tr-ck--g changes in p---t and a--m-l life; studying c--p--x e-v---nm---s*	*ab--rb--g CO_2; r-lea--ng O_2; returning n-t-i-n-s to the s--l when decaying; wo--s make soil f-r---e; d-mm--g rivers; clearing forests for f--ml---d; w---ing away plants; ex--sing soil to s-n--ght, wind, and water;*

Geosphere	*on and b---w the surface: c-nt--- n-s; is---ds; sea-floor;*	*c---t; m----e; o---r core; i---r core;*	*ex-l-re deep within the pl---t; satellite images; s-u-d wa--s; c-mp---r m---ll--g;*	*developing ac---ate f--tu--s*	*v-----o ex-l-s--n; r--ea-e of gasses and d--t; b---h of new islands; c-rv--g huge f--m----ns; setting up e--thqu---s; forming m--nt--n r--g-s; burying a town in m-dsl--e; c-ll--se;*

READING & SPEAKING

Task 21. Read the text about the range of the biosphere and what factors and processes affect the living things.

BEFORE YOU READ

DISCUSS IN GROUPS AND SHARE IN CLASS

- where the biosphere lies
- the forms of life and species you know
- if Earth's life forms require the same conditions as humans
- what Earth would be like without the biosphere

IN PAIRS, CHECK THE MEANINGS OF THE WORDS. HOW CAN YOU USE THEM TO DESCRIBE THE BIOSPHERE?

mudslide fungi burrow oxidation reduction insect gopher cave bottom vent vulnerable constantly composition tilt landscape

AFTER YOU READ

COMPLETE EACH LINE WITH 3-5 WORDS OR EXPRESSIONS FROM THE TEXT

A. *The span of the biosphere:* ___, ___, ___, ___, ___
B. *Major impacts on the biosphere:* ___, ___, ___, ___, ___, ___, ___
C. *Minor impacts on the biosphere:* ___, ___, ___, ___, ___, ___, ___
D. *Molecular level changes in the biosphere:* ___, ___, ___, ___, ___

CHOOSE FROM A-D TO RETELL WHAT THE TEXT SAYS ABOUT IT

A BIG BALL OF LIFE

The term biosphere is used to describe our living world. All of the microbes, plants, and animals can be found somewhere in the biosphere. The biosphere extends to the upper areas of the atmosphere, where birds and insects can be found. It also reaches down to dark caves deep in the ground or to the bottom of the ocean at hydrothermal vents. The biosphere extends to any place where life of any kind might exist.

Many factors affect the biosphere and our life here on Earth. There are large factors such as the distance between the Earth and the Sun. If our planet were closer to the Sun, it might be too hot to support life. If we were further away, it might be too cold. The tilt of the Earth is just as important. Seasons and seasonal climate changes are direct results of the tilt of the Earth towards or away from the Sun. Summer months allow half of the planet to warm while the other half cools. Six months later, the temperatures shift in the opposite direction.

Smaller factors also act on the biosphere. If you were to watch a piece of land that was only one square mile (or kilometer), you would see the influence of climate, daily weather, and erosion. These smaller factors change the living space and organisms must react accordingly. For example, how would a family of gophers react if their burrow got washed away in a mudslide? Even though humans are able to control much of their immediate environment, they are still vulnerable to weather and earthquakes.

The smallest of factors in the biosphere work on a molecular level. Chemical erosion is a great example of a landscape changing one molecule at a time. Oxidation and reduction reactions change the composition of rocks and organic materials. There is also biological erosion. Tiny organisms, such as bacteria and fungi, are constantly working to break down organic and inorganic materials.



Task 22. Check your understanding of the text above by circling the letter of the best answer.

1. According to the text, which of the following is NOT TRUE?

(A) Living things are vulnerable to unfavorable weather and climate.
(B) Chemical erosion is an example of a molecular level change.
(C) But for bacteria and fungi, there would be no biosphere on Earth.
(D) Simple life forms are as important for the biosphere as higher life forms.

2. The text DOES NOT mention which of the following?

(A) the impact of the human activity on the biosphere
(B) the dependence of the species habitats on natural conditions
(C) the location of the biosphere relative to other Earth's spheres
(D) the contribution of Earth's physical characteristics to life supporting conditions in the biosphere

3. Which line describes MAJOR FACTORS that affect the biosphere?

(A) bacteria, fungi, oxidation, reduction
(B) hydrothermal vents, caves, insects, birds
(C) Earth's orbit distance, tilt, seasonal climate and temperatures

(D) daily weather, erosion, mudslides, earthquakes

4. The word "mudslide" means

(A) the opening through which lava and other materials are emitted

(B) the gradual destruction and removal of rock or soil in a particular area by rivers, the sea, or the weather

(C) not having the structure or characteristics

(D) change in the position, direction, or focus of sth

5. Which sentence best summarizes the text?

(A) The outer factors have the major effect on the biosphere.

(B) The biosphere is a nucleus in the system of Earth's spheres.

(C) Humans are the most influential species in the biosphere.

(D) Inner and outer factors as well as Earth's hydrosphere and atmosphere affect sustainability of Earth's biosphere.

CONSOLIDATION



Task 23. Complete the text with suitable words. Some letters have been given for you.

WHAT IS THE EARTH SYSTEM?

Scientists increasingly view Earth as a dynamic system – a combination of interrelated, interdependent or **(1) _ n _ e _a _t _ng** parts forming a collective whole or entity. On a macro level, the Earth system maintains its existence and functions as a whole through the interactions of its parts, called **(2) _ _m _ o n _ n _ s**. At a lower level or micro level, it is helpful to think of the Earth system in terms of four central components known as the subsystems: the **(3) _ _ _ r _ s _ h _ r**, geosphere, atmosphere and biosphere. Sometimes the term lithosphere is used instead of geosphere to refer to the uppermost **(4) _a_ e _ s** of the solid Earth (oceanic and continental crustal rocks and uppermost **(5) _ _ n _l_**).

These subsystems are interconnected by processes and cycles, which, over time, intermittently store, transform and / or transfer matter and energy throughout the whole Earth system in ways that are governed by the laws of conservation of matter and energy. The energy that drives these **(6) _r_ _ e_ s _s** comes mainly from the Sun and sometimes from energy sources within the Earth.

Examples of some of these processes include **(7) _v_p_r_ _io_**, erosion, convection currents, transpiration, photosynthesis or weathering. They can occur at different rates and in different places over time.

A cycle is a collection of connected, ongoing processes that circulates a common component throughout a system – such cycles are continuous with no beginning or end. Examples in the Earth system include the rock cycle, the food chain, the carbon cycle, the nitrogen cycle, the **(8)_ _ t _ r** cycle and energy cycles.

Key to understanding the complexity of the Earth system is that manipulation in one part of a subsystem can cause **(9) _ f _e _ ts** in other parts of that subsystem and/ or the other subsystems, sometimes in ways that are quite unexpected. This response occurs because the subsystem attempts to maintain its stability, so if one variable **(10) _ _ a _ g _s**, other variables may be affected to varying degrees.



Task 24. Complete the text with the most appropriate word from (A–N) for each gap. You will not need *one word***. The first one is done for you (0).**

All four parts of the Earth system **(0)** ***shape*** the planet's surface. Earth's surface is worn away, **(1)** ……, and reshaped every day by the atmosphere, the hydrosphere, the biosphere, and the lithosphere. Here are some of the ways they affect the surface.

Not even the hardest stone can **(2)** …… wind and water. Over millions of years, rain, wind, and flowing water **(3)** …… huge formations such as the Grand Canyon in Arizona or the rock towers of Utah. Landmasses **(4)** …… together have **(5)** …… earthquakes and formed volcanoes and mountain **(6)** …… around the world. Plants, animals, and human beings have also changed Earth's surface. For instance, earthworms help make soils more **(7)** ……. And throughout human history, people have dammed rivers and **(8)** …… forests for farmland.

You are part of this process, too. Every time you walk or ride a bike across open land, you are changing Earth's surface. Your **(9)** …… or the bike's tires **(10)** …… into the dirt, wearing away plants and **(11)** …… soil to sunlight, wind, and water. If you take the same route every day, over time you will wear a **(12)** …… in the land.

A	cleared	**B**	set off	**C**	built up
D	withstand	**E**	dig	**F**	feet
G	***shape***	**H**	fertile	**I**	layers
J	exposing	**K**	path	**L**	pushing
M	ranges	**N**	carve		



Task 25. Read the text and decide which answer (A, B, C, or D) best fits each gap. There is an example at the beginning (0).

How do the Earth's spheres interact? All the spheres in the system interconnect and overlap. No sphere works on its own. Think of the many ways that the hydrosphere and the atmosphere connect. **(0) Evaporation** from the hydrosphere provides the medium for cloud and rain **(1)** _____ in the atmosphere. The atmosphere **(2)** _____ rainwater to the hydrosphere.

In what way do the lithosphere and hydrosphere connect? Water provides the **(3)** _____ and medium for **(4)** _____ and erosion of rocks in the lithosphere. The lithosphere, in turn, provides the platform for ice to melt and for water

to **(5)** _____ back into the oceans. The atmosphere provides the lithosphere with heat and energy needed for rock **(6)** _____ and erosion. The lithosphere, in turn, **(7)** _____ the Sun's energy back into the atmosphere. The biosphere receives gases, heat, and sunlight (energy) from the atmosphere. It receives water from the hydrosphere and a living medium from the lithosphere.

All four spheres can often be found in a single location. For example, the soil may contain **(8)** _____ from the lithosphere, moisture within the soil from the hydrosphere, as well as insects and plants from the biosphere **(9)** _____ the soil and pockets of air present between the soil **(10)** _____ .

0	**A**	flood	**B**	**evaporation**	**C**	liquid	**D**	water
1	**A**	formation	**B**	composition	**C**	development	**D**	creation
2	**A**	falls back	**B**	puts back	**C**	goes back	**D**	brings back
3	**A**	liquid	**B**	moisture	**C**	vapor	**D**	drops
4	**A**	airing	**B**	winding	**C**	weathering	**D**	watering
5	**A**	transform	**B**	flow	**C**	evaporate	**D**	carry
6	**A**	injury	**B**	hurt	**C**	failure	**D**	breakdown
7	**A**	reflects	**B**	shields	**C**	covers	**D**	releases
8	**A**	plates	**B**	crust	**C**	minerals	**D**	layers
9	**A**	living	**B**	inhabiting	**C**	filling	**D**	settling
10	**A**	elements	**B**	layers	**C**	parts	**D**	pieces

 **Task 26. Give English equivalents of the words and word combinations below. Then, use them in a list of 10 questions you would like to ask a lecturer about the spheres of Earth.**

A (Text "Earth's Four Systems") мати значний вплив; оточувати Землю; поглинати воду з поверхні землі; значно варіювати; мантія; підземний водоносний шар; одноклітинні організми; захищати від сонячної; фактична товщина; перерозподіляти тепло та вологість; прибережна зона; ризик підтоплення; простягатися під землею; поступово втрачати природне середовище; нестача води і продуктів; взаємодія між системами землі; газовий шар довкола землі; постачати кисень для дихання і вуглекислий газ для фотосинтезу.

B (Text "A Big Ball of Life") нахилення / відхилення Землі відносно Сонця; безпосередній наслідок; простягатись до вищих шарів атмосфери; сягати темних печер, дна океану й гідротермальних джерел; фактори, які впливають на біосферу; відстань між Землею і Сонцем; ближче / далі; занадто спекотно / холодно; зміщуватись у протилежному напрямку; змити нірку ховрашка; оповз; незахищений від погоди чи землетрусів; хімічна ерозія; зміна рельєфу; процеси окиснення й відновлення; біологічна ерозія; мікроби, гриби та бактерії; руйнувати органічний матеріал.



Task 27. Render the following text in English. Make use of Unit 5 essential vocabulary.

Літосфера – це зовнішня тверда оболонка Землі, що включає всю земну кору й частину верхньої мантії Землі й складається з осадових, вивержених і метаморфічних порід. Основна частина літосфери – це вивержені магматичні породи (95%), серед яких на континентах переважають граніти, а в океанах – базальти. Вісім елементів – кисень, кремній, водень, алюміній, залізо, магній, кальцій, натрій – утворюють 99,5 % земної кори.

Екологічне значення літосфери величезне. По-перше, на її поверхні живе більшість рослинних і тваринних організмів, у тому числі й людина. По-друге, верхня тонка оболонка літосфери на материках – це ґрунти, що забезпечують умови життя для рослин і є основною умовою для отримання продуктів харчування людей. По-третє, літосфера є джерелом отримання корисних копалин – енергетичної сировини, руд металів, мінеральних добрив, будівельних матеріалів тощо. У межах літосфери періодично відбувались і відбуваються фізико-географічні процеси (виверження вулканів, землетруси, зсуви, обвали, ерозія земної поверхні), які мають величезне значення для формування екологічних ситуацій в певних ділянках планети, а іноді призводять до глобальних екологічних катастроф.

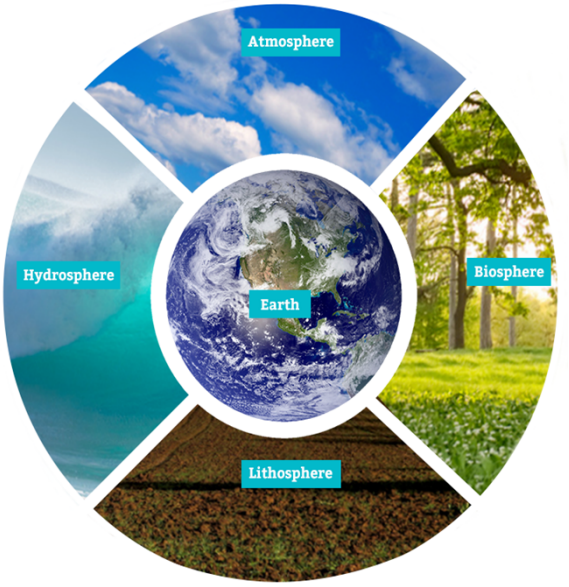
Нижня межа літосфери нечітка й визначається за різким зменшенням в'язкості порід, збільшенням їхньої щільності й іншими геофізичними характеристиками. Товщина літосфери на континентах і під океанами різниться й становить відповідно 25-200 і 5-100 км. Найглибші шахти, пройдені людьми, сягають глибин 3-4 км, найглибша в світі свердловина (пройдена на Кольському півострові) досягла глибини 12 км. Про стан і будову більш глибоких зон літосфери нам відомо лише на основі дистанційних методів, таких як сейсмо- та електророзвідка, гравіметрія тощо.

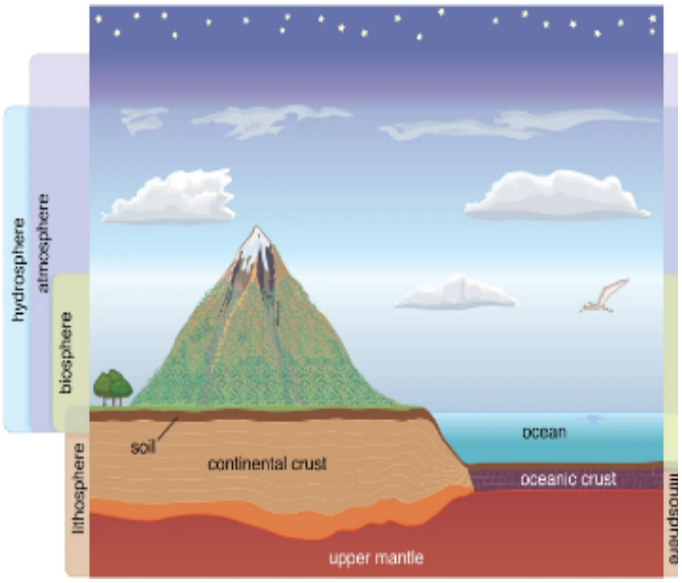


Task 28. Review the topics covered in this unit. Suppose you are to participate in an international scientific workshop. Be an expert in one of the topics below. Deliver a report.

1. Lithosphere. Lithosphere *vs* Geosphere.
2. Hydrosphere
3. Atmosphere
4. Biosphere
5. Other Spheres of Earth (Asthenosphere, Mesosphere, Cryosphere, etc.)
6. Interaction between the Earth's Spheres
7. Human Impact on the Earth's Spheres

Task 29. Speak on the topic "Spheres of Earth" for 3-4 minutes. Comment upon the supporting images below using the active vocabulary of the unit.





Task 30. Provide an extended answer to the question below in writing (120-150 words). Use appropriate academic and specialized vocabulary in clear and complete sentences.

What effect do you personally have on the Earth system? As part of the biosphere, think of some ways that you change the atmosphere, hydrosphere, lithosphere, and biosphere.

UNIT 6

ATMOSPHERE

L E A D – I N

Task 1. Discuss the following questions with a partner or in a small group.

- *Where does air come from? Do we get it from trees?*
- *Has the atmosphere always existed on Earth?*
- *Why doesn't the atmosphere drift into space?*
- *Is air the same everywhere on Earth?*
- *What factors affect air quality?*

Task 2. Look at the people in the photos below. Describe what the people are doing, how they are feeling and why. Decide where they are: in the countryside, at the top of a mountain, in a city, or in a rain forest? What is the air quality in these places?



A



B



C



D



E

VOCABULARY

Task 3. Look at the list of gases in the Earth's atmosphere. With your partner, decide what you know about them. Discuss the questions in class.

hydrogen (H_2) oxygen (O_2) nitrogen (N_2) ozone (O_3) helium (He) carbon dioxide (CO_2)

1.	Which two gases make up most of Earth's atmosphere?	…….
2.	Which gas is increasing on our planet?	…….
3.	Which of these gases are unique to planet Earth?	…….
4.	Which gas makes balloons float?	…….
5.	Which gas is given off by animals when they breathe out?	…….
6.	Which gas protects life on our planet from harmful light from the sun?	…….
7.	Which gas makes soda bubbly?	…….
8.	Which gas catches fire easily?	…….

9.	Which gas is released into the air when things burn?	……
10.	Which gas cannot be used directly from the air by most organisms and is changed into a usable form by bacteria?	……

Task 4 A. Look at the words in the box. Which of them can you pronounce correctly?

Specialized & General Academic Vocabulary	*alive ash average blanket blend block boundary burn up carbon dioxide clear drop eventually increase methane mixture occur percentage prevent ray shooting star still thunder trail unstable vapor wide*

Task 4 B. Practise reading the transcribed words below. Then, identify them in the box of Task 4 A.

/ˈbaʊndəri/; /prɪˈvent/; /ˈveɪpə/; /reɪ/; /ˈævərɪdʒ/; /əˈlaɪv/; /ˈʃuːtɪŋ/; /ˈblæŋkɪt/; /əˈkɜː/; /ɪnˈkriːs/; /pəˈsentɪdʒ/; /ˈmiːθeɪn/; /waɪd/; /ʌnˈsteɪbəl/; /treɪl/; /klɪə/.

Task 4 C. Write each word in the column that best describes what you know about it. Share your ideas with your partner. Then, consult a dictionary to check the meanings of the new words.

I don't know the meaning	I think I know the meaning	I know the meaning
……	……	……
……	……	……
……	……	……

CORE BLOCK

READING & SPEAKING

Task 5. The following text will introduce you to the topic of the atmosphere. Read the text and translate the phrases with the words in bold into Ukrainian.

BEFORE YOU READ, DISCUSS IN PAIRS TO CHECK IF YOU KNOW

➢ how planet Earth got its gaseous blanket

- if planet Earth is the only solar system planet to have the atmosphere above its surface
- why the atmosphere is necessary to sustain life
- if Earth's atmospheric gases are good for the living things

THE COMPOSITION AND STRUCTURE OF THE ATMOSPHERE

The atmosphere is a **blanket** of gases that covers every part of our planet Earth. It is the air surrounding Earth, which is composed of a **mixture** of 12 gases: *nitrogen, oxygen, argon, carbon dioxide, water* ***vapor****, neon, helium,* ***methane****, krypton, hydrogen, ozone, and xenon*. The two main gases are nitrogen and oxygen. The other gases make up only a small **percentage** of the atmosphere, but they are very important.

Humans need the atmosphere for many reasons. First, our bodies need the oxygen in the air to keep us **alive**. Second, humans need plants, the plants need the nitrogen in the air to grow. In addition, the atmosphere acts like a shield around Earth. It protects us from objects that fall from space, such as meteors. The ozone in the atmosphere also protects us. It **blocks** harmful **rays** from the sun; without ozone, the rays would burn us. Finally, some gases help control temperatures on Earth. **Carbon dioxide**, for example, **prevents** the air from becoming too cold. The special combination of gases in the atmosphere allows life on Earth to exist.

Air also includes many tiny particles. The particles may consist of dust, soil, salt, smoke, or **ash**. Tiny particles are needed for water vapor to condense on. Without particles, water vapor could not condense. Then clouds could not form and Earth would have no rain.

The atmosphere around Earth extends far above the surface of the planet. No clear **boundary**, or line, marks the end of the atmosphere. The air just gets thinner and thinner. In other words, the upper atmosphere has less oxygen, and it **eventually blends** into space. Scientists divide the atmosphere into five layers: the troposphere, the stratosphere, the mesosphere, the thermosphere, and the exosphere.

The troposphere extends from Earth's surface to an **average** of 12 kilometers above the surface. This layer contains all the familiar parts of our world: the oceans, the mountains, the clouds, and all living things. Most of the water in the atmosphere is located here, so weather conditions, such as rain, snow, and **thunder**, **occur** in the troposphere. In addition, the air in the troposphere is always moving. The movement creates turbulence, that is, a very **unstable** flow of air.

The stratosphere starts at 12 kilometers and ends at about 50 kilometers above Earth. There is no wind or weather in the stratosphere, and there are few clouds. The air is very **still** and **clear**. The ozone layer is in the stratosphere.

The mesosphere extends from 50 kilometers to 80 kilometers above the surface of Earth. The air in this layer becomes very thin, and the temperature **drops** to as low as -93ºC. In fact, the mesosphere is the coldest layer of the atmosphere. Every day millions of meteoroids enter our atmosphere from outer space, and they **burn up** in the mesosphere. Sometimes we can see their **trails** as **shooting** stars in the night sky.

The thermosphere is located approximately 80 kilometers above Earth's surface. In this layer, the temperature starts to **increase** again. In fact, the thermosphere is the hottest layer of the atmosphere. Astronauts in their spacecraft orbit Earth in the thermosphere. Finally, approximately 550 kilometers above Earth, we reach the exosphere. This layer is about 10,000 kilometers thick. That is almost as **wide** as Earth itself. Thousands of satellites from several countries orbit Earth in this layer.

Task 6. Work with a partner. Ask and answer questions about the text. Add at least three more questions to the list.

1. What is the air composed of?
2. Why is the atmosphere essential for all living things?
3. How many layers does the atmosphere consist of?
4. How do the layers of the atmosphere differ from each other?
5. ……?
6. ……?
7. ……..?

Task 7. Match each English word or phrase with its Ukrainian equivalent.

1.	alive *adj.*	**a.**	вуглекислий газ
2.	ash *n.*	**b.**	блокувати, перешкоджати
3.	average *adj.*	**c.**	відбуватися
4.	blanket *n.*	**d.**	падати, знижуватися
5.	blend *v.*	**e.**	нерухомий
6.	block *v.*	**f.**	метан
7.	boundary *n.*	**g.**	відсоток, процент
8.	burn up *phr. v.*	**h.**	збільшуватись
9.	carbon dioxide *phr.*	**i.**	падаюча зірка
10.	clear *adj.*	**j.**	середній
11.	drop *v.*	**k.**	запобігати, перешкоджати
12.	eventually *adv.*	**l.**	нестійкий
13.	increase *v.*	**m.**	загорятися
14.	methane *n.*	**n.**	грім
15.	mixture *n.*	**o.**	живий
16.	occur *v.*	**p.**	широкий
17.	percentage *n.*	**q.**	слід
18.	prevent *v.*	**r.**	захисний шар
19.	ray *n.*	**s.**	зрештою
20.	shooting star *phr.*	**t.**	межа, кордон
21.	still *adj.*	**u.**	пара
22.	thunder *n.*	**v.**	попіл

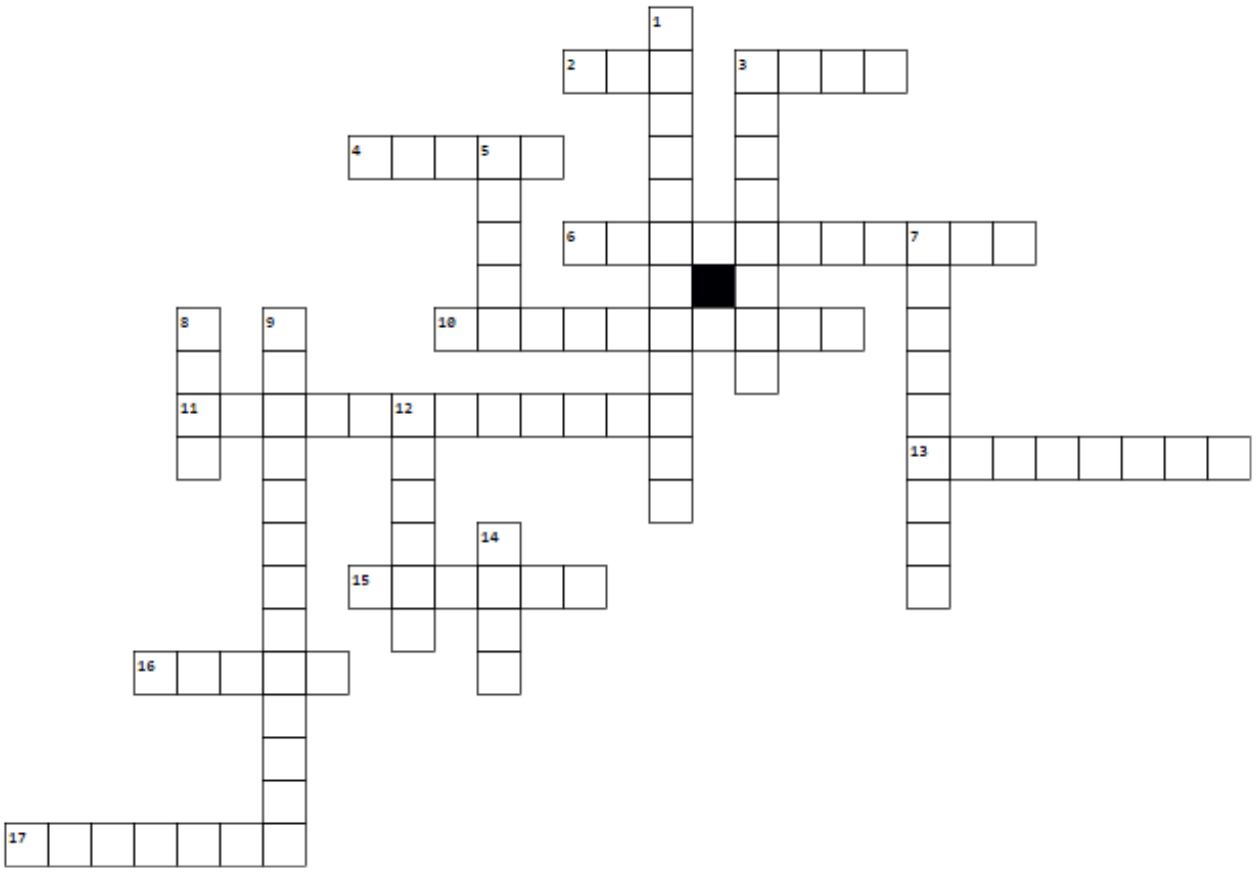
23.	trail *n.*	**w.**	суміш
24.	unstable *adj.*	**x.**	промінь
25.	vapor *n.*	**y.**	змішуватись
26.	wide *adj.*	**z.**	чіткий

Task 8. Match the following synonyms.

1.	occur	a.	limit
2.	drop	b.	stable
3.	blanket	c.	steam
4.	still	d.	unclouded
5.	increase	e.	mix
6.	vapor	f.	happen
7.	trail	g.	rise
8.	boundary	h.	pathway
9.	clear	i.	fall
10.	blend	j.	shield

Task 9. Solve the crossword.

(Also available at: https://crosswordlabs.com/view/atmosphere-456).



Across **Down**

2. grey or black powdery substance that is left after something is burnt

3. a gas which occurs in very small amounts in the atmosphere and is used in brightly colored electric signs and lights

4. a gas or extremely small drops of liquid that result from the heating of a liquid or solid

6. the lowest region of the atmosphere, extending from the Earth's surface to a height of about 6–12 km

10. the region of the Earth's atmosphere lying from a height of about 50 km to about 80 km above the Earth's surface

11. the layer of the Earth's atmosphere which lies between 10 and 50 kilometres above the Earth

13. a flammable gas, the lightest and commonest element in the universe

15. a gas lighter than air that will not burn and is used in balloons, airships, and some types of lights

16. a chemical element that forms almost 1 per cent of the Earth's atmosphere and is used in various products such as lasers and some electric light bulbs

17. a gas that burns easily and is the major constituent of natural gas and is used as a fuel

1. the region of the Earth's upper atmosphere extending from a height of approximately 80 km to between 550 and 700 km above the Earth's surface

3. a chemical element that forms most of the earth's atmosphere, and is a component of all proteins

5. a gas formed from oxygen by electrical discharges or ultraviolet light

6. a gas that burns easily, is the major constituent of natural gas, and is used as a fuel

7. the outermost region of the Earth's atmosphere, extending thousands of kilometers into space

8. dry powder consisting of tiny particles of earth or waste matter lying on the ground or on surfaces or carried in the air

9. a compound naturally present in the air (about 0.03 per cent) and is absorbed by plants in photosynthesis

12. a chemical element constituting about one-fifth of the volume of the atmosphere and is necessary for people, animals and plants to live

14. a current of air, especially a natural one that moves along or parallel to the ground, moving from an area of high pressure to an area of low pressure



Task 10. In the text of Task 5, find words which have these meanings.

a) to hurt, injure by fire or heat *(v.)* ……..

b) each of the lines in which light (heat) streams from the sun *(n.)* ……...

c) sudden violent movements of air *(n.)* ……..

d) living, existing, not dead *(adj.)* ……..

e) likely to change suddenly, especially if this creates difficulty or danger *(adj.)* ……..

f) sudden loud noise that comes from the sky especially during a storm *(n.)* ……..

g) make the movement or flow difficult or impossible (*v.)* ……..



Task 11. Next to each item below, write which layer of the atmosphere it refers to.

1.	This layer contains the ozone layer.	……..
2.	Shooting stars are seen and burn up in this layer.	……..
3.	This layer is included in the biosphere.	……..
4.	Weather is formed in this layer.	……..
5.	Most meteoroids break up in this layer.	……..
6.	This layer is where the space shuttle orbits.	……..
7.	Most planes fly in this layer.	……..
8.	This layer is the highest layer of Earth's atmosphere.	……..
9.	In this layer, the atmosphere reaches its coldest temperatures.	……..



Task 12. Complete the sentences with the most fitting words from the list below. Two words are extra.

mixture prevent ash wide average occur unstable ray blanket blend block boundary increase trail vapor burn up carbon dioxide still clear methane drop eventually

1. The Ural Mountains mark the ……. between Europe and Asia.
2. He worked so hard that ……. he made himself ill.
3. Do you think these two colors will ……. together?
4. Some leaves were floating about on the ……. lake.
5. The high winds cause the apples to ……. down.
6. The dogs are specially trained to follow the ……. left by the fox.
7. ……. earnings for unskilled workers are decreasing now.
8. A cloud of volcanic ……. is spreading across wide areas of the Philippines.
9. Clouds are formations of condensed water ……..
10. An explosion will probably……. at any minute.
11. Combine the eggs with a little flour and heat the ……. gently.
12. The hill was covered with a ……. of snow.
13. You have to keep watching to ……. the milk from boiling over.
14. This entrance is in constant use; do not ……. it.
15. A comfortable working environment will ……. productivity.
16. As the waste materials decompose, they produce ……. gas.
17. ……. is produced in huge amounts when fossil fuels are burned.
18. Stars more massive than the Sun will ……. their fuel much more rapidly.
19. The river is too ……. . We cannot swim across it.

20. Both clay and sandstone are ……. rock formations.

VIEWING & SPEAKING



Task 13. Watch a video about Earth's atmosphere to learn about its structure and characteristics.

BEFORE YOU WATCH

- Check the meanings of the words and expressions in the box where necessary.
- In pairs, decide how the words and expressions in the box may characterize the atmosphere of Earth. Share your ideas in class.

pollen colder pulls particles of dust upper auroras traps exert altitude environments decreases pollutants shooting stars protective densest moderate temperatures ash outermost heated light

AFTER YOU WATCH

- Check your predictions against the video.
- The summary of the video is below. Fill in the gaps with the missing words and phrases from the box.

The layer of gases that surrounds our planet is called the atmosphere. The atmosphere is composed of 78% nitrogen, 21% oxygen and 1% other gases. Water vapour and tiny **(1)** _____ _____ _____ , smoke and other chemicals are also found in the atmosphere. The atmosphere **(2)** _____ the Sun's energy to maintain **(3)** _____ _____ and forms a **(4)** _____ layer from the Sun's radiation. The force that atmospheric gases **(5)** _____ on the surface is called air pressure, or atmospheric pressure. This pressure is highest near seal level because gravity **(6)** _____ the air molecules close to the Earth's surface. As the **(7)** _____ increases, the air pressure **(8)** _____.

Humans add **(9)** _____ into the atmosphere every day. Natural sources of air pollution include volcanic **(10)** _____, **(11)** _____ and wildfire smoke. Air pollutants can travel great distances and impact **(12)** _____ around the globe.

The atmosphere is composed of 5 main layers: the troposphere, stratosphere, mesosphere, thermosphere and exosphere. Each layer has different characteristics. We live in the troposphere. This is the **(13)** _____ layer containing gas, water vapor, pollution and most weather elements. As altitude increases in the troposphere, the temperature gets **(14)** _____. The stratosphere is above the troposphere. Higher altitudes of the stratosphere are warmer because they are **(15)** _____ from the Sun's radiation. The ozone layer that filters harmful ultraviolet radiation is found in the stratosphere. The mesosphere is the coldest layer of atmosphere, with some temperatures as low as -100^{o} C. Meteoroids burn up in this layer and leave behind trails of glowing gases known as **(16)** _____ _____. The thermosphere is located in the

(17) _____ atmosphere and the temperature gets warmer as the altitude increases. Air particles in this layer are not dense but they move very quickly. The ionosphere is a part of the thermosphere that contains charged gas particles that create natural light displays called **(18)** _____. The exosphere is the **(19)** _____ layer of the atmosphere. Only very **(20)** _____ gases like hydrogen, helium and individual oxygen molecules are found here.

LEARN MORE!



Task 14. Write *T* if the statement is true or *F* if it is false. If the statement is wrong, make it right. Consult any reference material if you need help.

_____ 1. Without the atmosphere, we could not hear most sounds.
_____ 2. Without the atmosphere, Earth would be as cold as the Moon.
_____ 3. Earth's atmosphere consists mainly of oxygen.
_____ 4. Gases in the atmosphere are too thin to block any solar rays.
_____ 5. The atmosphere is about 10 percent water vapor.
_____ 6. Solid particles in the atmosphere may include dust and soil.
_____ 7. Clouds could not form if the air contained no solid particles.
_____ 8. Nitrogen makes up most of Earth's atmosphere.
_____ 9. The atmosphere is made up of 3 layers.
_____ 10. Ozone is a form of oxygen.
_____ 11. The higher you go in the ozone layer, the colder it gets.
_____ 12. The stratosphere is the closest layer to the Earth's surface.



Task 15. Work with a partner. Look at the words in each row. Choose the word which is odd and explain why you think so.

1.	spacecraft	bird	satellite	plane
2.	bird	satellite	spacecraft	tree
3.	cloud	tree	bird	spacecraft
4.	space station	spacecraft	plane	astronaut
5.	rain	snow	cloud	thunder
6.	atmosphere	exosphere	mesosphere	stratosphere



Task 16. Study the table that shows the temperature and the percentage composition of the atmospheres of Earth and Venus today. Three billion years ago, the Earth's early atmosphere was probably like the atmosphere of Venus today. Use the information from the table to help you complete the statements below.

	Percentage (%) composition of atmosphere	
Name of gas	**Earth today**	**Venus today**

Nitrogen	78	3.5
Oxygen	20.6	a trace
Argon	0.97	a trace
Carbon dioxide	0.03	96.5
Water vapour	0.4	a trace
Average surface temperature	20°C	460°C

In the Earth's atmosphere today, the main gas …….
In the Earth's atmosphere billions of years ago the main gas was ……
The Earth's surface is mainly covered with water……..
There is no water on the surface of Venus because ……

Task 17. Arrange the paragraphs about the formation of the atmosphere on Earth in the correct chronological order.

A.	____	Life begins in the oceans. Simple plants called cyanobacteria use carbon dioxide in photosynthesis. Ozone forms and oxygen levels start to rise.
B.	____	Earth is still too hot for any surface water. Its surface is covered in volcanoes.
C.	____	Animals evolve due to the increase in oxygen.
D.	_1__	Earth is a ball of molten rock. No atmosphere is present.
E.	____	Carbon dioxide levels rise due to pollution. Global warming starts – weather patterns are affected.
F.	____	Earth starts to cool down. Water vapour begins to condense and oceans are formed.
G.	____	Balance between carbon dioxide is achieved.
H.	____	Land plants start to appear. Oxygen levels rise rapidly.

EXTENSION

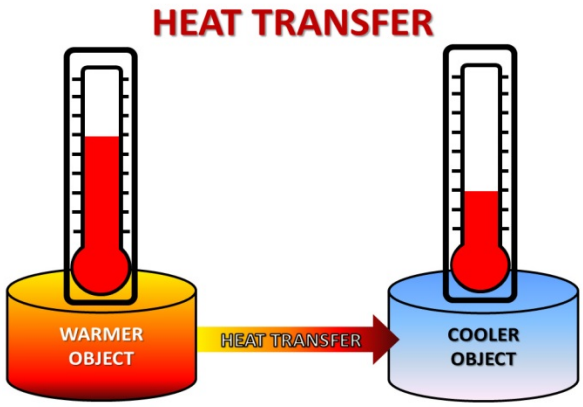
LISTENING AND SPEAKING

Task 18 A. Listen to Part 1 of the lecture *"Atmospheric Heating"* to help you understand how the Sun heats the Earth.

BEFORE YOU LISTEN

- Work in pairs to work out the meanings of these words and expressions: *thermal energy; solar radiation; electric and magnetic waves; transfer; conduction; convection currents.*

- Think of your everyday life. Where do you come across the phenomena mentioned in the task above? Share your ideas in class.
- Look at the image and try to explain what heat transfer is.



AFTER YOU LISTEN

- Fill in the gaps with the missing information from the box.

sinking cool contact radiates circulation radiation hot water boils to touch convection electromagnetic waves conduction

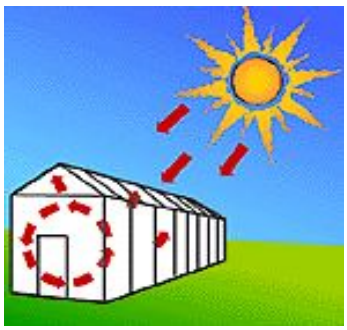
Heat moves through the Earth's atmosphere in three main ways: **(1)** _____ is the transfer of energy between two objects by **(2)** _____. Earth's surface warms up and **(3)** _____ most of the heat back into the atmosphere. **(4)** _____ is the transfer of heat by direct **(5)** _____. When you hold a metal object over a flame, it will eventually get extremely hot **(6)** _____. Heat will travel from the warm source to the colder object. **(7)** _____ is the transfer of heat energy in a liquid or gas by **(8)** _____. This process of mixing leads to rising warm air and **(9)** _____air. This type of heating is most commonly seen in the kitchen when **(10)** _____.

- Act as a lecturer to explain how Earth is heated by the Sun.

Task 18 B. Listen to Part 2 of the lecture *"Atmospheric Heating"* to get to know how greenhouse effect is produced.

BEFORE YOU LISTEN

- Discuss with your partner what you know about the greenhouse.
- Look at the picture and number each of the events in the correct order.



__ The glass windows hold the heat energy inside the greenhouse.
__ Energy comes from the sun.
__ The greenhouse stays warm and the plants grow.
__ Energy from the sun enters the greenhouse as light.
__ Inside the greenhouse, the light energy changes into heat energy.

- Share in class if you know why Earth's atmosphere is compared to a greenhouse.

AFTER YOU LISTEN

- Finish the sentences with the ideas relevant to the recording.

1. About 70% of the radiation that enters the Earth's atmosphere …….
2. Another 30% of the Sun's energy ……..
3. The atmosphere is like a warm blanket that …….....
4. The greenhouse effect is the process by which gases in the atmosphere such as water vapour and carbon dioxide …….
5. The gases function like the glass walls and roof of a greenhouse, which allow……..
6. For Earth to remain livable the amount of energy received from the Sun…….

- Role-play a talk. Split into two groups. Let one group play the part of experts and another one write a list of questions to the group of experts to find out how greenhouse effect makes the planet livable. Consider the following issues:

solar energy	*light waves*	*radiation trapping*
thermal energy	*radiation balance*	*water vapour and carbon dioxide*

READING & SPEAKING

Task 19. Read the text about the atmospheric composition of terrestrial and gas giant planets of the solar system.

BEFORE YOU READ

DISCUSS IN GROUPS AND SHARE IN CLASS

- if all planets in the solar system have atmospheres
- if oxygen is present on other planets of our solar system
- which planet in the solar system is the hottest / the coldest one
- which of the planets may contain water

CHECK THE MEANINGS OF THE WORDS AND EXPRESSIONS. THINK HOW THEY CAN BE USED IN THE TEXT. TURN TO A RELIABLE (E-)SOURCE WHERE NECESSARY.

hydrogen	*helium*	*sodium*	*potassium*	*calcium*	*magnesium*
runaway effect		*ammonia*	*ammonium*	*hydrosulfide*	
wrap around		*circumferences*	*whirl*	*shift forward*	

AFTER YOU READ

SUGGEST THE NAME OF THE PLANET FROM A-H FOR EACH PARAGRAPH (1-8).

A. *Mars*
B. *Venus*
C. *Uranus*
D. *Mercury*
E. *Neptune*
F. *Earth*
G. *Jupiter*
H. *Saturn*

CHOOSE ANY PLANET AND RESTORE WHAT THE PARAGRAPH SAYS ABOUT IT.

SOLAR PLANETS' ATMOSPHERIC TIDBITS

1._____ has almost no atmosphere. The planet's small size means that its gravity is too weak to hold down a normal atmosphere, which is why it is constantly being "blown away" into space by the pressure of sunlight and by the solar wind. Chemically, the atmosphere contains small amounts of hydrogen, helium, and oxygen and also has even tinier amounts of sodium, potassium, calcium, and magnesium. A large range in its surface temperatures (from - 173° C to + 427° C) is possible because the planet is very close to the Sun.

On **2.** _____, we live in the troposphere, the closest atmospheric layer to the surface. "*Tropos*" means change, and the name reflects our constantly changing weather and mixture of gases.

3._____ has a very thin atmosphere, nearly all carbon dioxide. Because of the Red Planet's low atmospheric pressure, and with little methane or water vapor to increase the weak greenhouse effect, its surface remains quite cold, the average surface temperature being about minus 63 degrees Celsius.

4._____'s atmosphere, like Mars', is nearly all carbon dioxide. However, the planet has about 154,000 times more carbon dioxide in its atmosphere than Earth (and about 19,000 times more than Mars does), producing a runaway greenhouse effect and a surface temperature hot enough to melt lead. A runaway greenhouse effect is when a planet's atmosphere and surface temperature keep increasing until the surface gets so hot that its oceans boil away.

5._____ is likely to have three distinct cloud layers (composed of ammonia, ammonium hydrosulfide and water) in its "skies" that, taken together, span an altitude range of about 71 kilometers. The planet's fast rotation creates strong jet streams, separating its clouds into dark belts and bright zones wrapping around the circumference of the planet.

6._____ atmosphere has a few unusual features. Its winds are among the fastest in the solar system, reaching speeds of 1,800 kilometers per hour. It may be the only planet in our solar system with warm masses of swirling atmospheric gas around both the

Northern and Southern poles. This produces hurricane-like systems like those on Earth. In addition, about every 20 to 30 Earth years, the planet hosts a megastorm that can last many months.

7._____ gets its signature blue-green color from the cold methane gas in its atmosphere and a lack of high clouds. The planet's minimum troposphere temperature is minus 224.2 degrees Celsius, making it even colder than Neptune in some places. Its winds move backward at the equator, blowing against the planet's rotation. Closer to the poles, winds shift forward and flow with the planet's rotation.

8._____ is the windiest planet in our solar system. Despite its great distance and low energy input from the Sun, wind speeds at the planet are over 2,000 kilometers per hour, making them three times stronger than Jupiter's and nine times stronger than Earth's. Even Earth's most powerful winds hit only about 400 kilometers per hour. Also, the planet's atmosphere is blue for the very same reasons as Uranus' atmosphere.

Task 20. Check your understanding of the text above by circling the letter of the best answer.

1. According to the text, which of the following is TRUE?

(A) Uranus records the lowest temperatures.
(B) The atmospheres of all solar system planets except Earth are icy.
(C) Venus is the hottest planet in the solar system.
(D) One common feature of the solar system planets is swirling winds on their Northern and Southern poles.

2. According to the text, the three planets whose atmospheres have the strongest winds are

(A) Earth, Venus, Mars
(B) Jupiter, Saturn, Neptune
(C) Mercury, Venus, Mars
(D) Earth, Jupiter, Uranus

3. Which line describes the chemical composition of Mars's atmosphere?

(A) carbon dioxide, oxygen
(B) hydrogen, helium, oxygen
(C) ammonia, ammonium hydrosulfide, water
(D) methane, carbon dioxide, water vapour

4. The word *"runaway"* in paragraph four means

(A) a child who leaves home without permission
(B) a strip of ground for airplanes to take off and land on
(C) very quick and uncontrollable
(D) a path made by animals

5. Both Uranus and Neptune

(A) have blue atmospheres because of the presence of cold methane
(B) have clouds stratified into dark and bright belts

(C) contain sodium, potassium, calcium, and magnesium in the atmosphere
(D) generate hurricanes every 20 years

CONSOLIDATION



Task 21. Complete the text with suitable words. Some letters have been given for you.

Oxygen is one of the main gases in Earth's atmosphere. Its **(1) _ _e _ _c_l** symbol is O_2 (as an element its symbol is O). Oxygen has no color, **(2) _ d_r**, or taste. It makes up 21 percent of Earth's atmosphere, 90 percent of the water in our oceans, and nearly 50 percent of Earth's **(3) _ _u_t**. It also makes up about 60 percent of the human body. Almost all living things need oxygen.

Oxygen also has other important uses. For example, factories use oxygen to **(4) p_ _ _u_e** steel, plastics, and textiles such as cotton and silk. Space **(5) _ _ _k_ts** use liquid oxygen for fuel. Doctors may give nearly pure oxygen to patients with **(6) _ _e_ _h_ng** problems. In addition, airplanes and spacecraft use a mix of oxygen with other gases that helps people breathe better at high **(7) a_ _i_ _d_s**.

Today, oxygen even provides recreation. "Oxygen bars" appeared in Japan in the late 1990s; now they are in airports, **(8) _ ea_t_** clubs, and many other places. By 2012, some bars were even selling "flavors" of oxygen, such as lavender and peppermint. Customers believe that the oxygen improves **(9) _ n_r_ _** and lowers stress. Some stores now sell cans of oxygen for people to enjoy anywhere. Does oxygen help with altitude sickness, jet lag, and **(10) h_ _d_ _ _es**? The can manufacturer says that it does, but scientific studies have not proven these benefits.



Task 22. Complete the text with the most appropriate word from (A–N) for each gap. You will not need one word. The first one is done for you (0).

There are 8 planets and over 160 moons in the solar system. Of these, the planets Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune have significant atmospheres. Pluto (a dwarf planet) may have a powerful atmosphere, but perhaps only when its **(0)** ***highly*** elliptical orbit is closest to the Sun. Of the moons, only Titan, a moon of Saturn, is known to have a **(1)** ..... atmosphere. Much of what is known of these planets and their moons has **(2)** ..... from the Pioneer, Viking, Mariner, Voyager, and Venera space probes.

The atmosphere of Venus is about 96 percent carbon dioxide, with **(3)** ..... temperatures around 737°K (464°C, or 867°F). **(4)** …… on Venus are made of sulfuric acid (H_2SO_4) and move in an **(5)** …… circulation of about 100 metres per second (224 miles per hour). Venus itself **(6)** …… only once every 243 Earth days. Surface pressures on Venus are around 95,000 millibars. (By contrast, Earth has a sea-level pressure of around 1,000 millibars.)

Mars has a **(7)** …… atmosphere composed of about 95 percent carbon dioxide, with the remainder being mostly diatomic nitrogen. Traces of **(8)** …… also occur. Mars has an average surface air temperature estimated at 210 K (-63°C, or -82°F), and surface pressures of about 6 millibars. Both water and carbon dioxide clouds are observed on Mars, and it has **(9)** …….. seasons. In addition to periodic regional and global dust storms, cyclonic storms and clouds, **(10)** …… with the boundary between cold air (from the polar cap) and warm air (from the mid-latitudes), have been observed on the planet. The rotation rate of Mars is close to the rotation rate of Earth. **(11)** ……..… of river channels on Mars indicates that liquid water was present and atmospheric **(12)** ……..… was much higher in the planet's geologic past.

A	clouds	**B**	thin	**C**	rotates
D	associated	**E**	covers	**F**	***highly***
G	density	**H**	resulted	**I**	well-defined
J	thick	**K**	evidence	**L**	surface
M	water vapour	**N**	easterly		



Task 23. Read the text and decide which answer (A, B, C, or D) best fits each gap. There is an example at the beginning (0).

Along with Earth, Venus and Mars have atmospheres that were **(0) primarily** formed as a result of volcanic gas **(1)** _____, although the **(2)** _____ of these gases on each planet has been very different. On Mars, for example, temperatures are currently so low that most of the water vapour emitted by volcanoes has apparently been **(3)** _____ as ice within the crustal **(4)** _____. The closer **(5)** _____ of Venus to the Sun, and the resultant higher temperatures, may have led to the **(6)** _____ of most of the water from that planet – most likely through the **(7)** _____ of water into hydrogen and oxygen. Hydrogen gas was lost to space; oxygen was combined with other elements through **(8)** _____; and carbon dioxide (produced by volcanic emissions) **(9)** _____ to high concentrations. In contrast, much of the carbon dioxide in Earth's early atmosphere became part of the crustal materials, and the buildup of oxygen in Earth's atmosphere is a result of photosynthesis by plants.

The air on Jupiter and Saturn is made up of nearly 100 percent diatomic hydrogen (H_2) and helium (He), with small contributions of methane (CH_4) and other chemical **(10)** _____. Much less is known regarding the atmospheres of the somewhat smaller Jovian planets Uranus and Neptune, although both are thought to be similar to those of Jupiter and Saturn.

0	**A**	eventually	**B**	**primarily**	**C**	approximately	**D**	constantly
1	**A**	particles	**B**	masses	**C**	trails	**D**	emissions
2	**A**	evolution	**B**	progress	**C**	growth	**D**	increase
3	**A**	composed	**B**	located	**C**	occurred	**D**	deposited
4	**A**	ground	**B**	land	**C**	soils	**D**	rock
5	**A**	proximity	**B**	boundary	**C**	edge	**D**	path

6	**A**	flow	**B**	loss	**C**	gas	**D** extinction
7	**A**	release	**B**	mixture	**C**	dissolution	**D** blend
8	**A**	radiation	**B**	oxidation	**C**	ionization	**D** condensation
9	**A**	contained	**B**	made up	**C**	packed	**D** accumulated
10	**A**	compounds	**B**	alloys	**C**	combinations	**D** solutions

 **Task 24. Give English equivalents of the words and word combinations below. Then, use them in a list of 10 questions you would like to ask a lecturer about the atmosphere of Earth and other planets of the solar system.**

A (Text "The Composition and Structure of the Atmosphere") шар суміші газів; аргон; двоокис вуглецю; незначний відсоток; потребувати азот для росту; захищати від метеорів; перешкоджати проникненню шкідливих променів; запобігати переохолодженню; простягатись угору над поверхнею; відсутність чітких меж; зливатися / поєднуватись із космосом; тропосфера; стратосфера; мезосфера; термосфера; екзосфера; грім; нестійкий потік повітря; озоновий шар; знизитись / підвищитись (°C); згоряти в мезосфері; падаюча зірка; чисте й нерухоме повітря.

B (Text "Solar Planets' Atmospheric Tidbits") надто слабка гравітація; здувати / відносити у космос; сонячний вітер; калій; натрій; кальцій; магній; низький атмосферний тиск; незначний вміст метану; нестримний парниковий ефект; середня температура поверхні; розплавити свинець; википати; досягати швидкості; чіткі шари хмар; сульфгідрат амонію; простягатись угору; швидке обертання; потокові течії; темні та яскраві пояси; огорнути планету довкола; вихорні атмосферні маси; властивий / чіткий колір; рухатись назад / вперед; дути за / проти напрямку обертання планети; перевищувати 2000 км / год.

 **Task 25. Render the following text in English. Make use of the essential vocabulary of the unit.**

Атмосфера – це газова оболонка, що оточує Землю. Атмосфера має «багатоповерхову» будову та ділиться на такі шари, як тропосфера, стратосфера, мезосфера, термосфера й екзосфера. Склад сухого залишку атмосфери по всій її товщі майже однаковий, відрізняється лише за щільністю і температурою. У нижньому шарі (тропосфері) підвищений вміст води, твердих часток, а над ґрунтом – вуглекислого газу. Тропосфера включає близько 80% всієї маси атмосфери.

Азот в атмосфері міститься в значно більшій концентрації (78%), ніж інші гази. Близько трьох мільйонів років тому в результаті появи зелених рослин і, відповідно, фотосинтезу, в атмосферу у великих кількостях став виділятися кисень. При окисленні молекулярним киснем аміачно-водневої атмосфери з'явилася величезна кількість азоту. На даний час цей газ виділяється в атмосферу в процесі життєдіяльності мікроорганізмів, тому що цей хімічний

елемент є складовою частиною білків рослинного і тваринного походження. Азот бере участь у природному кругообігу речовин і в регуляції концентрації молекулярного кисню в атмосфері, запобігаючи його надмірного накопичення.

Кисень після азоту посідає друге місце в процентному співвідношенні за об'ємним вмістом в атмосферному повітрі (20, 85%). Кисень необхідний для протікання таких важливих для живих організмів процесів, як дихання, гниття, горіння. Таким чином, без цього хімічного елемента життя неможливе. Практично весь вільний кисень надходить в атмосферу внаслідок фотосинтезу в клітинах рослин.

Важлива складова повітря – вуглекислий газ, який міститься в атмосфері в невеликих кількостях (0,04%). Вуглекислий газ вважається обігрівачем Землі, оскільки він добре пропускає сонячну радіацію до поверхні планети й утримує тепло. Концентрація вуглекислого газу в атмосфері залежить від діяльності вулканів, хімічних процесів в оболонках Землі (мінеральні джерела, ґрунт, продукти гниття). Також велика кількість вуглекислого газу виділяється в атмосферу від промислових підприємств. Однак, основна маса даної сполуки потрапляє в атмосферу внаслідок біосинтезу і розкладання органічної речовини в біосфері нашої планети.

Вміст інших газів в атмосфері незначний. Інертні гази, такі як неон, аргон, ксенон, надходять в атмосферу в результаті вулканічних виверженьі розпаду деяких радіоактивних елементів. Учені вважають, що в земній атмосфері міститься така мала кількість благородних газів внаслідок їх постійного розсіювання в космічному просторі.

Крім газів, в атмосферному повітрі містяться водяна пара і тверді частинки у формі аерозолю. Концентрація водяної пари в повітрі збільшується через випаровування води з поверхні Землі. У різних областях його вміст відрізняється, також він може змінюватися протягом року. Опади і хмари формуються з водяної пари. Саме завдяки вмісту водяної пари, в атмосфері утримується близько 60% тепла від земної поверхні.

Тверді частки в атмосферному повітрі – це пил космічного і вулканічного походження, сольові кристали, дим, мікроорганізми, пилок рослинних організмів, тощо. Суспензії твердих часток зменшують сонячну радіацію, що надходить до поверхні Землі, а також прискорюють згущення водяної пари і формування хмар.

Task 26. Choose 5-7 key terms from the unit. Use a dictionary or your own words to define these terms. Write the definitions in the glossary.

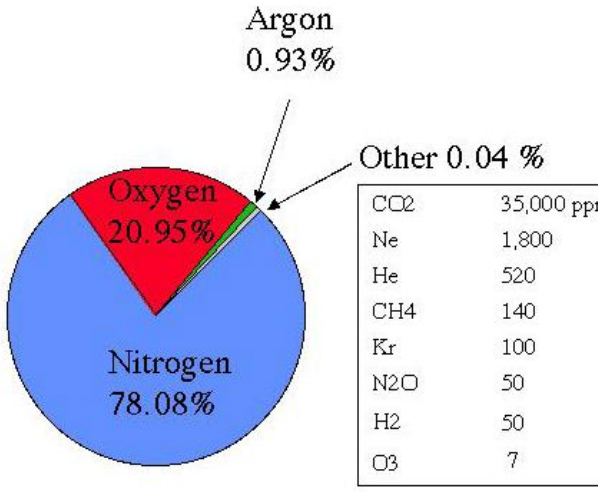
oxygen ozone mesosphere stratosphere carbon dioxide neon exosphere troposphere thermosphere wind thunder ray turbulence ash methane vapor hydrogen argon nitrogen dust helium ***radiation*** *conduction convection krypton xenon shooting star altitude pollutant pollen greenhouse effect*

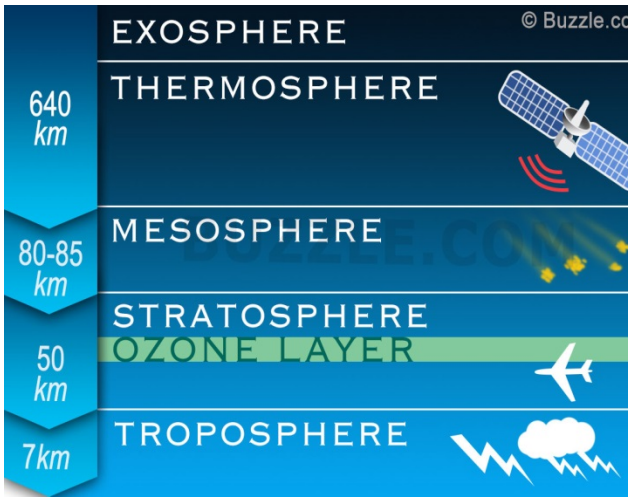
Example: ***Radiation*** *is the energy produced during nuclear reaction; energy released in the form of particle or electromagnetic waves.*

Task 27. Review the topics covered in this unit. Suppose you are to participate in an international scientific workshop. Be an expert in one of the topics below. Deliver a report.

1. The Role of the Atmosphere on Earth.
2. Composition of the Earth's Atmosphere.
3. Layers of the Earth's Atmosphere.
4. Atmospheres on Other Planets.
5. The Formation of the Atmosphere on Earth.
6. Air Pollution.

Task 28. Speak on the topic "Atmosphere" for 3-4 minutes. Comment upon the supporting images below using the active vocabulary of the unit.





Task 29. Work in groups. Act out the roles under appropriate rubrics. You will be given 5-7 minutes to prepare and 3-5 minutes for your presentation.

✓ Discuss the gas composition of the Earth's atmosphere through a role play.
✓ Name the five layers of the atmosphere and identify their peculiar features. Present it to the class through a game show.
✓ Discuss the temperature variations in each layer of the atmosphere and present it to the class as news report.
✓ List and discuss the negative effects of human activities on our atmosphere. Present it to the class through a talk show.

Task 30. Provide an extended answer to the question below in writing (120-150 words). Use appropriate academic and specialized vocabulary in clear and complete sentences.

Imagine our planet without the atmosphere, what do you think could happen? How would we be able to survive?

UNIT 7

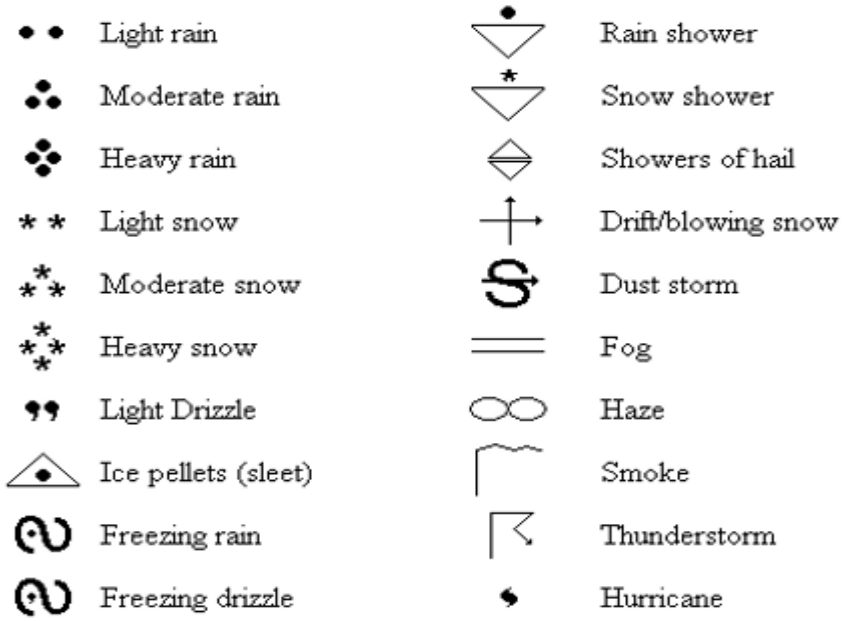
WEATHER AND CLIMATE

L E A D – I N

Task 1. Discuss the following questions with a partner or in a small group.

- *How can we describe the weather? Brainstorm words that name the weather, make a list. Think of at least 10-12 words.*
- *Describe the weather today. Use the words that you have brainstormed.*
- *What occupations are most affected by the weather?*
- *Do weather conditions affect any of your hobbies?*
- *Do you feel different because of the weather?*

Task 2. Study the chart below. Have you ever seen these weather symbols? Can you give Ukrainian equivalents to the following weather terms?



VOCABULARY

Task 3. Choose the words from the box to describe the seasons: spring, summer, autumn (fall), and winter.

rainy	*warm*	*hot*	*sunny*	*icy*	*cold*	*snowy*	*frosty*	*dry*

windy foggy cloudy cool calm humid wet clear mild fine dull pleasant nasty terrible awful miserable lovely bad unpleasant nice terrific chilly damp



Task 4 A. Look at the words in the box. Which of them can you pronounce correctly?

Specialized &General Academic Vocabulary	*ahead available blizzard destroy disaster drop hailstone humidity indoors ingredient powerful precipitation radar station severe sleet strength swirl tool trap variety virtually weather balloon weather vane*

Task 4 B. Practise reading the transcribed words below. Then, identify them in the box in Task 4 A.

/vəˈraɪəti/; /sliːt/; /ɪnˈgriːdiənt/; /ˈvɜːtʃuəli/; /əˈhed/; /streŋθ/; /ˈblɪzəd/; /træp/; /ˌɪnˈdɔːz/; /səˈvɪə/; /ˈheɪlstəʊn/; /əˈveɪləbəl/; /bəˈluːn/ ; /tuːl/; /dɪˈzɑːstə/; /swɜːl/; /prɪˌsɪpɪˈteɪʃən/.

Task 4 C. Write each word in the column that best describes what you know about it. Share your ideas with your partner. Then, consult a dictionary to check the meanings of the new words.

I don't know the meaning	I think I know the meaning	I know the meaning

…… …… ……	…… …… ……	…… …… ……

CORE BLOCK

READING & SPEAKING

Task 5. This text will introduce you to meteorology issues. Read the text and translate the phrases with the words in bold into Ukrainian.

BEFORE YOU READ, DISCUSS IN PAIRS TO CHECK IF YOU KNOW

- the components of weather and how they interact with each other
- what kind of weather can bring dreadful disasters
- how a hurricane is different from a tornado, and a snowfall from a blizzard
- what meteorologists deal with and what tools they use in their job

FORECASTING THE WEATHER

What does the word "weather" mean to you? There is a wide variety of types of weather. The weather can be sunny or stormy. It can be warm or cool. It can also be rainy, cloudy or windy. Sometimes, weather is severe. Let us consider a scientific definition of weather. Weather is the state of the atmosphere at a given time and place. Four main **ingredients determine** the weather: temperature, **humidity**, wind **speed** and direction, and air **pressure**.

All of the weather's four main ingredients interact with each other. As air particles respond to changes in pressure and move, they create wind. On a very humid day, there may be many clouds in the sky. When it is cloudy, many of the Sun's rays never **reach** the Earth. Severe storms happen in low-pressure weather systems. Warm, wet air begins rising into the air. The higher it rises, the cooler it becomes. Water vapor in the air forms drops. The drops join together to form clouds. Precipitation in the form of rain, sleet, snow or hail falls down to Earth's surface.

Thunderstorms often bring disasters with them. This can be in the form of floods, fires caused by lightning, damage from hailstones or strong winds, and even tornadoes. A **tornado** is a spinning mass of air over land that can destroy virtually everything in its path. A **blizzard** is a combination of strong winds and extremely low temperatures. Snowfall increases until it is so heavy it is difficult or impossible to see. People can become lost in the snow and freeze to death. Homes can be covered over with snow, trapping people indoors. A **hurricane** is the most powerful storm known on Earth. It forms over warm ocean waters off the coast of the tropics, becoming a gigantic swirling mixture of air and water. It can grow to between 100 and 900 miles wide. Wind speeds can average 75 miles per hour or more. Hurricanes do the most damage to coastal cities because they quickly lose their strength as they move over land. Hurricanes are so large

and powerful that their swirling clouds can be seen from space.

Meteorology is the scientific study of the weather. The scientists who specialize in this area are called **meteorologists.** Their job is to **collect** data, make observations about the data and **interpret** the data. Their goal is to make informed predictions about what kind of weather we can expect. When we get information ahead of time, we can prepare for it. Being prepared helps us stay safe.

There are many tools available to help meteorologists do their job: high-tech computers, Doppler radar stations, **weather balloons**, satellites, thermometers, anemometer, **weather vanes**, and barometers.

Task 6. Answer the questions using the ideas from the text.

1. What is a weather forecast? Do you personally rely on it?
2. What types of weather are mentioned in the text?
3. Name one danger associated with blizzards.
4. Which kind of extreme weather do you think would be the most difficult to face? Why?
5. What does a job of a meteorologist involve? Do you think it is easy or difficult to work as a meteorologist?
6. Name one weather tool. What is it used for?

Task 7. Match each English word or phrase with its Ukrainian equivalent.

1.	ahead *adv.*	**a.**	стихійне лихо
2.	available *adj.*	**b.**	пошкодження
3.	blizzard *n.*	**c.**	тиск
4.	collect *v.*	**d.**	флюгер
5.	damage *n.*	**e.**	вологість
6.	destroy *v.*	**f.**	різноманітність
7.	determine *v.*	**g.**	компонент, складова частина
8.	disaster *n.*	**h.**	швидкість
9.	drop *n.*	**i.**	потужний, сильний
10.	freeze *v.*	**j.**	тлумачити
11.	gigantic *adj.*	**k.**	метеозонд
12.	hail *n.*	**l.**	збирати
13.	humidity *n.*	**m.**	велетенський, гігантський
14.	ingredient *n.*	**n.**	сила
15.	interpret *v.*	**o.**	досягати
16.	powerful *adj.*	**p.**	псувати, нищити
17.	precipitation *n.*	**q.**	лютий, суворий
18.	pressure *n.*	**r.**	замерзати
19.	reach *v.*	**s.**	раніше, попередньо
20.	severe *adj.*	**t.**	закручений

21.	speed *n.*	**u.**	визначати
22.	strength *n.*	**v.**	гроза
23.	swirling *adj.*	**w.**	крапля
24.	thunderstorm *n.*	**x.**	інструмент, знаряддя
25.	tool *n.*	**y.**	наявний
26.	trap *v.*	**z.**	фактично, практично
27.	variety *n.*	**aa.**	град
28.	virtually *adv.*	**bb.**	заманювати у пастку
29.	weather balloon *phr.*	**cc.**	хуртовина
30.	weather vane *phr.*	**dd.**	опади



Task 8. Match the following synonyms.

1.	destroy	**a.**	constituent
2.	tool	**b.**	range
3.	ingredient	**c.**	harsh
4.	gigantic	**d.**	watch, inspect
5.	swirling	**e.**	instrument
6.	variety	**f.**	break up
7.	strength	**g.**	enormous
8.	reach	**h.**	spinning
9.	observe	**i.**	force
10.	severe	**j.**	get to



Task 9. Find words in the text that have these meanings.

1. a sudden accident or a natural catastrophe that causes great damage or loss of life *(n.)* .....
2. a device that measures the speed and force of wind *(n.)* .....
3. inside a building *(adv.)* .....
4. small, hard balls of ice that fall from the sky like rain *(n.)* .....
5. a very small amount of liquid that falls in a round shape *(n.)* .....
6. a device used for measuring the temperature of air *(n.)* .....
7. wet, partly melted falling snow *(n.)* .....
8. a metal object fixed to the top of a building that blows around to show the direction the wind is coming from *(n. phr.)* .....
9. a target or aim that someone is trying to reach or achieve *(n.)* .....



Task 10. Do a multiple-choice quiz. Choose the correct option.

1. Which is NOT a synonym for *"collect"*?
a) gather
b) expect

c) accumulate
d) compile

2. Which word is the opposite of *"severe"*?
a) violent
b) harmful
c) mild
d) powerful

3. The word *"to determine"* means
a) to say or do something as a reaction to something that has been said or done
b) to study or work on a particular subject or skill more than any others, so that you become an expert in it
c) not to be certain about something, especially about how good or true it is
d) to discover the facts or truth about something

4. Which word is similar in meaning to *"blizzard"*?
a) sleet
b) snowfall
c) hail
d) flood

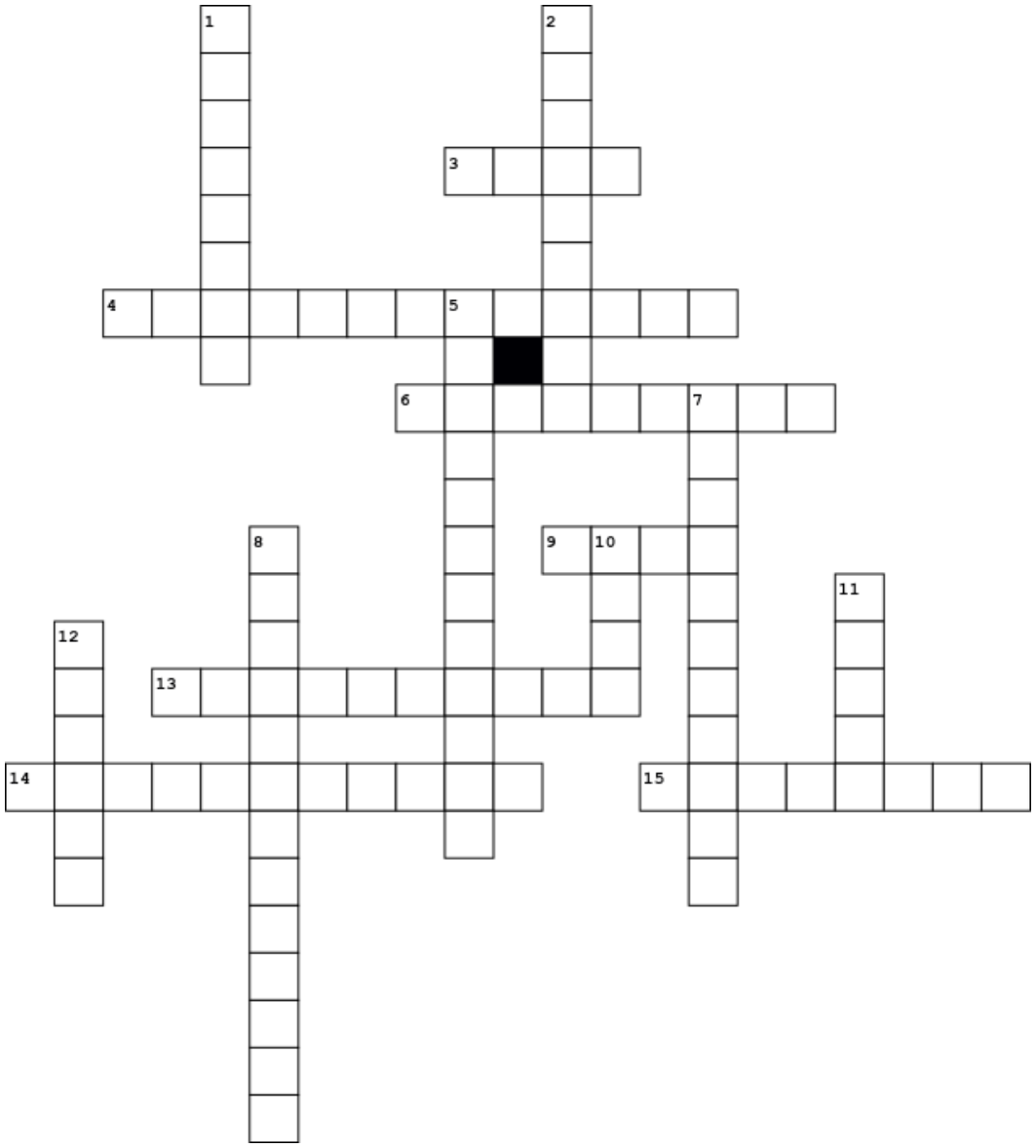
5. When we get information *ahead of time*, we can prepare for it.
a) in quick time
b) too late
c) beforehand
d) without warning

6. A tornado is a spinning mass of air over land that can destroy *virtually* everything in its path.
a) essentially
b) by chance
c) by visual
d) almost

7. Homes can be covered over with snow, *trapping* people indoors.
a) locking
b) causing
c) melting
d) surviving

8. A hurricane is the most *powerful* storm known on Earth.
a) unstable
b) forceful
c) predictable
d) indefinite

Task 11. Solve the crossword (refer to the text *"Forecasting the Weather").* (Also available at: https://crosswordlabs.com/view/weather-5012)



Across

3. a measurement of how much water there is in the air
6. a device that measures air pressure and shows when the weather is likely to change
7. the measurement in degrees of how hot or cold a thing or place is
8. a rising and overflowing of a body of water especially onto normally dry land

Down

1. the force exerted onto a surface by the weight of the air
2. an extremely large, powerful, and destructive storm with very strong winds
4. a scientist who studies the Earth's atmosphere and its changes, used especially in predicting what the weather will be like

9. to turn into ice or another solid as a result of extreme cold
10. a very small amount of liquid that falls in a round shape
11. atmospheric water vapour frozen into ice crystals and falling in light white flakes or lying on the ground as a white layer
12. a statement about what will happen or might happen in the future
14. falling products of condensation in the atmosphere, as rain, snow, or hail

5. a storm with thunder and lightning and usually heavy rain
13. water that falls in drops from clouds in the sky



Task 12. Use the words *in italics* to complete the sentences. You will not need two words.

pressure weather vane tools available collected damage destroyed determine disaster humidity drops freeze gigantic ingredient ahead interpret variety strength speed swirling hail trapping

1. The storms serve to modify the intense heat, though the lightning and ……. cause considerable damage.
2. There are six main components, or parts, of weather. They are temperature, atmospheric ……, wind, humidity, precipitation, and cloudiness.
3. A weather station is simply a facility with ……..... and technology used to forecast the weather.
4. Most of the old part of the city was …… by bombs during the war.
5. The dolphin carried him with great ……. to the nearest shore.
6. Scientists were brought in to …….. the age of the skeleton.
7. Weather instrument which tells wind direction is called …….
8. Thousands of people were left homeless by the ……..
9. I do not want to sell my house, but it is the only option …… to me.
10. When it slowed for the drive, the dust caught up, hiding it in a ……. cloud.
11. You must bring the dog inside! He will ……. out there.
12. …….. to crops caused by insects raised the price of bread and flour.
13. The employees complained that the cafeteria food lacked ……..
14. I …… the various papers that were lying on the desk.
15. She survived in the wilderness by eating berries and…… small animals and birds.
16. These lines of the poem are somewhat hard to ……..
17. When I think back, it is difficult to believe I found the ……. to do so.
18. The shoe store is having a …….. sale next week.
19. She viewed color as an essential …… of good design.
20. ……. of water shimmered on the spider's web.

VIEWING & SPEAKING



Task 13 A. You are going to watch a video to learn how to predict weather patterns by the clouds.

BEFORE YOU WATCH

- With your partner, discuss how different clouds can be.
- Check the meanings of the words and expressions in the box. Ask your teacher / classmates for help where necessary.

altitude	*cirrus*	*stratus*	*cumulus*	*wispy*	*puffy*	*fair*
cumulonimbus	*altocumulus*	*altostratus*	*drizzle*	*sleet*	*funnels*	
of high speed	*alley*	*fog*	*moisture*	*ice crystals*	*collide*	
strength	*mist*	*extreme*	*discharged*	*rotating winds*		

- Use the vocabulary from the box to assume how different weather ingredients affect precipitation and weather conditions.

AFTER YOU WATCH

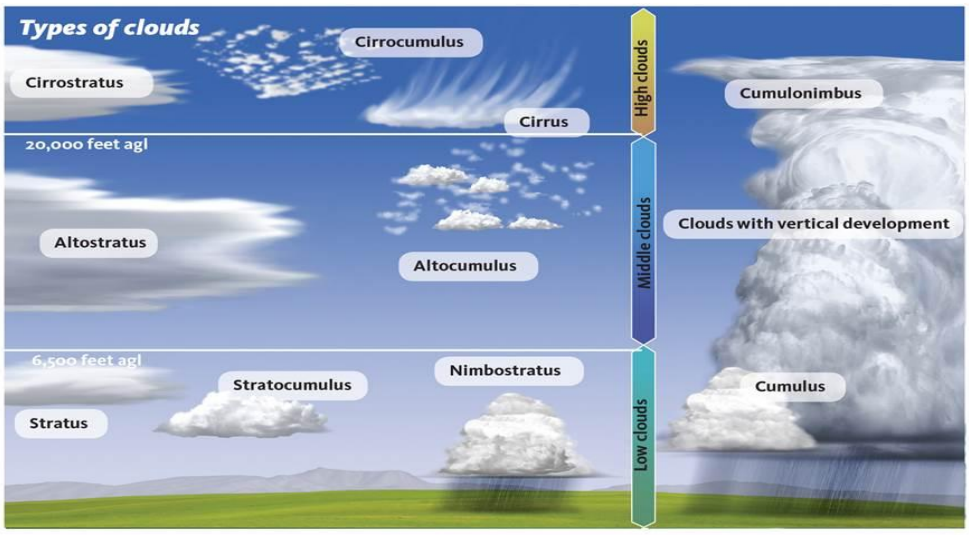
- Fill in the gaps with the appropriate words and expressions from the video.
  1. Clouds form when water vapor condenses as ……. or ice crystals and accumulates in the atmosphere.
  2. Clouds are characterized by their shape and ……. .
  3. The three main types of clouds are cirrus, ……., and cumulous.
  4. Cirrus clouds are thin, ……. clouds that form at high altitudes and are composed of ……. .
  5. Stratus clouds form in ……. that spread across the sky and often bring continuous ……. .
  6. Cumulous clouds are large ……. clouds that are typical of ……. weather.
  7. A cumulonimbus cloud is a very large cumulous cloud that is responsible for ……. and ……. weather.
  8. Altocumulous and ……. clouds form in the ……. of the atmosphere, above 6,000 feet.
  9. Stratus clouds that form close to the ground are called ……. .

- Match the beginnings in **1-13** with the endings in **a-m** to read the descriptions of different kinds of precipitation. Check yourself against the video.

1	Precipitation is water that has condensed in	**a**	while snow is basically water that has crystallized.
2	Rain, sleet, snow and hail are	**b**	create heavy rain, wind and lightning.
3	Rain typically falls from stratus clouds	**c**	discharged from the cloud.

4	Sleet is a mixture of water and ice,	**d**	that often develop in cumulonimbus clouds.
5	Hail forms during a thunderstorm, when water droplets move thorough	**e**	when winds moving in different directions collide over warm ocean water.
6	Thunderstorms are small high energy weather systems that	**f**	it has a potential to grow its strength.
7	These storms form when rapidly rising warm air condenses	**g**	in wind direction with increasing altitude.
8	Lightning occurs when electricity is	**h**	the atmosphere and falls to the Earth.
9	Tornadoes are funnels of high speed, rotating winds	**i**	in a form of a drizzle or mist.
10	Tornadoes form when there is a drastic change	**j**	different forms of precipitation.
11	A hurricane is a large tropical rotating weather system. A hurricane forms	**k**	A snow belt exists in the northern US along the great lakes, where warm water vapor mixes with cold air masses.
12	As long as a hurricane is over open water,	**l**	a cycle of rising, freezing, or falling inside a cumulonimbus cloud.
13	Winter weather occurs when moisture reaches cold air masses.	**m**	into an electrically charged cumulonimbus cloud.

Task 13 B. Look out the window and look up at the sky. What is the weather like today? What kinds of clouds do you see? Use the details to describe the weather and clouds. Make use of the following image depicting the types of clouds.



LEARN MORE!

Task 14. Match parts of the sentences in Columns A and B to learn some interesting facts about weather.

A		B	
1.	Some frogs get noisier	**a.**	produce 160 kmph winds!
2.	Some tornadoes can be faster than	**b.**	follows a volcanic eruption.
3.	In Antarctica, snow can fall so hard	**c.**	can take up to 1 hour to reach the ground.
4.	A thunderstorm can	**d.**	the USA, which faces on average 1,200 tornadoes every year.
5.	Lightning often	**e.**	formula one racing cars!
6.	The coldest temperature	**f.**	1 billion tonnes of rain falls on the Earth.
7.	Snowflakes falling at 2-4 mph	**g.**	just before it rains.
8.	The country most affected by tornadoes is	**h.**	Mt Washington, New Hampshire, USA at an amazing 231 mph.
9.	For each minute of the day	**i.**	ever officially recorded was -89.2°C.
10.	The strongest ever recorded wind was on	**j.**	you can't see your hand in front of your face.

Task 15. Unscramble the words below.

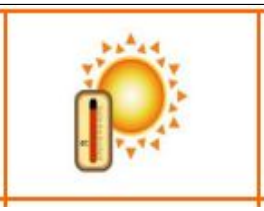
1. elste……..
2. olycdu……...
3. mudih……
4. yogfg…….
5. stofyr…….....
6. datonro……..
7. nywdi……....
8. lihcyl……
9. ilah……..
10. nuesrmrtodth……..
11. uldl…….....
12. rdizbalz……...
13. revees……..
14. ehurcnrai…….

Task 16. Rank the following weather events with your partner. Put the ones you like most at the top. Explain your choice.

- rain
- snow
- wind
- rainbows
- 35-degree heat
- storms
- -5°C
- mist and heavy fog

Task 17 A. Match the words to the pictures.

cold	*hot*	*warm*	*cloudy*	*foggy*
sunny	*rainy*	*snowy*	*windy*	*stormy*

				
1.	**2.**	**3.**	**4.**	**5.**
				
6.	**7.**	**8.**	**9.**	**10.**

Task 17 B. Read the weather forecast in the UK and draw weather symbols on the map.

In the extreme north it is snowing in Scotland and the weather is very cold. In the centre and north of England, it is raining. In the west, in Wales, it is very cloudy. Even further to the west in Ireland, the winds are very strong. In the south west of England, it is partly cloudy. In the south east of England, it is warm and very sunny. There are storms along the east coast of England and Scotland. We can expect thunder and lightning throughout the evening.



Task 17 C. Read the weather forecast below and make up your own one. Draw weather symbols on the map and be ready to present the weather forecast for tomorrow.

Look at the map. In the north of the country, it will be cold and rainy. But the rain may move to the north-east, which will bring cold weather there. In the central part, it will be mostly dull. It will be snowy and the day will be dull and cold. As you can see on the map, in the south, it is sunny or partly cloudy, a bright clear day with sunshine. It may be windy later.

EXTENSION

VIEWING AND SPEAKING

Task 18. Watch the video to discover how climate and weather are different but related and how they are the ways to describe atmospheric conditions on Earth.

BEFORE YOU WATCH

- Discuss in groups why there are many different climates on Earth's surface.
- Share in class if biodiversity depends on climatic conditions.
- Work in pairs to check the meanings of the words and expressions below. Make up true statements with them.

latitude	*elevations*	*moderate*	*prevailing wind*	*rain shadow*	*lush*		
nutrient	*distinct*	*chaparral*	*plenty*	*decay*	*fertile*	*muddy*	*acidic*

AFTER YOU WATCH

1. Name the main factors that influence temperature: **a.** _____; **b.** _____; **c.** _____; **d.** _____.

2. List the three temperature zones on Earth's surface that are based on latitude: **a.** _____; **b.** _____; **c.** _____.

3. Match each term with its definition.

1.	biome	**a.**	an area having relatively little precipitation due to the effect of a topographic barrier, especially a mountain range
2.	climate	**b.**	an area that extends from about 66.5 to 90 north and south latitudes
3.	prevailing wind	**c.**	a distance measurement, usually in the vertical or "up" direction

4.	tropical zone	**d.**	a region of the Earth's surface that has a particular type of weather, plants and animals
5.	latitude	**e.**	an area located from about 23.5 to 66.5 north and south latitudes
6.	rain shadow	**f.**	the direction that the wind blows most often in a location
7.	polar zone	**g.**	an area near the equator that receives direct sunlight all year round
8.	altitude	**h.**	the average year-after-year conditions of temperature, precipitation, winds, and clouds
9.	temperate zone	**i.**	distance north or south of the equator measured in degrees up to 90 degrees

4. Write the name of the biome next to its features. Describe it in full.

temperate forest *tropical desert* *tropical savannah* *tundra* *tropical rain forest* *temperate grassland* *temperate chaparral* *taiga* *temperate desert*

A.	----------	little rainfall; very few trees; the most fertile soil; many crops; four distinct seasons
B.	----------	year-round dry climate; nutrient poor soil; hot during the day; cool over night; four distinct seasons
C.	----------	high rainfall; high temperatures throughout the year; lush rainforests; nutrient poor soils; frequent rains; washed away top soil; more plant and animal life species than in any other biome
D.	----------	in the polar zone; beyond 66.5 degrees latitude both North and South; short growing seasons; 24 hours of light during the summer; 24 hours of dark during the winter; muddy top layer of soil; frozen soil below; permafrost
E.	----------	cool and wet in winter; hot and dry in summer; short evergreen shrubs; chaparral rocky nutrient poor soil; four distinct seasons
F.	----------	in the polar zone; south of the Tundra; acidic soil; few plants
G.	----------	hot and dry; nutrient poor soil
H.	----------	plenty of rain; evergreen trees; fertile soil; dropping and decaying of leaves; four distinct seasons
I.	----------	hot grass land; wet and dry seasons; large region across Central Africa

5. Read this list of places. Do any of them have similar weather? Explain.

Alaska	Puerto Rico
Gobi Desert, China	Sahara Desert
Hawaii	Rub'al-Khali, Saudi Arabia
Nord, Greenland	Thailand

Nothern Canada Southern France

READING & SPEAKING

Task 19. Read the text about non-scientific ways of predicting the weather.

BEFORE YOU READ

DISCUSS IN GROUPS AND SHARE IN CLASS

- some stereotypes of good / bad winter, spring, summer, and autumn weather in the places you live
- if people depend on weather nowadays
- if you need and rely on weather forecasts
- if an ordinary person can predict the weather

IN PAIRS, CHECK THE MEANINGS OF THE WORDS AND EXPRESSIONS IN THE BOX, THEN USE THEM IN APPROPRIATE CONTEXTS OF YOUR OWN.

ant	*roost*	*cow*	*mosquito*	*delightful*	*spider*	*web*	*noon*
dew	*pollen*	*wind draft*	*groom*	*construction worker*		*upside down*	

AFTER YOU READ

UNSCRAMBLE THE WORDS IN A-E TO MAKE UP QUESTIONS.

A. good / signs / what / are / the / of / weather?
B. signals / of / can / change / the / science / weather / wild / explain / from?
C. is / why / to / weather / it / important / predict?
D. what / include / does / weather?
E. predict / bad / nature / how / does /weather?

MATCH* A-E *WITH* 1-5 *IN THE TEXT AND GIVE ANSWERS.

SPLIT INTO TWO GROUPS. LET GROUP 1 LIST SOME MORE FACTS ON HOW PEOPLE PREDICT THE WEATHER IN THE WILD. LET GROUP 2 ACT AS EXPERTS AND GIVE A SCIENTIFIC EXPLANATION FOR THE ALTERNATIVE METHODS OF WEATHER PREDICTION.

WHAT'S THE WEATHER? CHECK NATURE!

1. _____ The atmosphere is always changing, and these changes are called weather. Weather includes precipitation such as rain, sleet, hail, and snow. Weather also includes wind direction and its force, and clouds too.

2. _____ Do you know what the weather will be tomorrow? Forecasting, or predicting, what the weather will be tomorrow is important. It helps us decide what we will wear and the activities we will do. You would not plan to wear a coat if the temperature is going to be 32 degrees, just as you would not plan to go swimming during a thunderstorm. Farmers, sailors, and construction workers all need to know the weather to plan their days better.

3. _____ Today, satellites and other weather instruments forecast the weather. But you can predict the weather by looking at signs in nature just as people have done for hundreds of years. You can predict the weather by looking at flowers that close up when a storm is coming. Ants build hills, birds roost on telephone lines, and cows rest in pastures when weather is going to turn stormy. Mosquitoes also seem to be more active when rain is on the way. Some leaves turn upside down when rain is likely. When sailors see a red sky in the morning, they say that it is a warning of bad weather to come.

4. _____ If they see a red sky at night, they say a delightful day is on the way. Another sign that good weather is on its way is seeing spiders "hanging out their laundry", or webs, by noon. Smoke going straight up from a chimney and birds flying high in the sky are also signs of good weather. So is seeing morning dew on the grass on a summer's day.

5. _____ Predicting the weather using nature has some scientific basis. Flowers close up to stop their pollen blowing away in bad weather. Birds roost because their ears hurt when the air pressure drops. Tree leaves turn upside down due to wind drafts. Chimney smoke goes straight up when there is no pressure pushing the smoke down to earth. Cats might groom themselves before a storm because of increased static electricity in the air. Even healed broken bones and bad teeth will bring more pain because of pressure changes signaling bad weather is on the way.

So, next time you want to know what the weather is going to be, you could check the weather forecast or just go outdoors and check nature!



Task 20. Check your understanding of the text above by circling the letter of the best answer.

1. Which group has used the morning / evening sky to predict the weather?
   (A) sailors
   (B) farmers
   (C) construction workers
   (D) people with broken bones
2. Which actions of creatures in nature might predict a sunny day?
   (A) ants building ant hills
   (B) spiders making webs
   (C) birds roosting on telephone lines
   (D) mosquitoes being very active
3. What might explain why birds roost on telephone wires?
   (A) temperature changes
   (B) air pressure changes
   (C) clouds changing
   (D) static electricity
4. What do you think is the main point of this story?
   (A) Sailors need to know the weather.

(B) Some of the old-fashioned ways of predicting the weather by observing nature may be accurate.
(C) Birds always know what the weather will be like.
(D) It is better to watch television to find out what the weather will be like.

5. Which of the following would you classify under "stormy weather"?
(A) Cats are cleaning themselves a lot.
(B) Spiders are hanging webs.
(C) Kids are hiding in the bushes.
(D) Birds are flying high in the sky.

CONSOLIDATION



Task 21. Complete the text with suitable words. Some letters have been given for you.

As air masses warm and cool and move across the Earth's surface, they create weather. Sometimes the clashes between air masses cause storms, which can be **(1) s _ v _ _ e**. They disrupt the usual patterns of life and often lead to major property **(2) d _ m _ _ _** and loss of human life. Hurricanes, tornadoes, **(3) b _ _ z _ _ _ ds**, droughts, and floods are examples of extreme weather.

Storms that form over warm, tropical ocean waters are called **(4) _ u _ ri _ _ _ _ s** – also known as typhoons in Asia. As they hit land, they pound the area with **(5) s _ _ rl _ _ g** winds and very heavy rains. The low-lying coastal regions of Bangladesh in South Asia are especially vulnerable to storm surges from tropical cyclones.

Unlike hurricanes, which take days to develop, tornadoes form quickly and sometimes without warning. Born from strong **(6) t _ _ _ _ er _ _ _ _ ms**, tornadoes are capable of immense damage. In a tornado, winds swirl counter-clockwise around a low-pressure center. These winds may reach speeds of 300 miles per hour, blasting apart buildings and lifting objects as large as cars and mobile homes. These violent storms **(7) _c_ _r** around the world, but the United States is a major hotspot with about a thousand tornadoes every year.

"Tornado Alley," a region that includes the area in the eastern state of South Dakota, Nebraska, Kansas, Oklahoma, northern Texas, and eastern Colorado, is often home to the most **(8) p _ w _ _ f _ l** and destructive of these storms. U.S. tornadoes cause 80 deaths and more than 1,500 injuries per year.



Task 22. Complete the text about a place of extremes with the most appropriate word from (A–N) for each gap. You will not need one word. The first one is done for you (0).

Does it rain very much where you live? Do you get tired of wearing a raincoat and carrying an umbrella? If so, be glad you don't live in Cherrapunji, India. Some people

think Cherrapunji may be the **(0)** ***wettest*** place on Earth. In fact, it is one of the rainiest places on our planet, with an **(1)** ….. rainfall of more than 1,143 centimeters per year. It rains in Cherrapunji all year; in fact it is the only place in India that receives rain year **(2)** …... However, most of the rain falls during six months of the year. Cherrapunji actually has a **(3)** ….. of water during the six months. How is this possible?

Cherrapunji is a mountain town in the northeastern state of Meghalaya. For six months of the year, winds called monsoons **(4)** ….. from the southwest, and they bring extremely **(5)** …… rain. The other half of the year, the monsoons blow from the northeast; they bring some rain, but not very much. In the past, the area **(6)** ….. Cherrapunji was mostly forest. The trees protected the **(7)** ….. and kept it in place. Therefore, the ground could **(8)** …... water from the rainy season for use throughout the year. However, in **(9)** ….. years the town grew, and people cut down large numbers of trees; they wanted **(10)** ….. for new homes and businesses. Now that the trees are gone, most of the rainwater runs down into the **(11)** …... It no longer goes into the ground. That's why one of the rainiest places in the world must **(12)** ….. in water from other areas during the dry season.

A	soil	**B**	space	**C**	average
D	blow	**E**	bring	**F**	hold
G	valley	**H**	***wettest***	**I**	around
J	round	**K**	shortage	**L**	humidity
M	recent	**N**	heavy		



Task 23. Read the text and decide which answer (A, B, C, or D) best fits each gap. There is an example at the beginning (0).

Climate is the pattern of weather a place has over a long period of time. People who study climate are called climatologists. What do these scientists **(0)** ***look for*** when they study a region's climate? Some of what they measure include **(1)** _____ rainfall, sunshine, winds, and temperature. They also look at how each weather condition changes from month to month and year to year. For example, are there cold and hot seasons in the region? Or do the temperatures stay pretty much the same all year long? Does it rain more during certain months than others?

There are five big factors that can make climates **(2)** _____ from place to place.

Latitude: This is the distance of a place north or south from the equator. The closer a region is to the equator, the hotter it is on average all year long. The **(3)** _____ away it is, the cooler it is.

Altitude: This is the **(4)** _____ of a place above sea level. Higher elevations tend to be colder than lower elevations.

Distance from oceans and large lakes: Large bodies of water rise and drop in temperature more **(5)** _____ than land. Areas near large bodies of water tend to have **(6)** _____ winters and cooler summers than places at the same latitude that are away from the water.

Mountain ranges: Air cannot go through mountains. Instead, it rises and cools as it travels up the side of a mountain. The cool air causes water in the air to cool. Then the water falls as rain, which removes most of the water. All of the rain stays on the same side of the mountain! The other side of the mountain is drier and may even become as dry as a desert.

Wind: Several major belts of wind blow around the earth. They blow from different directions. As they do, they distribute cool air, heat, and **(7)** _____ to different parts of the world.

The weather patterns in a climate zone **(8)** _____ the types of vegetation and animals found there. For example, roses could never survive at the South Pole, which has an icecap climate. It is too cold there. Penguins could never survive in a region with **(9)** _____ climate. It is very dry there, with very hot summers. As a result, places that have similar climates also have similar types of vegetation and animals. People worry that human activity may be changing the global climate, which could cause big problems. The temperature differences between summer and winter may become more extreme for some places. Animals and vegetation may become **(10)** _____.

0	**A**	find	**B**	predict	**C**	**look for**	**D**	deal
1	**A**	middle	**B**	average	**C**	medium	**D**	standard
2	**A**	variant	**B**	variety	**C**	various	**D**	vary
3	**A**	farest	**B**	farer	**C**	farther	**D**	farthest
4	**A**	height	**B**	high	**C**	hight	**D**	highest
5	**A**	slower	**B**	slowly	**C**	slow	**D**	slowest
6	**A**	drier	**B**	wetter	**C**	more severe	**D**	milder
7	**A**	moisture	**B**	precipitation	**C**	temperature	**D**	pressure
8	**A**	interact	**B**	effect	**C**	affect	**D**	influence on
9	**A**	marine	**B**	humid	**C**	damp	**D**	arid
10	**A**	extincted	**B**	extinct	**C**	extinction	**D**	extincting

Task 24. Give English equivalents of the words and word combinations below. Then, use them in a list of 10 questions you would like to ask a lecturer about the weather and climate.

A (Text "Forecasting the Weather") повітряна куля; робити спостереження та передбачення / прогнози; очікувати; інструмент / засіб; температура й вологість; напрям та швидкість вітру; біля тропічного побережжя; атмосферний тиск; несприятливі / суворі погодні умови; заметіль / хуртовина; завчасно отримувати інформацію; вологе повітря; торнадо; вихрові хмари; замерзнути до смерті; градусник; снігопад; утримувати людей у помешканні; збирати й тлумачити дані; руйнувати все на своєму шляху; реагувати на зміни; взаємодіяти одне з одним; сильні грози; надзвичайно низькі температури; потужний ураган; завдавати найбільшої шкоди; флюгер; вихруватий потік повітря; опади у вигляді дощу, снігу з дощем, снігу, граду; спричиняти лиха; похмуро; паводки і пожежі, спричинені блискавкою; прибережні міста; збитки від градин і сильних вітрів.

B (Text "What's the weather? Check nature!") мурахи та комарі; наближатися; ранкова роса; протяг; чудовий день; відпочивати на пасовищах; надягати пальто; виходити на вулицю; будівельники; квітковий пилок; град та мокрий сніг; прямо підніматися з димоходу; павутиння / павутина; супутники; попереджати про погану погоду; вимиватися / вилизуватися (про тварин); сидіти на дротах телефонних ліній; завдавати більшого болю; у першій половині дня (до полудня); пере-/ вивертатись; діяльність, заняття; під час грози; моряки та фермери; притискати до землі; застереження про наближення поганої погоди; прикмета доброї погоди; напрям і сила вітру.



Task 25. Render the following text in English. Make use of the essential vocabulary of the unit.

Погода – стан нижнього шару атмосфери в конкретній місцевості в конкретний час, або протягом тривалого часу (година, доба, декада, місяць). Погода характеризується низкою метеорологічних елементів, таких як вітер, температура, тиск, вологість, видимість та ін. Багаторічний режим погоди в даній місцевості називають кліматом даної місцевості.

Звичайні погодні явища на землі – вітер, хмари, атмосферні опади (дощ, сніг тощо), тумани, грози, пилові бурі та хуртовини. До рідкісніших явищ належать стихійні лиха, як-от торнадо й урагани.

Наука, що вивчає зміни основних показників стану повітря, називається метеорологією. Спостереження за погодою ведуть на метеорологічних станціях за допомогою спеціальних приладів. Перші метеорологічні спостереження почали проводити у стародавньому Єгипті, Індії та Китаї. У Європі в 1654 році була створена перша міжнародна метеорологічна мережа. В Україні перші інструментальні метеорологічні спостереження почали проводити у Києві в 1771 році. Велике значення для метеорологічної науки мало відкриття в Україні університетів, завдяки яким у першій половині XIX століття проводилися систематичні наукові дослідження в галузі метеорології, кліматології, геофізики.

В останні роки також використовується супутникова інформація про стан океанів і частин суші, де немає метеостанцій. Фотографування хмарних систем із супутників дозволяє виявити зародження тропічних циклонів над океанами.

Головними споживачами метеорологічної інформації є морський флот і авіація. Дані про метеорологічний режим широко використовуються при проектуванні й експлуатації різних споруд – будівель, аеродромів, залізниць, ліній електропередач тощо. У першу чергу від погодних умов і клімату залежить сільське господарство. На продуктивність значною мірою впливає вологість ґрунту і повітря, кількість опадів, світла, тепла. У кінці XIX століття сформувалася навіть самостійна галузь метеорології – агрометеорологія.

Щодня люди користуються прогнозом погоди, щоб вирішити, що одягнути в цей день. Прогнози дощів, снігу та сильних вітрів використовуються для планування робіт та відпочинку на свіжому повітрі.

Task 26. Choose 5-7 key terms from the unit. Use a dictionary or your own words to define these terms. Write the definitions in the glossary.

blizzard disaster hail humidity thunderstorm precipitation sleet drizzle fog ***shower*** *air pressure wind heat hurricane flood dew tornado frost mist haze chill biome altitude latitude draft weather balloon anemometer thermometer weather vane barometer cirrus (cloud) stratus (cloud) cumulus (cloud)*

Example: *Shower is a short fall of rain over a small area.*

Task 27. Review the topics covered in this unit. Suppose you are to participate in an international scientific workshop. Be an expert in one of the topics below. Deliver a report.

1. Weather and Seasons. Types of Weather.
2. Components of Weather.
3. Precipitation. Types of Clouds.
4. Meteorology and its Tools.
5. Forecasting the Weather. Signs in Nature
6. Climate Zones

Task 28. Speak on the topic "Weather and Climate" for 3-4 minutes. Comment upon the supporting image below using the essential vocabulary of the unit.



Task 29. Use the Internet to find out about changing weather in your country. Are weather patterns the same now as they used to be/ were ten years ago? Is this good? What will the weather be like in the future? Make a list of examples of strange weather happening around the globe. Talk in groups about this.

Task 30. Choose a region to describe the factors that affect its climate. Use appropriate academic vocabulary and clear and complete sentences (100-120 words).

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