

МІНІСТЕРСТВО ОСВІТИ І НАУКИ УКРАЇНИ
КИЇВСЬКИЙ НАЦІОНАЛЬНИЙ УНІВЕРСИТЕТ ІМЕНІ ТАРАСА ШЕВЧЕНКА

АНГЛІЙСЬКА МОВА ДЛЯ БІОЛОГІВ

Навчальний посібник

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Розроблено для вивчення англійської мови за професійним спрямування здобувачами вищої освіти (рівня "Бакалавр" за спеціальністю "Біологія") і має на меті формування у студентів спеціалізованих мовних вмінь та навичок відповідно до фаху. Запропоновано автентичні відеоматеріали, а також оригінальні тексти для читання, розроблено завдання, що сприяють розширенню словникового запасу здобувачів вищої освіти, а також підвищують аналітичні здібності студентів до сприйняття, аналізу отриманої інформації з подальшим її використанням під час говоріння і письма.

Для студентів 2 року навчання ННЦ Інституту біології та медицини, розраховано для використання під час аудиторної та самостійної роботи студентів.

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ПЕРЕДМОВА

Навчальний посібник з англійської мови призначений для студентів 2 року навчання ННЦ Інституту біології та медицини. Метою посібника є розвиток практичних навичок володіння англійською мовою в обсязі, необхідному для роботи з фаховою літературою, а також усного та письмового спілкування у науковій сфері. Ця мета реалізується через цілеспрямований добір та тематичну організацію матеріалу, а також систему вправ.

Ключовим завданням пропонованої книги є допомогти здобувачам вищої освіти освітньо-кваліфікаційного рівня "Бакалавр" природничих спеціальностей досягти функціонального рівня мовленнєвої компетенції за всіма видами мовленнєвої діяльності, а саме Аудіювання, Читання, Говоріння та Письма.

Матеріали навчального посібника можуть бути використані для викладання англійської мови студентам-біологам та студентам інших природничих спеціальностей для поглиблення знань англійської мови за спеціальністю, а також для розвитку навичок читання, аудіювання, збагачення словникового запасу зі сфери біології.

Структура посібника складається з дев'яти розділів, додатків і списку використаних джерел. Тексти, представлені у посібнику охоплюють теми, які відображають актуальні напрями досліджень у сучасних природничих науках та активізують інтерес студентів до навчально-наукового процесу. Запропонований перелік додаткових матеріалів для читання надає можливість максимально залучити студентів до обговорення здобутків науки та подальшого розвитку мовних навичок із їх опрацюванням.

Розділи посібника пропонують оригінальне наповнення та відображають запропоновані теми у повному обсязі. Завдання націлені на читання та розуміння галузевого тексту, вдосконалення навичок письма та усного мовлення з біологічної тематики.

На початку подано ознайомчі вправи для презентації теми розділу, які допомагають студенту зорієнтуватися у подальшому вивченні матеріалу. Далі запропоновано прочитання оригінального тексту та різнонаправлені тренувальні вправи для розвитку навичок роботи з лексикою професійного спрямування. Комплекс вправ на

перевірку розуміння тексту передбачає запитання до тексту; вправи на виявлення вірних/хибних тверджень; завдання множинного вибору; вправи на завершення та відтворення тверджень згідно опрацьованого матеріалу. Метою комплексу вправ є засвоєння найбільш уживаних лексичних одиниць біологічної терміносистеми для активізації та використання лексики сучасної англійської мови професійного спрямування. Запропоновані тренувальні вправи, перегляд і опрацювання тематичних відеоматеріалів, підготовка творчих завдань сприяють розвитку мовленнєвих навичок, стимулюють комунікацію та мотивують студентів до обговорення тематичної проблематики та обміну досвідом. Удосконалення мовленнєвих навичок здійснюється за допомогою різноманітних завдань, що відповідають формату Програми з англійської мови для студентів нефілологічних спеціальностей.

Автори висловлюють щире подяку рецензентам за критичне прочитання навчального посібника, висловлені конструктивні зауваги і побажання, професійні поради та інтелектуальну підтримку.

UNIT 1

LIVING AND NON-LIVING ORGANISMS



Before you read

Task 1. Before reading answer the following questions:

How can you identify whether this or that thing is living or non-living?

Do you know any example when something can be named both living or non-living?

Task 2. Look at the useful vocabulary. Study the following list of words and their definitions

versus, prep.

– against; as opposed to; in contrast to

inanimate, adj.

– not alive; showing no sign of life; lifeless

illuminate, v.

– make (something) visible or bright by shining light on it

shed, v.

– the act or process of allowing (tears, light etc.) to flow

exhibit, v.

– to show something publicly in a place such as museum

comprehensive, v.

– complete and including everything that is necessary

underscore, v.

– underline (something), emphasize

showcase, v.

– to exhibit especially in an attractive or favorable aspect

Reading

Task 1. Read the text and complete the tasks below

Living and nonliving things

In the study of the natural world, one of the most fundamental distinctions is that between living and non-living things. This differentiation is crucial not only in biological sciences but also in various other fields such as ecology, environmental science, agriculture, and philosophy. Understanding what constitutes life versus what is inanimate helps illuminate our world's complexities, shedding light on the interrelationships and interactions that sustain ecosystems and societies. In contrast, non-living things lack these characteristics. They can be inanimate objects like rocks and water or chemical compounds found within living organisms that, by themselves, do not exhibit life.

The distinction between living and non-living things is vital across multiple scientific and philosophical disciplines, each benefitting from a clear understanding of this fundamental classification.

Biology is fundamentally the study of life. Understanding what defines living organisms allows for a comprehensive exploration of their structures, functions, and interactions. This knowledge is essential in all areas of medical research, from understanding diseases to the development of treatments and pharmaceuticals. For example, knowing the differences between healthy and cancerous cells is crucial for effective cancer treatment.

Ecology examines the interactions among organisms and their environments, including both living and non-living components. Awareness of these distinctions allows ecologists to analyze ecosystems, food webs, and nutrient cycles. This understanding is vital for conservation efforts, highlighting the roles that various species play within their habitats and underscoring the need to protect biodiversity.

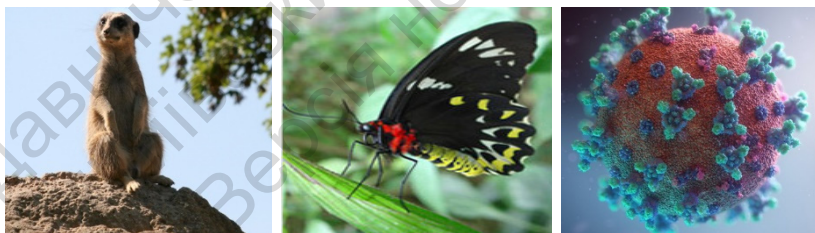
Environmental scientists rely on the distinction to study the impact of non-living phenomena, such as pollution and climate change, on living organisms. Understanding these interactions aids in predicting shifts in ecosystems and developing effective remediation strategies. Furthermore, resource management requires a keen knowledge of both living organisms and non-living resources to foster sustainable practices.

In agriculture, discerning the difference between living crops and pests versus the non-living aspects of soil, climate, and water is essential for optimizing yield and ensuring sustainability. Understanding these relationships is critical not only for improving crop production but also for developing effective pest control strategies that minimize damage to the ecosystem.

The study of living organisms' evolutionary relationships showcases how life adapts to non-living surroundings over time. Understanding these distinctions enables researchers to trace lineages and comprehend the mechanisms of evolution, providing insights into the origin of life itself.

The distinction between living and non-living entities is foundational to our understanding of the natural world. This understanding has profound implications across scientific research, conservation efforts, agricultural practices, and ethical considerations. By recognizing the intricate complexities of life and its interactions with non-living components, we not only gain insights into the workings of our ecosystems but also cultivate a deeper appreciation for the interdependence of all forms of existence. This awareness is crucial as we face unprecedented environmental challenges and strive towards a sustainable future.

By Kazem Haghnejad Azar. Adjusted (Source: ResearchGate.net)



Task 2. Answer the following questions

1. What are the core characteristics that differentiate living things from non-living things?
2. In what ways does the understanding of living and non-living distinctions contribute to advancements in medical research?
3. How does the distinction between living and non-living things impact ecological studies and conservation efforts?

4. Why is it important to recognize the roles of both living and non-living components in resource management according to environmental science?

5. What philosophical implications arise from the distinction between living and non-living entities, particularly in discussions about ethics and animal rights?

Task 3. Read the statements and identify whether they are **TRUE** or **FALSE**

1. All living things are composed of cells. T/F
2. Metabolism is a characteristic that only living organisms exhibit. T/F
3. Non-living things play no significant role in ecosystems. T/F
4. Living organisms are capable of maintaining a stable internal environment through processes like regulation and feedback mechanisms. T/F
5. The study of viruses has led to debates about whether they should be classified as living or non-living entities. T/F

Task 4. Match the words to make the phrases from the text

1	food	a)	practices
2	cancerous	b)	practices
3	sustainable	d)	complexities
4	climate	e)	webs
5	intricate	f)	considerations
6	agricultural	g)	efforts
7	pest control	h)	change
8	conservation	i)	cells
9	ethical	k)	research
10	scientific	l)	strategies

Task 5. Fill in the gaps using the phrases from **Task 4**

1) By adopting _____, organizations can address behavioral consumer shifts and reduce their carbon footprint

2) A _____ is the natural interconnection of *food* chains and a graphical representation of what-eats-what in an ecological community

3) The _____ of human emotions often mirror the delicate interconnections found within nature

4) The main difference between _____ and normal cells is that *cancer cells* grow uncontrollably.

5) City staff and students conducting research must respect the following principles and _____ in research.

6) Improving _____ for crop care can be done in an ecofriendly manner, even without harmful pesticides.

7) The Nature *Conservation* Index is a data-driven analysis of each country's progress in balancing _____ and development

8) Present-day _____ includes both *global warming* and its wider effects on Earth's climate system.

Before you watch

Task 1. Group the examples of living and non-living things in columns. Can you see a pattern? What group of things can be placed right-side? How could you name it?

animals / rivers / gadgets / germs / hills / tables / fishes / planets and stars / bacteria / mountains / cars / oceans / plants / chairs / birds / clothes

living	non-living	

Watch!

Task 1. Watch the video '*Mrs. Gren*' (*Science Sauce*, Aug., 2017) and try to catch the characteristics of living and non-living things

Source: <https://www.youtube.com/watch?v=QHPYRwCWAzM>



Task 2. What does 'Mrs. Gren' stand for? Without watching try to remember.

M – _____ **R** – _____ **S** – _____
G – _____ **R** – _____ **E** – _____
N – _____

Task 3. Match the characteristics from the video with the definitions, the first letter is given

1	M	A	the ability to detect and respond to changes in the environment
2	R	B	a permanent increase in size
3	S	C	removal from organisms of toxic materials and substances in excess of requirements
4	G	D	taking in of materials for energy, growth and development
5	R	E	an action by an organism causing a change of position or place
6	E	F	the processes that make more of the same kind of organism
7	N	G	the chemical reactions in cells that break down nutrient molecules and release energy

Task 4. Watch the video again. Pay your attention to the examples given. Match the Heads and the Tails

Heads

1. People often struggle with idea of movement in plants ...
2. You might be familiar with the idea of glucose and oxygen ...
3. How do leaves know which direction the light is, ...
4. This definition distinguishes it (cell size) from putting weight ...
5. Example of this is that bacterial cells will divide to ...
6. Example of this can be breathing ...
7. For growth and development plants require ...

Tails

- A** produce more, humans have babies, flowering plants produce seeds.
B but if you think about it, they can all turn the leaves towards the Sun.

- C which is another kind of growing.
- D that's because of gravity.
- E light, water, carbon dioxide, animal need organic compound.
- F being converted to carbon dioxide and water in humans.
- G out carbon dioxide or the urea in urine that is released.

Language practice

Task 1. Open the brackets and fill in the gaps with the appropriate verb form

Applying the Characteristics of L and NL things

Now we have a better understanding of the characteristics of a living organism, so we can apply them to determine what is and what is not a living organism. Let's take our wooden chair as an example. If we 1) _____ (**look**) at the wood under a microscope, we 2) _____ (**may**) see traces of the cells that used to make up the living tree it came from but the wood itself is no longer alive. Once it 3) _____ (**remove**) from the tree, it lost the ability to grow, breathe, absorb nutrition or reproduce.

Fire is a tricky one. It appears to be very much alive, but if we 4) _____ (**apply**) the characteristics above, we 5) _____ (**be**) able to determine that it is not considered a living organism. Living things are made up of cells and as they grow, they 6) _____ (**create**) new cells. Fire 7) _____ (**not have**) cells. Fire 8) _____ (**seem**) to reproduce but no information is passed on. No DNA is carrying information from one generation to another. Fire remains the same every time. It may grow bigger or shrink smaller, hotter or cooler, it may even move differently, but that's all because of its current conditions, not because of information it 9) _____ (**inherit**) in DNA. Fire may appear to be breathing but it is unable to form proteins from the oxygen and hydrogen and carbon it "feeds on". It simply 10) _____ (**destroy**) proteins. Living organisms also require nutrients and water, and 11) _____ (**gift**) with incredible ways of 12) _____ (**find**) and using these things in their environments. They can also sense and respond to threats. Fire is unable to do any of these things.

Task 2. Look at the statements and choose the best alternative

1) Plants are complex, *multicellular / unicellular* organisms. They use the sun's energy to create food, in a process called *combustion / photosynthesis*. This, among other criteria, qualifies them as *living / non-living* organisms.

2) People and animals are also multicellular organisms. They *don't create / create* their own food internally, rather, they eat other plants or animals to get the *energy / pleasure* they need to survive. They move, reproduce and grow, excrete and respire. They also *detect / miss* and *can't adapt / adapt* to threats in their environment. If we look at the checklist, it's *clear / unclear* that animals and humans are living organisms.

3) Fungi is considered a living organism and can be single-celled or multicellular. An example of a fungus is a mushroom. They *"eat" / "breath"* by releasing enzymes onto their food which breaks it down, so that they can *mash / absorb* it.

4) Bacteria are considered living organisms even though they are so *small / big* that we have to use a microscope to see them. Most bacteria feed off other organisms. Bacteria *can't be / can be* good or bad. The bad ones cause disease while the good ones can help *make / ruin* delicious food like yogurt.

5) Protoctists are also tiny microscopic single-celled organisms. Some of them "eat" just like *birds / plants* do while others are more like animal cells. Some protoctists *can't / can* cause diseases, for example Plasmodium causes Malaria.

6) Viruses can be even smaller than bacteria or protoctists and they *always / never* cause diseases. The Corona Virus is an example we are all too familiar with.

7) Pathogens are living organisms that cause diseases. Fungi, bacteria and protoctists can be pathogens, and viruses *aren't / are* always pathogens.

Task 3. Use The Passive Voice to transform statements below and rewrite them

1. Scientists studied the cells to understand their functions better.
2. Plants synthesize energy through the process of photosynthesis.
3. Researchers conducted the experiment to observe the growth patterns of bacteria.
4. Scientists proposed a new classification system to differentiate living organisms from non-living things.
5. Researchers measured the effects of pollution on various ecosystems.
6. The team collected valuable data during the ecological survey to assess biodiversity.
7. The report thoroughly analyzes the characteristics of living things.
8. Public awareness campaigns often influence decisions about wildlife conservation.
9. The study evaluated the methods used for their effectiveness in teaching the differences between living and non-living entities.
10. The discovery of viruses sparked a debate regarding their classification as living or non-living.

Speaking

Roundtable Discussion:

Share your thoughts on how human activities impact both living and non-living things. Consider environmental issues, conservation and sustainability.

Discuss the fundamental differences of living and non-living things, including such processes as metabolism, growth, and reproduction



Writing

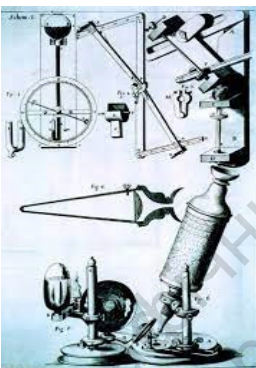
Informative poster Write an informative poster following the instructions:

Instructions:

- ✓ *define your topic*: choose a clear, specific subject that you want to communicate
- ✓ *create a catchy title*: use a concise, engaging title that captures the essence of your topic
- ✓ *organize content into sections*: introduction; main points; visual elements
- ✓ *use visuals*: incorporate relevant images, graphs, charts, or diagrams to illustrate points; use icons and infographics to simplify complex information
- ✓ *keep text concise*: limit the amount of text per section; use short sentences and phrases
- ✓ *highlight key information*: use bold, italics, or different colors to emphasize important points

UNIT 2

CELL: THE HISTORY OF DISCOVERY



Before you read

Task 1. Before reading answer the following questions:

The discovery of the cell was an important step. Why was it so important for the further scientific development? Can you name the set of tools used to succeed in such challenging task?

Task 2. Look at the useful vocabulary. Study the following list of words and their definitions

- | | |
|--------------------------|--|
| <i>unaided, adj.</i> | – needing or having no assistance; without help |
| <i>exceedingly, adv.</i> | – extremely; to a great extent |
| <i>perceive, v.</i> | – to notice something or someone by using sight, sound, touch, taste, or smell |
| <i>contemporary, n.</i> | – a person or thing living or existing at the same time as another |
| <i>inquiry, n.</i> | – an act of asking for information |
| <i>ground, v.</i> | – to install; to place; to locate |

Reading

Task 1. Read the text and complete the tasks below

Robert Hooke

All living things are made up of one or more cells. A cell is the smallest unit that can carry on all of the processes of life. Beginning in the 17th century, curious naturalists were able to use microscopes to study objects too small to be seen with the unaided eye. Their studies led them to propose the cellular basis of life.

In 1665, English scientist Robert Hooke studied nature by using an early light microscope. A light microscope is an instrument that uses optical lenses to magnify objects by bending light rays. Hooke looked at a thin slice of cork from the bark of a cork oak tree. "I could exceedingly plainly perceive it to be all perforated and porous," Hooke wrote. He described "a great many little boxes" that reminded him of the cubicles or "cells" where monks live. When Hooke focused his microscope on the cells of tree stems, roots, and ferns, he found that each had similar little boxes. The "little boxes" that Hooke observed were the remains of dead plant cells.

Hooke believed the cells had served as containers for the "noble juices" or "fibrous threads" of the once-living cork tree. He thought these cells existed only in plants, since he and his scientific contemporaries had observed the structures only in plant material. Nine months of experiments and observations are recorded in his 1665 book "Micrographia: or some Physiological Descriptions of Minute Bodies made by Magnifying Glasses with Observations and Inquiries Thereupon," the first book describing observations made through a microscope. It featured many drawings, some of which have been attributed to Christopher Wren, such as that of a detailed flea observed through the microscope. Hooke was the first person to use the word "cell" to identify microscopic structures when he was describing cork.

Anton van Leeuwenhoek

The first person to observe living cells was a Dutch trader named Anton van Leeuwenhoek. Leeuwenhoek made microscopes that were simple and tiny, but he ground lenses so precisely that the

magnification was 10 times that of Hooke's instruments. In 1673, Leeuwenhoek was able to observe a previously unseen world of microorganisms. He observed cells with green stripes from an alga of the genus Spirogyra, as shown in and bell-shaped cells on stalks of a protist of the genus Vorticella. Leeuwenhoek called these organisms animalcules. We now call them protists. During his long life, he used his lenses to make pioneer studies on an extraordinary variety of things – living and nonliving – and reported his findings in more than 100 letters to the Royal Society of England and the French Academy.

By Mary Bellis (Source: www.ThoughtCo.com)

Task 2. Answer the following questions

1. Which significant contribution did Robert Hooke make to the field of biology in the 17th century?
2. How did Robert Hooke study the structure of cork, and what did his observations reveal?
3. What did Robert Hooke mean by referring to the "little boxes" he observed in cork, and when did he start using the term "cell"?
4. In what way did Anton van Leeuwenhoek's advancements in microscopy differ from those of Robert Hooke?
5. What kind of organisms did Anton van Leeuwenhoek observe, and how did he describe them?

Task 3. Read the statements and identify whether they are TRUE or FALSE

1. Anton van Leeuwenhoek studied microorganisms and referred to them as "animalcules". T/F
2. Hooke's observations led him to believe that cells were only found in animals. T/F
3. Hooke's microscopes had a magnification that was ten times greater than that of Leeuwenhoek's instruments. T/F
4. The term "cell membrane" was derived from Hooke's observations of cork cells. T/F
5. Hooke's book "Micrographia" contained illustrations that were only his original drawings. T/F

Task 4. Match the words from the text with the definition

1	bark	a)	<i>the long, thin part of a plant that the leaves and flowers grow on</i>
2	fern	b)	<i>consisting of or characterized by fibres</i>
3	stem	c)	<i>the hard outer covering of a tree</i>
4	root	d)	<i>a very small jumping insect that feeds on the blood of animals and humans</i>
5	fibrous	e)	<i>to place on a foundation</i>
6	thread	f)	<i>the main stem of a plant</i>
7	flea	g)	<i>a green plant with long stems, leaves like feathers, and no flowers</i>
8	ground	h)	<i>a long very thin piece of a material</i>
9	stalk	i)	<i>the part of a plant that grows down into the earth to get water and food and holds the plant firm in the ground</i>
10	porous	j)	<i>having minute spaces or holes</i>

Task 5. Complete the sentences with the words from **Task 4**

1. The _____ system of the plant helps to anchor it in the ground and absorb water and nutrients.

2. The lush green _____ in the corner of the garden adds a tropical touch to the overall landscape.

3. The spider spun a delicate _____ to create its intricate web in the corner of the window.

4. The _____ of the flower supports its vibrant petals and transports nutrients from the soil.

5. The architect worked diligently to _____ the new building, ensuring it had a solid foundation to withstand harsh weather conditions."

6. The _____ nature of celery makes it a crunchy addition to salads and snacks.

7. The _____ texture of the sponge allows it to soak up water quickly.

8. My dog was scratching incessantly because it had picked up a _____ from the grassy area in the park.

9. The thick, protective _____ of the oak tree provides shelter for various insects and animals.

10. The _____ of the corn plant reached impressive heights by the end of the summer.

Before you watch

You are going to watch the video about cell theory. What do you know about it? Have the concepts of cell theory changed since the 19th century? What do you think?

Task 1. Look at the *Timeline-History of Cell Biology*. Try to match the dates with events. Surf the Internet to check your ideas

1665 > 1827 > 1855 > 1857 > 1897 > 1996 > 2004

- A Karl Von Baer discovers the mammalian egg.
- B Kolliker describes mitochondria in muscle.
- C Researchers in Scotland clone a sheep from an adult sheep cell.
- D Robert Hooke observes cork cells.
- E Rudolf Virchow adds to the cell theory.
- F Tissue engineering used to grow new skin and bone for transplant.
- G Camillo Golgi discovers the Golgi apparatus in cells.

Watch!

Task 1. Watch the video '*Cell Theory vs Modern Cell Theory*' (MooMooMath and Science, Jan., 2023) and complete the tasks below



Source: <https://www.youtube.com/watch?v=ABRXm5lpnag>

Task 2. Watch the video and match the sentences "*heads*" and "*tails*"

Heads

1. The invention of the microscope led to the discovery of cells ...
2. Understanding of cells was very limited. It took 175 years ...
3. In 1839 Schleiden realized that plants are composed of cells ...

4. In 1855 Rudolf Virchow added the third tenant to the cell theory ...

5. Since 1855 microscopes have improved, computers are now used in research ...

Tails

A and during the same time Schwann realized that animals are also composed of cells.

B when he supposed that all cells come from pre-existing cells.

C scientists learned enough about cells to come up with the cell theory.

D and helped us get much better understanding of hoe life works

E And our knowledge of the cell has expanded greatly

Task 3. While watching the video you've learnt about *The cell theory* and *The new cell theory*. Look at the mixed list of the cell theory concepts and place them into the order mentioned in the video: *the cell theory* (CT1, CT2, CT3) and *the new cell theory concepts* (NCT1, NCT2...)

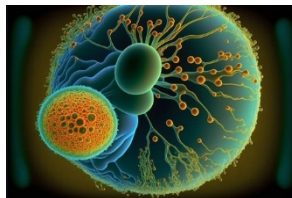
- All living organisms are composed of one or more cells. CT1
- The cell is the basic unit of life CT2
- Energy flow occur in the cell CT3
- All living organisms are made of cells NCT1
- Cells arise from pre-existing cells NCT2
- Genetic information is passed on during cell division NCT3
- All cells come from pre-existing cells NCT4
- The cell is the basic unit of structure and organization in organisms NCT5
- All cells have the basic chemical composition NCT6

Language practice

Task 1. Read the text and fill in the gaps with the terms

Mature cells can be reprogrammed to become immature cells

The Nobel Prize winning John B. Gurdon and Shinya Yamanaka discovery that mature 1) _____ cells can be reprogrammed into immature 2) _____ cells is a breakthrough in cell biology. It transformed what scientists knew about



cell 3) ____ by showing that cells can evolve into any body
 4) _____. Before this 5) _____, scientists weren't aware that mature
 cells could 6) _____ into a different state. This work has paved the
 way for new 7) _____ of related research and 8) _____ solutions.

A tissue
 B healthcare
 C skin

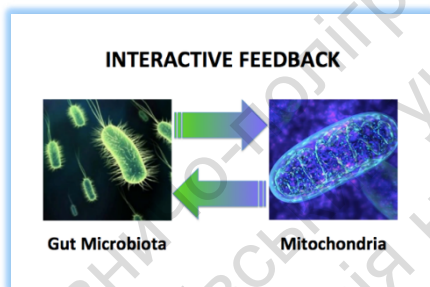
D development
 E stem
 F fields

G change
 H research

Task 2. Read the information about research findings and fill in
 the gaps with the word from the list

***Gut bacteria and mitochondria communicate
 to improve athletic performance in horses***

both / thereby / during / with / by / one / what / that / of / between



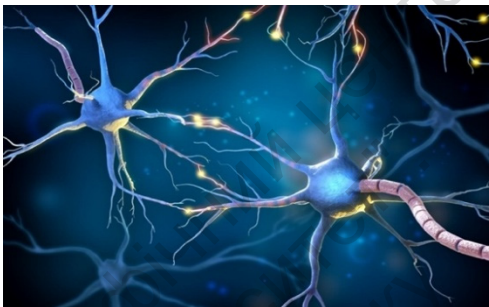
A 2021 research paper published in *Frontiers in Molecular Bioscience* found 1) ____ gut bacteria and mitochondria communicate to regulate and extend energy in horses. 2) ____ does this mean for the future of cell biology? Well, to start 3) _____, it

helps scientists better understand chemical signals and gene expression. It means there's potential to create cellular supplements that could support the athletic ability 4) ____ of horses and humans – 5) ____ of the paper's authors – Dr. Nuria Mach – explains, "Studying horses is a good way to assess the link 6) ____ gut bacteria and mitochondria, because the level of exercise, and 7) ____ mitochondrial function, performed 8) ____ a horse 9) ____ an endurance race is similar to that 10) ____ a human marathon runner." Athletes, stay tuned.

Task 3. Read the text and chose the appropriate verb form

Your brain cells form new connections throughout your life

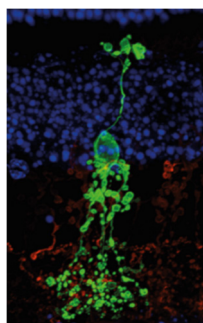
Until recently, experts 1) *believed* / *believing* the brain stopped developing once it was fully matured. But multiple research experiments 2) *since showed* / *have since shown* that it 3) *continues* / *continue* to rewire itself as we learn and perform new tasks. Certain brain activities can 4) *help* / *helping* to create new connections between nerve cells, which helps to develop your brain throughout your life. Researchers 5) *believed* / *believe* mental stimulation may also help the brain grow new cells, support neuroplasticity and 6) *increase* / *increases* cell reserves. To support your brain's development, Harvard Medical School 7) *recommended* / *recommends* participating in activities such as painting, reading, taking courses and solving puzzles.



Task 4. Read the text and open the brackets to use the correct form of the verb

There's a cell in the retina named "Campana"!

In a 2021 research paper, scientists outlined a new cell discovery within the eye's retina: a nerve cell named "Campana". What's special about this discovery? Other than it 1) ____ (**be**) a previously unknown cell, this knowledge allows scientists to develop a clearer understanding of the body's central nervous system and possibly 2) ____ (**mean**) there's a whole new class of retinal neurons. Scientists still 3) ____ (**explore**) exactly what the Campana cell does. So far, they know it 4) ____ (**relay**) visual cues from photoreceptors.



It's possible to create a biohybrid fish using human stem cells

The creation of a biohybrid fish – an analog fish that 5) ____ **(construct)** using human cardiac cells obtained from stem cells – 6) ____ **(bring)** scientists one step closer to 7) ____ **(be)** able to build an artificial heart. The research, 8) ____ **(publish)** in *Science* in 2022, provides advanced findings on how to create artificial muscular pumps. 9) ____ **(creat)** by researchers from Harvard University and Emory University, the fish's ability to swim at the rhythm of a pumping heart 10) ____ **(trigger)** by the cardiac cells. In an interview with Wyss Institute, the study's senior author Kit Parker 11) ____ **(elaborate)** that the ultimate goal of this research 12) ____ **(be)** to learn how to build an artificial hear.



Coral reefs have immune cells

In 2021, *Cell* published research findings that 13) ____ **(provide)** scientists with a deeper understanding of the evolution of animal immune responses. Before this study, very little 14) ____ **(know)** about cell types or the molecular biology of coral reefs. Initially, the research 15) ____ **(aim)** to investigate single cells within a type of coral 16) ____ **(name)** *Stylophora pistillata*. 40 cell types 17) ____ **(define)** in the study, and among them were two new immune cell types that likely 18) ____ **(support)** the resilience of coral reefs against environmental stressors.



Task 5. Read the text and change the word to make an appropriate word form

There's a regenerative cell in human lungs we didn't know about

1) **Research** _____ from the Perelman School of Medicine at the University of Pennsylvania 2) **recent** _____ discovered a cell deep within human lungs that may play an important role in supporting lung 3) **heal** _____. The cells, now known as 4) **respire** _____ airway secretory cells, were discovered while researchers were in the process of 5) **investigate** _____ cells within human lung tissue. Some important 6) **feat** _____ of these cells are that they support the 7) **regenerate** _____ of other cells and help to maintain and regenerate alveolars (tiny air tubes within your lungs that play a key role in your body's ability to breathe). The 8) **discover** _____ of these cells could support further research in lung health medicine.



You can rewind the cellular biological clock by around 30 years

2022 has been a big year for 9) **cell** _____ discoveries. Continuing from the cellular 10) **reprogram** _____ discoveries of John B. Gurdon and Shinya Yamanaka, researchers from the Babraham Institute have found a way to regenerate 11) **old** _____ skin cells and 12) **part** _____ restore their functions. Based on molecular measures, their method makes older skin cells behave like cells that are around 30 years younger. If 13) **science** _____ can find a way to apply this method to other types of cells, it could mean big things for the world of 14) **regenerate** _____ medicine.



Task 6. Think about 10 sentences using the words from the list

A: research / scientist / scientific / discovery / investigate

B: cell / cellular / unicellular / multicellular

C: skin / tissue / stem / retina / nervous

D: reprogram / regenerate / restore / rewind

Speaking

Discuss the way how the discovery of cell changed the world. Think about ethical issues of Cell Biology

Debate on the topic "Is it possible to reprogram the cells of an organism to make it forever young?". Be ready to express and to listen to different viewpoints, form and present arguments, use critical thinking.



Writing

Educational Presentation

Prepare a presentation that educates peers about a new discovery of Cell biology. *Instructions:*

1) select a topic: choose a relevant and engaging topic that aligns with your purpose

2) research thoroughly: gather information from credible sources, including books, academic journals, reputable websites, and experts in the field. Take notes on key points, data, and examples

3) organize your content: structure your presentation with a clear outline:

Introduction: present your topic and objectives. Capture the audience's attention

Body: divide main points into sections, supporting each with evidence and examples; use visual aids and multimedia for clarification

Conclusion: summarize the key points and reiterate the importance of the topic.



UNIT 3

CELL DIVERSITY



Before you read

Task 1. Answer the questions

Why is it important to learn about different types of cells in medicine and health? How is cell diversity linked to the complexity of an organism? Why is cell diversity essential for the adaptation of organisms to their environments?

Task 2. Look at the useful vocabulary. Study the following list of words and their definitions

branching, adj. – resembling the branches of a tree; divergent

rectangular, n. – a flat shape with four sides

platelike, adj. – having characteristics of a plate; flat

evolve, v. – to develop gradually

cord, n. – a long, thin, tubular structure made up of nervous tissue

ratio, n. – the relationship between two amounts, represented by two numbers or a percentage

Reading

Task 1. Read the text and complete the tasks below

Cell Diversity

Cells come in a variety of shapes and sizes that suit their diverse functions. There are at least 200 types of cells, ranging from flat cells to branching cells to round cells to rectangular cells. Cells of different organisms and even cells within the same organism are very diverse in terms of shape, size, and internal organization. One theme that occurs again and again throughout biology is that form follows function. In other words, a cell's function influences its physical features.

Cell Shape

The diversity in cell shapes reflects the different functions of cells. The long extensions that reach out in various directions from the nerve cell allow the cell to send and receive nerve impulses. The flat, platelike shape of skin cells suits their function of covering and protecting the surface of the body. As shown below, a cell's shape can be simple or complex depending on the function of the cell. Each cell has a shape that has evolved to allow the cell to perform its function effectively.

Cell Size

Cells differ not only in their shape but also in their size. A few types of cells are large enough to be seen by the unaided human eye. For example, the nerve cells that extend from a giraffe's spinal cord to its foot can be 2 m (about 6 1/2 ft) long. A human egg is about the size of the period at the end of this sentence. Most cells, however, are only 10 to 50 μm in diameter, or about 1/500 the size of the period at the end of this sentence.

The size of a cell is limited by the relationship of the cell's outer surface area to its volume, or its surface area-to-volume ratio. As a cell grows, its volume increases much faster than its surface area does. This trend is important because the materials needed by a cell (such as nutrients and oxygen) and the wastes produced by a cell (such as carbon dioxide) must pass into and out of the cell through its surface. If a cell were to become very large, the volume would increase much more than the surface area. Therefore, the surface area would not allow

materials to enter or leave the cell quickly enough to meet the cell's needs. As a result, most cells are microscopic in size.

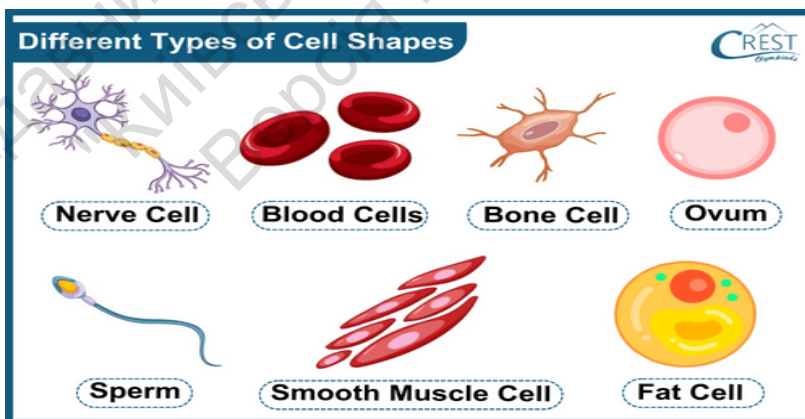
By Janet L. Hopson, John H. Postlethwait (Source: Modern Biology, 2006)

Task 2. Match the words to make phrases from the text

1	suit	A	cells
2	branching	B	out
3	round	C	cord
4	rectangular	D	shape
5	internal	E	surface area
6	reach	F	cells
7	nerve	G	ratio
8	platelike	H	functions
9	spinal	I	organization
10	egg	J	impulses
11	outer	K	cells
12	area-to-volume	L	cell

Task 3. Match the pictures with the names of the cells

egg cell / flat cell / head-and-tale cell / rectangular cell / round cell / branching cell



Task 4. Complete the sentences with the phrases from the list given in **Task 3**

1) Neurons transmit information incredibly fast through _____, enabling quick reactions to stimuli.

2) _____, such as neurons, are designed to connect with multiple other cells, allowing efficient communication within the nervous system.

3) The _____ of a cell, including its organelles, is crucial for maintaining its health and functionality.

4) Different cell types have unique structures that specifically _____ necessary for their roles in the body.

5) Cells with a _____, such as those found in certain types of connective tissue, allow for greater surface area, facilitating nutrient absorption.

6) The _____ contains a variety of cell types, including neurons and glial cells, which coordinate movement and sensory information.

7) _____, like red blood cells, are effective at traveling through blood vessels to transport oxygen throughout the body.

8) _____ found in epithelial tissue provide structural support and help in forming protective barriers.

9) Increasing the _____ of a cell can enhance its ability to absorb nutrients and exchange gases with its environment.

10) The female _____ is one of the largest cells in the human body, designed to provide nutrients to the developing embryo.

11) A high _____ is important for cells to efficiently exchange materials with their surroundings, especially in smaller cells.

12) Neurons and other types of _____ to neighboring cells, forming complex networks for signal transmission.

Before you watch

The video you are going to watch is about cell types and cell organization. Before you start think about the answers to the next questions:

What role does cell specialization play in the efficiency of multicellular organisms, and how is this concept absent in unicellular

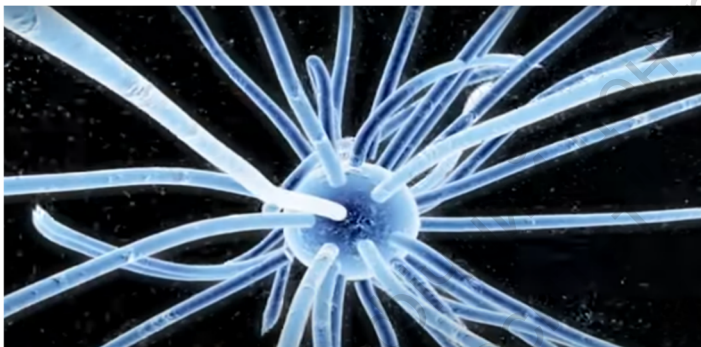
organisms? How does evolutionary pressure influence the complexity of unicellular versus multicellular organisms in different environments?

Task 1. Match the terms with the definitions

1	unicellular	A	having or consisting of many cells
2	multicellular	B	process by which certain living cells called phagocytes ingest or engulf other cells or particles
3	thrive	C	a space or vesicle within the cytoplasm of a cell, enclosed by a membrane and typically containing fluid
4	amoeba	D	a short microscopic hairlike vibrating structure found in large numbers on the surface of certain cells
5	phagocytosis	E	division or splitting into two or more parts
6	vacuoles	F	consisting of a single cell
7	cilia	G	a single-celled animal that catches food and moves about by extending fingerlike projections of protoplasm
8	flagella	H	grow or develop well or vigorously
9	fission	J	any unicellular fungus that reproduces vegetatively by budding or fission, including forms such as candida that can cause disease.
10	yeast	K	a whiplike extension used by different cells, as well as unicellular organisms, for movement

Watch!

Task 1. Watch the video "*Unicellular and Multicellular Organisms*" (*The Digital Classroom Experience*, Oct., 2024) and complete the tasks below



Source: <https://www.youtube.com/watch?v=RRxgd-9ghkk>

Task 2. Fill the table with the words from the video

muscle cells / vacuoles / lungs / nerve cells / reproduction / heart / cilia / skin cells / circulation / digestive system / stomach / flagella / cell membrane birthing / circulatory system / digestion

Organs	Organelles	Cells	Functions	Body Systems

Task 3. Match the words to make phrases from the video

1	absorb	A	the difference
2	explore	B	quickly
3	digest	C	strategies
4	get	D	to play
5	survival	E	a copy
6	make	F	things
7	binary	G	nutrients

8	reproduce	H	the energy
9	handle	J	fission
10	role	K	the food

Task 4. Think about 6 sentences with the phrases from the table

- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____
- 6) _____

Task 5. Watch the video and match the sentences "*heads*" and "*tails*"

Heads

1. Multicellular organisms, like humans, plants and animals are much more complex ...
2. Unicellular organisms, like bacteria and amoebas, ...
3. Both unicellular and multicellular organisms ...
4. Even though, they may seem worlds apart, ...
5. Since multicellular organisms are much more complex, ...

Tails

A are perfectly designed for their environments.

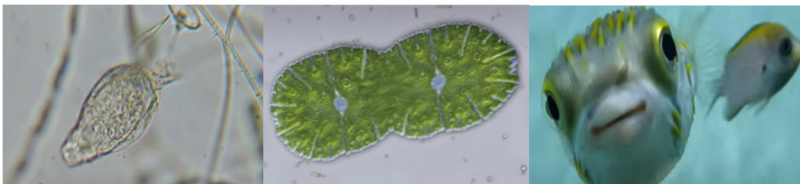
B and have many different types of specialised cells working together to meet their needs.

C they need more than just one cell to meet their basic needs.

D both types of organisms are equipped to survive and thrive.

E are simple and rely only on one cell to do all the work.

Task 6. Match the verbs or phrasal verbs from the video with their "*heads*" and synonyms



1	dive	on	a	dispose of, throw away
2	rely	around	b	bathe, float
3	take	down	c	<i>separate, grade,</i>
4	get rid	into	d	sink into, dig into
5	move	by	e	<i>sustain, keep going</i>
6	swim	in	f	absorb, grasp
7	break	in	g	break, divide
8	keep	of	h	<i>believe in, count on</i>
9	split	alive	j	exceed, prevail
10	excel	through	k	travel, change location

Task 7. Fill in the gaps with the verbs from **Task 6**

1. Cells have mechanisms to **of** waste products, ensuring that they maintain a healthy internal environment.

2. Fish **through** water using their fins to navigate efficiently and escape from predators.

3. Plants **in** carbon dioxide from the atmosphere and use it for photosynthesis to produce energy.

4. Many animals **on** their senses to detect predators or find food in their habitat.

5. Unicellular organisms often need to **around** in search of food, which they accomplish through flagella or cilia.

6. The digestive system helps **down** food into smaller molecules that can be absorbed by the body.

7. When studying marine biology, it's essential to **into** the various relationships between organisms and their environments.

8. Some organisms **by** adapting to their environments, developing unique traits that enhance their survival.

9. During the process of mitosis, the cell's nucleus will **in** two, ensuring that each daughter cell receives an identical set of chromosomes.

10. Cells must perform various functions to **alive**, including regulating their internal conditions and responding to external signals.

Language practice

Task 1. Read the text and fill in the gaps with the terms

Two basic types of cells

nucleoid / lack / kingdoms / life-forms / present-day / genetic / evidence / differentiated / organisms / domains

Fossil 1) _____ suggests that the earliest cells on Earth were simple cells similar to some 2) _____ bacteria. As cells evolved, they 3) _____ into two major types: prokaryotes and eukaryotes.

Prokaryotes

Prokaryotes are organisms that 4) _____ a membrane-bound nucleus and membrane-bound organelles. Although prokaryotic cells lack a nucleus, their 5) _____ information – in the form of DNA – is often concentrated in a part of the cell called the 6) _____. Prokaryotes are divided into two 7) _____: Bacteria and Archaea. The domain Bacteria includes organisms that are similar to the first cellular 8) _____. The domain Archaea includes 9) _____ that are thought to be more closely related to eukaryotic cells found in all other 10) _____ of life.

Task 2. Read the text and choose the best alternative

Eukaryotes

Organisms made up of one or more cells that have a 1) *nucleus / nucleoid* and membrane-bound 2) *organisms / organelles* are called eukaryotes. Eukaryotic cells also have a 3) *variety / variables* of subcellular structures called organelles, well-defined, 4) *intracellular / extracellular* bodies that perform specific functions for the 5) *cell / cilium*. Many organelles are surrounded by a membrane. The organelles 6) *transport / carry out* cellular processes just as a person's pancreas, heart, and other 7) *organelles / organs* carry out a person's life processes. Eukaryotic cells are generally much 8) *smaller / larger* than prokaryotic cells, which shows a white 9) *blood / lymphatic* cell (eukaryote) destroying 10) *tiny / tinned* bacterial cells (prokaryotes).

Task 3. Read the text and use an appropriate word form to fill in the gaps

There are many different degrees of 1) _____ (*organise*) in life. As from the start, a cell is an entity's 2) _____ (*simple*) living 3) _____ (*function*) unit, and it is always 4) _____ (*know*) as the basic unit of life. Despite their small size, cells are 5) _____ (*construct*) in a precise way. 6) _____ (*Cell*) organisation is defined as the components that make up a cell and how they are 7) _____ (*organise*) within it. An 8) _____ (*organ*) is a unique component of the cell that performs a specific function.

Task 4. Read the text and fill in the gaps with an appropriate word

Where do organisms get energy from?

on across out for every of in down other
as from up lot with unlike by

Inside 1) _____ cell of all living things, energy is needed to carry 2) life processes. Energy is required to break 3) _____ and build 4) _____ molecules and to transport many molecules 5) _____ plasma membranes. All of life's work needs energy. A 6) _____ of energy is also simply lost to the environment as heat. The story of life is a story of energy flow – its capture, its change of form, its use 7) _____ work, and its loss 8) _____ heat. Energy, 9) _____ matter, cannot be recycled, so organisms require a constant input of energy. Life runs 10) _____ chemical energy. The chemical energy that organisms need comes from food. Food consists 11) _____ organic molecules that store energy in their chemical bonds. Glucose is a simple carbohydrate 12) _____ the chemical formula $C_6H_{12}O_6$. It stores chemical energy in a concentrated, stable form. In your body, glucose is the form of energy that is carried 13) _____ your blood and taken up 14) _____ each of your trillions of cells. Cells do cellular respiration to extract energy 15) _____ the bonds of glucose and 16) _____ food molecules. Cells can store the extracted energy in the form of ATP (adenosine triphosphate).

Task 5. Read the text and match the terms from the text with the definitions below

Cell Reproduction

You have probably have heard of the importance and prevalence of cell division. While there are a few cells in the body that do not undergo cell division (such as gametes, red blood cells, most neurons, and some muscle cells), most somatic cells divide regularly. A somatic cell is a general term for a body cell, and all human cells, except for the cells that produce eggs and sperm (which are referred to as germ cells), are somatic cells. Somatic cells contain *two* copies of each of their chromosomes (one copy received from each parent). A homologous pair of chromosomes is the two copies of a single chromosome found in each somatic cell. The human is a diploid organism, having 23 homologous pairs of chromosomes in each of the somatic cells. The condition of having pairs of chromosomes is known as diploidy. Cells in the body replace themselves over the lifetime of a person. For example, the cells lining the gastrointestinal tract must be frequently replaced when constantly "worn off" by the movement of food through the gut.

By Rachel Aptekar (Source: Bio.Libretxts.org)

- 1) the fact or condition of being prevalent
- 2) *an organism's reproductive cells, also referred to as sex cells*
- 3) any cell of a living organism other than the reproductive cells
- 4) *any cell that gives rise to the gametes of an organism that reproduces sexually*
- 5) similar in position, structure, and evolutionary origin
- 6) *packages of DNA containing part or all of the genetic material of an organism*
- 7) the system of organs that allows for the consumption and digestion of food, absorption of nutrients, and excretion of waste
- 8) *unfit or useless through hard or extended use*

Task 6. Read the information about types of cell reproduction.

A. Fill in the gaps with the parts of the sentences removed from the text

Mitosis vs. Meiosis

A) that only occurs in germ cells that divide to produce sperm or eggs

B) also known as gametes

C) that are genetically identical to the parent cell and to each other

D) when a sperm and an egg combine at fertilization

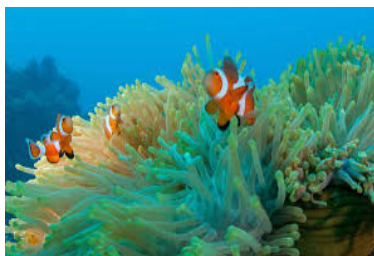
E) Mitosis happens when you grow

Most human cells divide their nucleus by a process called mitosis that results in two cells 1) _____. In mitosis the parent cell and the daughter cells all have two copies of each type of chromosome (they are diploid). Somatic cells reproduce by mitosis. Meiosis is a specialized cell division 2) _____. It produces cells that have only one copy of each type of chromosome (are haploid). Both mitosis and meiosis result in eukaryotic cell division. 3) _____ is the differing goals of each process. The goal of mitosis is to produce two daughter cells that are genetically identical to the parent cell. 4) _____, and to replace injured and worn out cells. You want all your new cells to have the same DNA as the previous cells. The goal of meiosis is to produce sperm or eggs, 4) _____. The resulting gametes are not genetically identical to the parent cell. Gametes are haploid cells, with only half the DNA present in the diploid parent cell. This is necessary so that 5) _____, the resulting zygote (the fertilized egg) has the correct amount of DNA – not twice as much as the parents. The zygote then begins to divide through mitosis.

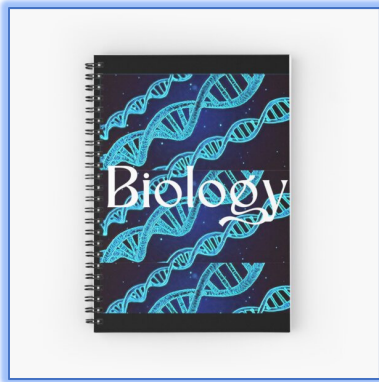
Speaking

Discuss the importance of unicellular and multicellular organisms for the global ecosystem. Give your examples on how the two types of organisms are functioning.

Case Study: Present a case study of a specific cell peculiarity (e.g. type, function, etc.) choosing "a representative" from the environment (e.g. plant, animal, insect, microorganism, virus etc.)



Writing



Biology Journal Entry:

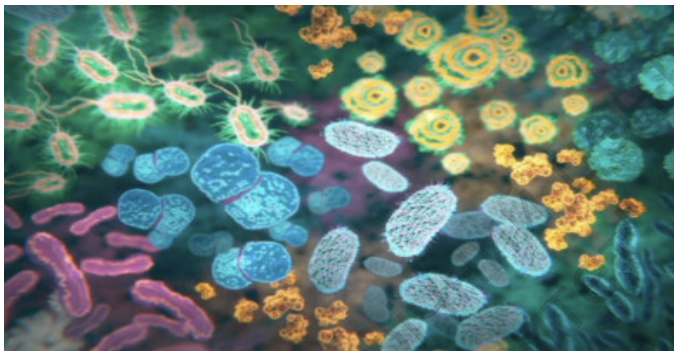
– write a reflective journal entry as a biologist documenting your daily observations of unicellular and multicellular organisms in your surroundings

Instructions:

- 1) *choose a focus:* select a specific topic or concept related to Biology that interests you (e.g., cellular processes, ecological interactions, genetic traits)
- 2) *date and title:* start with the date and a clear title that reflects the main idea of your entry
- 3) *introduction:* provide a brief introduction to the topic, stating its significance and any background information necessary for understanding
- 4) *observations and experiences:* record any relevant observations, experiments, or experiences related to the topic. Include details of any experiments or laboratory work and personal reflections on what you observed, learned, or found interesting
- 6) *personal reflection:* reflect on what you learned from the entry. What questions do you still have? How has your understanding of the topic evolved?
- 7) *conclusion:* summarize the key points of your entry and restate the importance of the topic
- 8) *citations and references:* if you use outside sources, include a bibliography or references at the end to give credit to authors and studies cited in your entry

UNIT 4

MICROBES AND MICROBIOMES



Before you read

Task 1. Before reading answer the following questions:

What types of microbes do you know? Are they "enemies" or "friends" for other living organisms? Could microbes influence our good or bad mood?

Task 2. Look at the useful vocabulary. Study the following list of words and their definitions

1. archaea, *n.* – a type of microorganism similar to bacteria but with a different structure, thought to have existed for billions of years

2. microbiota, *n.* – the range of microorganisms that may be commensal, mutualistic, or pathogenic found in and on all multicellular organisms, including plants

3. spectrum, *n.* – used to classify something in terms of its position on a scale between two extreme points

4. infant, *n.* – a very young child or baby

5. in utero, *adv.* – before birth

6. optimum, *adj.* – the best or most effective possible

7. microbiome, *n.* – the community of microorganisms (such as bacteria, fungi, and viruses) that inhabit a particular environment, including the human body

Reading

Task 1. Read the text and complete the tasks below

The human microbiome: why our microbes could be key to our health

What are microbiomes? Both inside and out, our bodies harbour a huge array of microorganisms.



While bacteria are the biggest players, we also host single-celled organisms known as archaea, as well as fungi, viruses and other microbes – including viruses that attack bacteria. Together these are dubbed the human microbiota. Your body's

microbiome is all the genes your microbiota contains, however colloquially the two terms are often used interchangeably.

Hang on, aren't microbes supposed to be dangerous? It's a bit of a spectrum: some are pathogens, but others only become harmful if they get in the wrong place or boom in number, and some are very useful to the body – such as by helping to break down the array of sugars found in human breast milk. "These sugars are not broken down by the infant," said Prof. John Cryan, a neuropharmacologist and microbiome expert from University College Cork. Instead, microbes in the baby's gut do the job. Other key roles of our microbes include programming the immune system, providing nutrients for our cells and preventing colonisation by harmful bacteria and viruses.

Where do my gut microbes come from? Do I just pick them up from my surroundings? Partly. But it is more complicated than that. "It is still a little bit controversial but for the most part it is thought that we are sterile when we are in utero, and as we are being born, as we emerge through the birth canal from our mums, we get this handover bacteria," said Cryan. "It is like a gulp at birth. Those bacteria are really important for starting the whole process." Cryan notes that during pregnancy a mother's microbiome shifts, apparently to an

optimum mix for offspring. "If you are not born by vaginal delivery, but are born by [caesarean] section, things start off being different," he said. Indeed, studies have suggested that these differences could be one of the reasons why babies born by caesarean section have a higher risk of conditions including asthma and type 1 diabetes. That said, doctors have cautioned parents against attempting to seed babies born by caesarean section with vaginal bacteria. Our gut microbiome changes quickly over our first year or two, shaped by microbes in breast milk, the environment and other factors, and stabilises by the time we are about three years old. But our environment, our long-term diet, stress and the drugs we take, such as antibiotics, continue to play a role as we age, meaning our microbiome can change throughout our life.



Are microbes the same in my gut as on my skin? No, different parts of the body – the skin, gut – all have very different, distinct communities of microbes. While gut microbes have gained a lot of attention, microbes elsewhere are also important: in recent studies,

scientists have found that bacteria commonly found on the skin might help to protect against skin cancer. Microbiomes also differ from person to person. "When you look at the overall active microbiomes between two healthy people, even if they are living in the same city, you see a tremendous amount of disagreement in their microbiome," said Rob Knight, professor of paediatrics, computer science and engineering at the University of California San Diego and an expert on the human microbiome. Variability in the gut microbiome, Knight notes, helps to explain why people respond differently to the same foods. "Whether tomatoes are good or bad for you, whether rice is good for you or worse for you than ice cream and so on is explained by your microbiome," he said.

By Nicola Davis (Source: theguardian.com)

Task 2. Match the words to make phrases from the text

1	optimum	A	microbiota
2	human	B	milk
3	microbiome	C	mix
4	breast	D	section
5	huge	E	expert
6	caesarean	F	amount
7	gut	G	array (of microorganisms)
8	tremendous	H	microbiome

Task 3. Complete the sentences with the phrases from the table **Task 2**

1. The _____ plays a crucial role in maintaining our overall health and well-being.

2. A _____ can provide valuable insights into how our gut bacteria influence digestion and immunity.

3. Achieving an _____ of diverse bacteria in the gut microbiome is key to enhancing digestive health and bolstering the immune response.

4. Recent studies have shown that _____ contains vital nutrients that help establish a healthy microbiome in infants.

5. The gut hosts a _____ of microorganisms, each contributing to various bodily functions and processes.

6. Babies born via _____ may have different microbiota compared to those born vaginally, potentially impacting their health later in life.

7. The _____ is essential for the digestion of food, metabolic processes, and even the regulation of the immune system.

8. Research indicates that a _____ of genetic material is found in the gut microbiome, which far exceeds that of the human genome itself.

Before you watch

Task 1. You are going to watch the video about microbes and germs. Before you start, think about the answers to the next questions:

- *What is the major function of microbes?*
- *Which microbes cause diseases?*

Task 2. Make a list of *airborne microbes* and *indoor environment microbes* and compare with your partner

airborne microbes: _____, _____, _____,

indoor environment microbes: _____, _____,

Watch!

Task 1. Watch the video '*Are we filtering the wrong microbes?*' (TED Talks, Jul., 2011) and complete the tasks below.



Source: https://www.ted.com/talks/jessica_green_are_we_filtering_the_wrong_microbes/transcript

Task 2. Fill the table with the words from the video

- 1) tiny life forms, such as bacteria and fungi, that are invisible to the naked eye.
- 2) a system that uses mechanical equipment to control airflow, heating, and cooling in buildings.
- 3) the variety of different microbes present in a particular environment.
- 4) a microorganism that can cause disease.
- 5) the genetic material found in all living organisms.
- 6) infections that patients get while receiving medical treatment.
- 7) a way of managing buildings by promoting beneficial microbes while limiting harmful ones.

- 8) a type of food that contains live bacteria, often consumed to support gut health.
- 9) a statistical map used to compare microbial communities in different samples.
- 10) the process of humans constantly releasing microbes from their skin and mouth into the environment.

Task 3. Watch the video and match the sentences "heads" and "tails"

Heads

- 1. Humans in developed countries spend more than 90 % of their lives...
- 2. Buildings act as complex ecosystems...
- 3. Airborne microbes enter buildings through...
- 4. The study in a hospital examined microbial communities...
- 5. Mechanically ventilated air contains microbes commonly associated with...
- 6. Outdoor air has microbes typically found on...
- 7. Hospitals consume large amounts of energy...
- 8. Hospital-acquired infections, also known as nosocomial infections...
- 9. The concept of an 'ecosystem framework' for buildings...
- 10. The goal of designing 'healthy buildings' is...

Tails

- A...indoors, where they are exposed to various microorganisms.
- B...that harbour both beneficial and harmful microbes.
- C...windows, ventilation systems, and human activity.
- D...in mechanically ventilated rooms, naturally ventilated rooms, and outdoor air.
- E...human skin and saliva due to constant shedding.
- F...plant leaves, soil, and other natural surfaces.
- G...and are among the most energy-intensive industries in the U.S.
- H...are a major concern in healthcare environments.
- I...aims to promote beneficial microbes while inhibiting harmful ones.
- J...to improve indoor microbial diversity and human health.

Task 4. Read the sentences and fill in the gaps with the information from the video

1. Humans in the developed world spend more than _____% of their lives indoors.

2. Buildings are complex _____, hosting both beneficial and harmful microbes.

3. Airborne microbes enter buildings through _____, ventilation systems, and human activity.

4. The study in a hospital examined microbial DNA in three types of rooms: _____, naturally ventilated rooms, and outdoor air.

5. The study used an _____ diagram, a statistical map to compare microbial communities.

6. The microbes found in mechanically ventilated air are mostly associated with _____ and _____.

7. Outdoor air contains microbes commonly found on _____ and _____.

8. Hospitals use about _____ times more energy than office buildings.

9. The current hospital ventilation model focuses on keeping the _____ out.

10. The study suggests that ventilation strategies could influence _____-acquired infections.

11. Scientists are considering an _____ framework to manage microbial ecosystems in buildings.

12. The concept of a healthy building is similar to how people consume _____ to improve gut health.

13. The goal of smart building design is to promote a _____ group of indoor microorganisms.

Task 5. Match the words to make phrases from the video

1. indoor

2. mechanical

3. airborne

a) microbes

b) ventilation system

c) diversity

4. hospital-acquired	d) framework
5. microbial	e) infections
6. outdoor	f) microbiota
7. natural	g) air
8. statistical	h) diagram
9. ecosystem	i) ventilation
10. smart	j) buildings
11. ventilation	k) energy consumption
12. probiotic	l) yogurt
13. human	m) architecture
14. nosocomial	n) pathogens
15. hospital	o) environments

Task 6. Fill in the gaps with the phrases from **Task 5**

1. Humans spend most of their lives in _____, where they are exposed to trillions of microbes.

2. A _____ is used to control airflow, heating, and cooling in buildings.

3. _____ enter buildings through windows, ventilation systems, and human activity.

4. Patients in hospitals are at risk of _____, which they acquire during medical treatment.

5. Researchers analysed the _____ to compare microbial communities in different environments.

6. The study found that _____ contains a greater variety of microbes than indoor air.

7. Some hospitals use _____ instead of mechanical ventilation to allow fresh air inside.

8. The concept of an _____ helps in promoting beneficial microbes indoors.

9. Scientists are working on _____ to improve air quality and human health.

10. The _____ in hospitals is much higher than that of office buildings.

11. Some people consume _____ to promote a healthy gut microbiota.

12. The _____ in buildings influences the distribution of microorganisms.

13. _____ in hospitals contribute to many patient infections.

14. The study showed that _____ are often present in mechanically ventilated air.

15. Collaboration between biologists and experts in _____ can lead to healthier indoor spaces.

Language practice

Task 1. Read the text and fill in the gaps with the terms

Microbes are tiny living things that are found all around us. Also known as (1) _____, they are too small to be seen by the naked eye. They live in (2) _____, soil, and in the air. The human body is home to millions of these microbes too.

Some microbes make us ill, while others are important for our (3) _____. The most common types of microbes are (4) _____, viruses, and fungi. There are also microbes called (5) _____, which can cause diseases such as toxoplasmosis and malaria.

Choose the correct option for each gap:

- | | | | |
|----|----------------|-------------------|--------------|
| 1. | a) ecosystems | b) microorganisms | c) cells |
| 2. | a) water | b) blood | c) food |
| 3. | a) health | b) environment | c) diseases |
| 4. | a) bacteria | b) insects | c) parasites |
| 5. | a) antibiotics | b) protozoa | c) enzymes |

Bacteria are made up of just one (6) _____. Some bacteria need (7) _____ to survive, while others do not. Some prefer (8) _____ temperatures, while others thrive in cold environments. Most bacteria are not harmful to humans. Many live on or in our bodies and help us stay (9) _____. For example, (10) _____ bacteria in the intestines help digest food.

Choose the correct option for each gap:

6. a) virus b) cell c) gene
7. a) food b) oxygen c) sunlight
8. a) hot b) mild c) low
9. a) healthy b) sick c) asleep
10. a) yeast b) lactic acid c) penicillin

Unlike bacteria, viruses do not have **(11)** _____ of their own. Instead, they consist of **(12)** _____ surrounded by a protein shell. Many viruses cause diseases. Some, like the common cold, are harmless, while others, like **(13)** _____, can be severe. Viruses invade **(14)** _____ and use them to multiply.

Choose the correct option for each gap:

11. a) symptoms b) cells c) lungs
12. a) molecules b) bacteria c) fungi
13. a) influenza b) tuberculosis c) pneumonia
14. a) red blood cells b) host cells c) immune systems

Fungi exist in many environments. Some well-known fungi include **(15)** _____, mold, and edible mushrooms. Certain fungi can cause infections known as **(16)** _____, such as athlete's foot and nail infections. However, some fungi, such as **(17)** _____, produce antibiotics that help fight bacteria.

Choose the correct option for each gap:

15. a) yeast b) viruses c) parasites
16. a) mycoses b) inflammation c) pneumonia
17. a) penicillin b) salmonella c) probiotics

Task 2. Read the text and fill in the gaps with an appropriate word

Microbes are tiny living things that are found **(1)** _____ us. Also known as microorganisms, they are too small to be seen **(2)** _____ the naked eye. They live **(3)** _____ water, soil, and in the air. The human body is home **(4)** _____ millions of these microbes too. Some microbes make us ill, while others are important **(5)** _____ our health. The most common types of microbes are bacteria, viruses, and fungi. There are also microbes responsible **(6)** _____ diseases such as toxoplasmosis and malaria.

Choose the correct prepositions:

1. a) in b) around c) on
2. a) by b) with c) from
3. a) at b) in c) on
4. a) of b) to c) with
5. a) for b) to c) with
6. a) for b) to c) of

Bacteria are made up (7) ____ just one cell. Some bacteria need oxygen to survive, while others do not. Some thrive (8) ____ hot temperatures, while others prefer a cold environment. Most bacteria aren't dangerous (9) ____ humans. Many of them even live (10) ____ our body and help us stay healthy. For example, lactic acid bacteria in the intestines assist (11) ____ digestion.

Choose the correct prepositions:

7. a) of b) from c) in
8. a) at b) in c) on
9. a) to b) with c) for
10. a) in b) on c) at
11. a) on b) with c) in

Unlike bacteria, viruses have no cells (12) ____ their own. Instead, they consist (13) ____ molecules surrounded by a protein shell. Viruses invade healthy cells and multiply (14) ____ them. Some viruses cause diseases such as influenza and hepatitis. Others remain inactive (15) ____ the body for long periods and reactivate when the immune system is weak.

Choose the correct prepositions:

12. a) of b) on c) in
13. a) of b) from c) with
14. a) in b) on c) within
15. a) on b) in c) at

Fungi can be found (16) ____ different environments. Some fungi occur naturally (17) ____ the skin or inside the body, but others can cause infections. Diseases caused by fungi are known (18) ____ mycoses. These infections can develop (19) ____ the skin, lungs, or mucous membranes. However, not all fungi are harmful. Some produce antibiotics, such as penicillin, which is used (20) ____ fighting bacterial infections.

Choose the correct prepositions:

16. a) on b) in c) at
17. a) on b) at c) by
18. a) of b) with c) as
19. a) in b) on c) at
20. a) for b) in c) to

Task 3. Fill in the gaps with the parts of the sentences removed from the text.

Microbes are tiny living things that are found (1) _____. Also known as microorganisms, they are too small (2) _____. They live in water, soil, and (3) _____. The human body is home to millions (4) _____. Some microbes make us ill, while others (5) _____. The most common types of microbes are bacteria, (6) _____. There are also microbes responsible for diseases such as (7) _____.

Bacteria are made up of just (8) _____. Some bacteria need oxygen to survive, (9) _____. Some thrive in hot temperatures, (10) _____. Most bacteria aren't dangerous to humans. Many (11) _____ and help us stay healthy. For example, lactic acid bacteria in the intestines (12) _____.

Unlike bacteria, viruses have no (13) _____. Instead, they consist of molecules (14) _____. Viruses invade healthy cells and (15) _____. Some viruses cause diseases such as (16) _____, while others remain inactive (17) _____ and reactivate when the immune system is weak.

Fungi can be found (18) _____. Some fungi occur naturally on the skin or inside the body, (19) _____. Diseases caused by fungi are known as (20) _____. These infections can develop in the skin, lungs, (21) _____. However, not all fungi are harmful. Some produce antibiotics, (22) _____, which is used to fight bacterial infections.

Choose the correct phrase to complete each sentence

1. but others can cause infections. 2. of these microbes too. 3. such as penicillin. 4. influenza and hepatitis. 5. and in the air. 6. in different environments. 7. multiply within them. 8. viruses and fungi. 9. toxoplasmosis and malaria. 10. are important for our health. 11. to be seen by the naked eye. 12. but others do not. 13. or mucous

membranes. 14. surrounded by a protein shell. 15. live on or in our body. 16. assist in digestion. 17. one cell. 18. but they are needed to digest food. 19. cells of their own. 20. inside the body for long periods.

Speaking



Debate on topic: "Are Germs More Harmful or Beneficial?"

Instructions:

✓ divide into two groups: one side argues that germs (microbes) are mostly harmful,

while the other argues that they are mostly beneficial

✓ each group presents their points with examples (e.g., harmful germs cause infections, beneficial microbes support digestion and mental health)

✓ after both sides present, discuss as a class or group and reach a conclusion

Role Play: "Doctor and Patient – The Link Between Microbes and Mental Health"

Instructions:

✓ one person plays a doctor, and the other plays a patient experiencing anxiety or depression

✓ the doctor explains how gut microbiota might influence mental health and suggests lifestyle changes (e.g., probiotics, diet, exercise)

✓ the patient asks questions and discusses concerns

✓ after the role play, switch roles or discuss as a group



Writing

Creating a Flyer on Microbes

You are a **science communicator** designing an informational flyer about microbes for a general audience. Your goal is to explain the role of microbes in human health and everyday life in a simple, engaging, and visually appealing way.



Instructions:

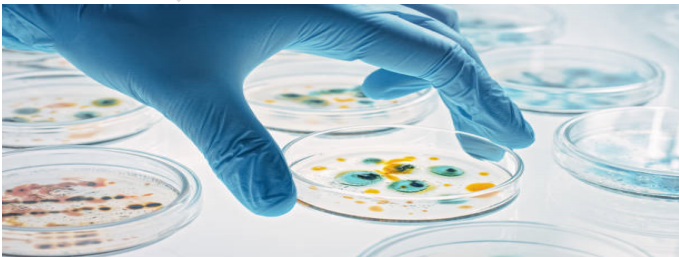
Title & Headings: Choose an eye-catching title and organize your flyer with clear headings.

Content:

- ✓ define microbes and their different types (bacteria, viruses, fungi, protists)
- ✓ explain their role in human health (both beneficial and harmful effects)
- ✓ highlight interesting facts (e.g., "Did you know that there are more bacterial cells in your body than human cells?")
- ✓ include tips on maintaining a healthy balance of microbes (e.g., diet, hygiene, probiotics)

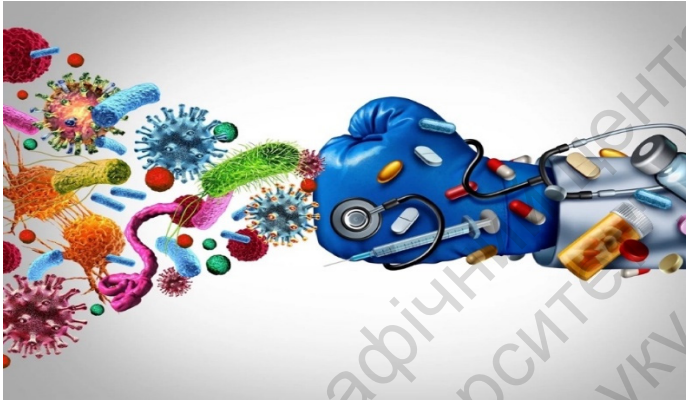
Visual Appeal: Use bullet points, short paragraphs, and simple language. Add drawings or icons if possible.

Format: Keep the flyer short (one page), informative, and visually appealing.



UNIT 5

FIGHTING MICROBES



Before you read

Task 1. Before reading answer the following questions:

Why do people get sick? What is the difference between a virus and bacteria?

What kind of treatment does each of the abovementioned need?

Task 2. Look at the useful vocabulary. Study the following list of words and their definitions

resistance, *n.* – the process where bacteria develop the ability to survive the effects of antibiotics

mutation, *n.* – a change in the DNA sequence of an organism, sometimes leading to antibiotic resistance

pathogen, *n.* – a harmful microorganism, such as bacteria or viruses, that can cause disease

bacteriophage, *n.* – a virus that infects and destroys bacteria, sometimes used as an alternative to antibiotics

cross-contamination, *n.* – the transfer of harmful bacteria from one substance, surface, or food to another

efflux pump – bacterial mechanism that actively removes antibiotics from the cell, making the bacteria resistant

enzyme, *n.* – a biological protein that speeds up chemical reactions, including those that can break down antibiotics

infection control – strategies and procedures used in healthcare and public settings to prevent the spread of infections

Reading

Task 1. Read the text, summarize it, share the key points with a partner

Growing Dangers of Antibiotic Resistance: Examining Causes and Methods of Prevention and Control Strategies

Antibiotics are a class of drugs used to treat bacterial infections by working to kill bacteria or inhibit their growth. Doctors or other medical professionals prescribe antibiotics to treat specific bacterial infections, such as Penicillins and Macrolides, to name a few examples. They are given in several forms, such as oral tablets, capsules, liquids, or injections. Ways to use antibiotics responsibly are to take the full course as prescribed, even if symptoms progress, not use antibiotics for viral infections like the common cold or flu, not share antibiotics with others, and not use leftover prescriptions. However, these rules are not always followed by patients, which can pose hazards to one's health and increase antibiotic resistance. Antibiotic resistance occurs when bacteria evolve mechanisms to resist the effects of antibiotics, which can later develop through mutations, in which the DNA sequence of a cell can change. Antibiotic resistance works through bacteria-producing enzymes that destroy the antibiotic (ex. Beta-lactamases break down penicillins).

Antibiotic Resistance is a threat because infections caused by resistant bacteria are harder to treat, leading to prolonged illnesses, and higher medical costs. Resistant bacteria can easily spread to others, including vulnerable populations like the elderly and infants because their bodies are more prone to diseases since their immune systems aren't fully developed yet or their body is worn out. Six bacterial diseases that are resistant to antibiotics increased by 20 % during the COVID-19

pandemic, according to a data sheet released by the CDC in July 2024. In 2022, these infections continued to be higher than pre-pandemic levels. As a result, more than 1.2 million people have died each year.

The effects of antibiotic resistance are unnecessary expensive medical bills, impact on healthcare procedures, organ transplants, cancer therapy, and major surgeries. Such procedures become riskier with antibiotic-resistant bacteria and lead to longer hospital stays, which increase medical costs. That's why it is crucial to highlight the dangers of antibiotic-resistant bacteria and explore ways to prevent increased antibiotic resistance. *See more p.*

*By Rahul Reddy Janga (Source: NHSJH.
The National Highschool Journal of Science)*

Task 2. Answer the following questions based on the information from the text

1. What is antibiotic resistance, and why is it a growing concern?
2. How do antibiotics work to treat bacterial infections?
3. What are some consequences of antibiotic resistance?
4. Why is it important to educate the public about responsible antibiotic use?
5. What are some mechanisms bacteria use to resist antibiotics?

Task 3. Complete these sentences using the ideas and information from the text

1. Antibiotic resistance occurs when bacteria _____.
2. The excessive and improper use of antibiotics in medical and agricultural settings has _____.
3. Antibiotics are commonly used in agriculture to _____.
4. One of the consequences of antibiotic resistance is _____.
5. When patients do not complete the full course of antibiotics, _____.
6. Antibiotic-resistant infections can lead to prolonged illnesses and _____.
7. Bacteria develop resistance to antibiotics through mechanisms such as _____.
8. One way to prevent the spread of bacteria is by practicing _____.

Task 4. Match the words from the text with the definitions

- | | | |
|---------------------------------|-----------------------------|----------------------|
| 1. <i>Antibiotic resistance</i> | 2. <i>Bacteriophages</i> | |
| 3. <i>Cross-contamination</i> | 4. <i>Efflux pumps</i> | 5. <i>Mutation</i> |
| 6. <i>Phage therapy</i> | 7. <i>Beta-lactamases</i> | 8. <i>Macrolides</i> |
| 9. <i>Pathogen</i> | 10. <i>Fluoroquinolones</i> | |

Definitions:

A. The ability of bacteria to withstand the effects of antibiotics, making infections harder to treat.

B. A process where bacteria remove antibiotics from their cells, reducing their effectiveness.

C. The transfer of bacteria or other pathogens from one surface, substance, or food to another.

D. A type of enzyme that breaks down certain antibiotics, rendering them ineffective.

E. A category of antibiotics that includes azithromycin and erythromycin, often used to treat respiratory infections.

F. The use of bacteriophages to treat bacterial infections by targeting specific bacteria.

G. A natural or artificial change in the DNA sequence of an organism.

H. Microorganisms that have become resistant to multiple antibiotics, making them difficult to treat.

I. A class of broad-spectrum antibiotics that inhibit bacterial DNA replication.

J. The ability of bacteria, viruses, and other microbes to resist the effects of drugs meant to kill them.

K. A type of virus that infects and kills bacteria by injecting its genetic material into bacterial cells.

L. A group of antibiotics often used in combination with other drugs to treat bacterial infections.

Task 5. Complete the sentences with the words from **Task 4**.

1. _____ is a major global health concern because it makes bacterial infections harder to treat with common antibiotics.

2. Scientists are exploring _____ as an alternative to antibiotics by using viruses that infect and destroy bacteria.

3. Proper food handling is essential to prevent _____, which can spread bacteria from raw meat to vegetables.

4. Some bacteria use _____ to remove antibiotics from their cells, reducing the effectiveness of the treatment.

5. A genetic _____ in bacteria can lead to resistance against antibiotics, making infections more difficult to treat.

6. _____ involves using bacteriophages to specifically target and kill harmful bacteria in patients.

7. _____ are commonly prescribed antibiotics that are effective against respiratory infections.

8. A _____ is any microorganism, such as bacteria or viruses, that can cause disease in humans.

9. Doctors sometimes prescribe _____ to treat severe bacterial infections, but overuse has led to resistance.

10. The spread of _____ makes it difficult to treat infections, as bacteria become resistant to multiple drugs.

Before you watch

Task 1. You are going to watch the video about antibiotics and bacteria. Before you start answer the following questions:

Why do these types of microorganisms exist? What is their major function? What do you think?

Task 2. Think of the reasons why people need antibiotics to fight bacteria. Make a list of diseases that need antibiotic treatment and compare them with your partner

Watch!

Task 1. Watch the video '**Antibiotics vs. Bacteria: Fighting the Resistance**' (National Library of Medicine, 2018) and complete the tasks below

Source: <https://medlineplus.gov/medlineplus-videos/antibiotics-vs-bacteria-fighting-the-resistance/>



Task 2. Match the phrases mentioned in the video with their meanings

1. antimicrobial resistance	an infectious disease caused by the bacterium <i>Mycobacterium tuberculosis</i> , known for its difficulty to treat and high mortality, especially when resistant strains are involved
2. tuberculosis (tb)	a sexually transmitted infection caused by <i>Neisseria gonorrhoeae</i> , which has developed resistance to most antibiotics, making it harder to treat
3. gonorrhoea	a strain of <i>Staphylococcus aureus</i> that is resistant to many common antibiotics and poses serious health risks
4. mrsa	a common bacterium found on the skin, personal items, and in noses; while usually harmless, it can cause infections, particularly if it becomes resistant to antibiotics
5. staphylococcus aureus (staph)	the excessive or unnecessary use of antibiotics, which accelerates the development of bacterial resistance
6. overuse of antibiotics	the improper use of antibiotics – such as not completing a prescribed course – that leaves behind bacteria capable of developing resistance
7. misuse of antibiotics	mutations or alterations in the bacterial genetic material that can give some bacteria a survival advantage against antibiotics.
8. dna changes	modifications in the structure of the bacterial outer layer that can prevent antibiotics from binding or penetrating, reducing their effectiveness
9. bacterial cell surface changes	mechanisms in bacteria that actively expel antibiotics from the cell, thereby diminishing the drugs' effectiveness

10. antibiotic pumps	proteins produced by some bacteria that can break down or deactivate antibiotics, rendering them ineffective
11. enzymes that neutralize antibiotics	practices designed to minimize foodborne infections, such as proper cooking, cleaning, and handling of food
12. safe food preparation	vaccinations that help prevent infections by priming the immune system to fight specific pathogens, reducing the need for antibiotics
13. immunizations	procedures used by healthcare providers to identify the exact bacteria causing an infection, ensuring that the most appropriate antibiotic is chosen
14. diagnostic tests	the scientific studies and initiatives conducted by the national institute of allergy and infectious diseases aimed at understanding and combating antimicrobial resistance through new treatments, vaccines, and diagnostic methods
15. niaid research	the ability of bacteria to survive and grow despite the use of antibiotics that are designed to kill them

Task 3. Watch the video and match the sentences "heads" and "tails"

Heads

- Antibiotics are designed to target bacteria,
- Bacteria can develop resistance due to genetic changes,
- Overuse of antibiotics in medicine can lead to resistance,
- Incomplete antibiotic courses may allow bacteria to survive,
- Safe food preparation helps prevent infections,
- Diagnostic tests help identify the most effective treatment,
- The immune system plays a key role in fighting infections,
- NIAID researches new ways to overcome resistance,
- Antibiotic pumps help bacteria expel drugs,
- Vaccinations reduce the need for antibiotics by preventing infections

Tails

- a. enabling some bacteria to eject antibiotics before they can act.
- b. reducing the occurrence of infections that require antibiotic treatment.
- c. which is why ongoing research is critical for public health.
- d. making it harder for antibiotics to work effectively.
- e. so healthcare providers can match treatments more precisely.
- f. thereby creating a reservoir for resistant strains.
- g. and ensure that only susceptible bacteria are killed.
- h. helping to prevent the spread of harmful bacteria.
- i. which allows bacteria to transfer resistance genes to others.
- j. making it more difficult to control bacterial outbreaks.

Task 4. Read the sentences and fill in the gaps with information from the video.

1. Antibiotics are designed to _____ harmful bacteria and treat infections.

2. Bacteria can become resistant due to _____ changes in their DNA.

3. Incomplete courses of antibiotics may leave behind _____ bacteria that can continue to multiply.

4. Overuse of antibiotics in both medicine and agriculture contributes to the development of _____ strains.

5. Some bacteria produce _____ that neutralize the effects of antibiotics.

6. The misuse of antibiotics can harm not only harmful bacteria but also the _____ bacteria that protect our health.

7. Antibiotics are ineffective against _____ infections, which is why they should only be used when necessary.

8. Vaccinations help prevent infections, thereby reducing the need for _____.

9. Diagnostic tests are important because they help identify the _____ bacteria causing an infection.

10. Bacteria can transfer resistance genes to each other through a process known as _____ gene transfer.

11. In agriculture, the routine use of antibiotics for growth promotion can lead to resistant _____ in animals.

12. Researchers at NIAID are studying new ways to overcome _____ in bacterial infections.
13. The rapid development of resistance makes it more difficult to _____ infections effectively.
14. Proper _____, such as regular hand-washing, can reduce the spread of infectious bacteria.
15. The fight against antibiotic resistance requires a coordinated effort from both the public and _____ providers.



Language practice

Task 1. Read the sentences and fill in the gaps with the correct terms.

- Antibiotics are used to _____ harmful bacteria.
A) fuel B) target C) ignore D) support
- Bacteria can become _____ when exposed to antibiotics improperly.
A) relaxed B) weakened C) resistant D) excited
- The _____ of antibiotics in medicine and agriculture contributes to the development of resistant strains.
A) overuse B) underuse C) mixing D) absence
- Genetic _____ in bacteria can lead to resistance by altering how they respond to antibiotics.
A) creations B) changes C) delays D) restrictions
- Incomplete courses of antibiotics may allow _____ bacteria to survive and multiply.
A) weak B) resistant C) slow D) old
- Diagnostic _____ are used to identify the specific bacteria causing an infection.
A) tests B) errors C) trials D) assumptions

7. The _____ system is vital in fighting infections and keeping harmful bacteria in check.

- A) skeletal B) circulatory C) immune D) digestive

8. Vaccinations help to _____ infections, thereby reducing the need for antibiotic treatments.

- A) cause B) prevent C) delay D) ignore

9. Safe _____ preparation, such as proper cooking and handling, can minimize foodborne infections.

- A) food B) waste C) chemical D) media

10. Some bacteria possess special pumps that can _____ antibiotics from their cells.

- A) randomly absorb B) metabolize nutrients C) expel D) store

11. Bacterial _____ changes can occur rapidly, resulting in the evolution of new, resistant strains.

- A) artistic B) genetic C) behavioral D) economic

12. The misuse of antibiotics not only affects harmful bacteria but also the _____ bacteria that help protect our health.

- A) supportive B) beneficial C) opposite D) explosive

13. Proper public health practices, including regular hand-washing and _____, can help reduce the spread of infections.

- A) meditation B) exercise C) immunizations D) gaming

Task 2. Read the sentences and choose the best alternative that fits into the context.

1. Antibiotics are used to _____ (*target / ignore*) _____ harmful bacteria.

2. Bacteria can become _____ (*resistant / sensitive*) _____ when exposed to antibiotics in an improper way.

3. The _____ (*over / under*) _____ use of antibiotics in medicine and agriculture contributes to the development of resistant strains.

4. Genetic _____ (*changes / stability*) _____ in bacteria can lead to their ability to survive antibiotic treatment.

5. Incomplete courses of antibiotics may leave behind _____ (*resistant / dead*) _____ bacteria that can multiply.

6. Diagnostic _____ (*tests / guesses*) _____ are essential to identify the bacteria causing an infection.

7. The ___ (*immune / digestive*) ___ system plays a crucial role in fighting infections.

8. Vaccinations help to ___ (*prevent / cause*) ___ infections, reducing the need for antibiotics.

9. Proper ___ (*food / water*) ___ preparation, such as safe food handling, can reduce foodborne infections.

10. Some bacteria have special pumps that can ___ (*expel / absorb*) ___ antibiotics out of their cells.

11. DNA ___ (*changes / repairs*) ___ in bacteria can occur rapidly, allowing new strains to emerge.

12. The misuse of antibiotics can harm the ___ (*beneficial / harmful*) ___ bacteria that protect our health.

13. The development of antibiotic ___ (*resistance / harmony*) ___ is a serious concern for public health.

14. Research institutes such as NIAID are working on new ways to overcome bacterial ___ (*resistance / sensitivity*) ___.

15. Good public health practices, including regular hand-washing and ___ (*immunizations / celebrations*) ___, help reduce the spread of infections.

Task 3. Read the text and fill in the gaps with an appropriate preposition.

It's important to understand the relationship **1) (a)** between / **(b)** of ___ your physical health and depression **2) (a)** to / **(b)** for ___ understand how antibiotics may affect your risk **3) (a)** of / **(b)** for ___ developing depression. There is a concept based **4) (a)** on / **(b)** at ___ the "brain-gut axis," which essentially theorizes that the relationship **5) (a)** between / **(b)** among ___ the brain and the gut is crucial **6) (a)** to / **(b)** for ___ the healthy function **7) (a)** of / **(b)** ___ for both. In recent years, evidence has emerged linking depression **8) (a)** with / **(b)** to ___ antibiotic use. In fact, recent studies have shown evidence that depression may be triggered (or at least the risk **9) (a)** for / **(b)** of ___ it may be increased) when a person's intestinal flora – the gut biome – is disrupted. The hypothesis, then, is that one of the most significant and sudden causes **10) (a)** of / **(b)** for ___ gut flora disruption – antibiotics – may increase your chances **11) (a)** of / **(b)** for ___ developing depression, or at least play a role **12) (a)** in /

(b) at ___ the onset 13) (a) of / (b) for ___ mood disorders. This discovery has implications 14) (a) for / (b) to ___ future research 15) (a) on / (b) in ___ antibiotic use.

Task 4. Fill in the gaps with the correct verb tense form

1. There isn't a lot of data on the medications in the antibiotics world that ___ cause depression, but there is data supporting depression as a potential side effect for an increasing number of medications. (A) *will cause* (B) *do cause*

2. But there ___ data supporting depression as a potential side effect for an increasing number of medications. (A) *is* (B) *has been*

3. Medications like fluoroquinolone and its derivatives ___ associated with increased risks for depression. (A) *have been* (B) *are*

4. It's important to understand that a fear of depression ___ prevent you from taking medications prescribed by your healthcare provider, especially for potentially serious infectious diseases.

(A) *should not* (B) *must not*

5. If you ___ previously been depressed, are currently depressed or are seeing signs of depression, or if you're worried about the dangers of antibiotics due to a family history of depression, it's best to speak with a healthcare professional about these concerns.

(A) *have* (B) *had*

6. Or if you ___ worried about the dangers of antibiotics due to a family history of depression, it's best to speak with a healthcare professional about these concerns.

(A) *are* (B) *were*

7. It is likely that worse things ___ from failing to treat an infection than from the treatment itself.

(A) *may come* (B) *will come*

8. Letting a healthcare provider know about your concern ___ a crucial safety mechanism for protecting your mental health while treating your physical health.

(A) *is* (B) *has been*

9. It is important that a fear of depression ___ prevent appropriate treatment.

(A) *does not* (B) *will not*

10. If your risk of depression substantial, it is crucial to discuss these concerns with a healthcare provider.

(A) *is*

(B) *was*

Speaking

The Debate on Antibiotic Misuse

Discuss the statement:

'The overuse of antibiotics in medicine and agriculture is the primary driver of antibiotic resistance'



Discussion Points:

- Identify examples of antibiotic misuse in both healthcare and agriculture.
- Debate whether strict regulations on antibiotic prescriptions could significantly reduce resistance.
- Consider alternative methods for managing infections without contributing to resistance.

Instructions:

Divide into two groups. One group argues in favor of the statement, while the other presents counterarguments. After 5 minutes of preparation, hold a structured debate, ensuring that each side presents evidence and examples to support their position.

Writing

Writing Instructions for Antibiotic Treatment of Lung Inflammation

Imagine you are a healthcare professional writing a step-by-step guide for junior doctors on how to prescribe antibiotics for lung inflammation (pneumonia). Your instructions should be clear, structured, and precise to ensure proper treatment and avoid antibiotic resistance.



Instructions:

- *Title & Introduction:* Start with a brief explanation of lung inflammation and the importance of correct antibiotic use.
- *Step-by-Step Algorithm:* Use numbered steps to guide doctors through the process.
- *Dos and Don'ts:* Include key precautions (e.g., avoid unnecessary prescriptions, check for allergies).
- *Format & Clarity:* Use simple, direct language and clear headings.

Example: ★ Step-by-Step Guide for Antibiotic Treatment of Pneumonia

<p><u>Step 1: Confirm Diagnosis</u> Assess patient symptoms: fever, cough, difficulty breathing, chest pain. Perform a chest X-ray and blood tests if necessary.</p>	<p><u>Step 2: Identify Risk Factors</u> Check for comorbidities (e.g., diabetes, COPD, heart disease). Determine if the patient is in a high-risk group (e.g., elderly, immunocompromised).</p>
<p><u>Step 3: Choose the Right Antibiotic</u> For mild cases (outpatient treatment): Prescribe amoxicillin (500 mg every 8 hours for 7 days). For severe cases (hospitalized patients): Use IV ceftriaxone + azithromycin.</p>	<p><u>Step 4: Monitor Patient Progress</u> Reassess symptoms after 48-72 hours. If no improvement, consider antibiotic resistance and adjust treatment.</p>
<p><u>Step 5: Educate the Patient</u> ✓ Take the full course of antibiotics -even if symptoms improve. ✓ Do not skip doses. ✗ Avoid self-medication or stopping early.</p>	<p><u>Step 6: Prevent Antibiotic Resistance</u> Prescribe antibiotics only when necessary. Do not use antibiotics for viral infections (e.g., common cold). Encourage vaccination (e.g., flu vaccine, pneumococcal vaccine).</p>

UNIT 6

THE BODY: ORGANS OF PERCEPTION



Before you read

Task 1. Before reading answer the following questions:

Which body parts can you name? What are their functions? What is unique about the human body? What senses of perception can you name?

Task 2. Look at the pictograms and name the parts of the body?

Match them with the names of the senses:



1) _____, _____, _____, _____, _____,

2) *smell / vision / taste / hearing / touch*

Task 3. Think about 5 sentences using the words from Task 2.

Example: "I can smile with my lips"

1) _____; 2) _____; 3) _____; 4) _____;
5) _____

Task 4. Look at the useful vocabulary. Study the following list of words/phrases and their definitions

1. sclera, <i>n.</i>	a clear, spherical part of the eye larger than a marble
2. iris, <i>n.</i>	the colored part of the eye surrounding the pupil
3. retina, <i>n.</i>	the light-sensitive layer at the back of the eye, detecting light the
4. pupil, <i>n.</i>	black, circular opening in the iris surrounded by colored tissue the colored part of the eye surrounding the pupil
5. cornea, <i>n.</i>	the transparent layer forming the front of the eye
6. myopia, <i>n.</i>	near-sightedness; difficulty seeing distant objects clearly
7. hyperopia, <i>n.</i>	far-sightedness; difficulty seeing close objects clearly
8. cataract, <i>n.</i>	a medical condition causing cloudiness in the eye's lens

Reading

Task 1. Read the text, summarize it and share with a partner

The Elegant Eye

They aren't what most people think they are, Human eyes...

Touted as ethereal objects by poets and novelists throughout history, they are nothing more than white spheres, somewhat larger than your average marble, covered by a leather-like tissue known as sclera and filled with nature's facsimile of jelly. Your beloved's eyes may pierce your heart, but in all likelihood, they closely resemble the eyes of every other person on the planet. At least I hope they do, for otherwise he or she suffers from severe myopia (near-sightedness), hyperopia (far-sightedness), or worse. Such uniformity is essential: for an eye to focus properly, its length and its optical system must be matched match to within a fraction of a millimetre. When a man and woman toss their genes together to make a baby, nature sets the focal

point (determined by the optical power of the cornea and crystalline lens) at a standard distance, then adjusts the length of the eyeball to that same distance – twenty-four millimetres, or about one inch, with a few millimetres of variation thrown in for good measure. Thus, unlike livers and kidneys and hearts and brains – those ordinary, non-spherical organs – eyes tend to an impressive sameness all over the world. My spleen may be half again bigger than yours, intestines can vary by five feet in length from person to person, but, with rare and usually disastrous exceptions, eyes are like so many peas in a pod. [...]

Since every normal eye displays a clear cornea and a white scleral coat, any notion of special beauty attributed to the globe itself must derive from the iris, the dynamic membrane that contains the pupil and rests in front of the crystalline lens. The iris comes in many colors, but if one trusts the obsession of poets and novelists, the most beautiful irises are always blue: light-blue, velvety-blue, welkin-eyed, peacock, midnight, cobalt, ice-blue. Green gets an occasional nod – "she had jewel-bright emerald eyes, so lustrous and fetching they tore through my heart" – but most of the time blue runs the show. The rankest discrimination, and a bit ironic, since blue irises contain no intrinsic pigment, showing only the raw color of the tissue itself. The pigment cells in the Caucasian iris often add a twist to this aesthetic by lying dormant during gestation, breaking the heart of many a parent when the gorgeous blue eyes of their newborn turn muddy-brown as the months go by.

The texture of the iris is all but invisible to the unaided eye, but the ophthalmologist's slit-lamp microscope discloses a panorama of diaphanous spokes, crypts and valleys, flecks and spots and strands that dance about with each twitch of the pupil. Dark irises tend toward a tight weave, while light irises fluff up like a shag rug. And there's the all-important pupil: constricted by morphine and bright light, dilated by fear, darkness, sexual arousal, and death. Yes, the coroner's final measure, the mark of a departed soul – enormous black pupils that give nary a twitch to even the brightest light. Despite this morbid sign, many cultures consider large pupils a sign of beauty. "Belladonna," Spanish for "beautiful lady," is also the name of a pupil-dilating poison extracted from the plant *Atropa belladonna*, more commonly known as deadly nightshade. About myopia – if you have

it, be happy. Numerous scientific studies have shown that near-sighted men and women boast a higher average intelligence than their non-myopic cohorts. The precise mechanism of this association remains unknown, but there are two popular theories: nature and nurture. Those who support nature argue that during embryologic development, the eyes develop from the same neural tube as the brain itself. Since large eyes tend to be myopic, big eyes and big brains might go together in much the same fashion as long arms and long legs. *See more p.*

By John Gabel (Source: thenakedscientist.com)

Task 2. Answer the following questions based on the article.

1. How does the author describe human eyes at the beginning of the text?
2. What determines the focal point of the eye?
3. What is the standard length of a human eyeball?
4. Why do eyes generally look similar among people worldwide?
5. According to the text, what actually makes human eyes appear "beautiful"?

Task 3. Read the statements and identify whether they are **TRUE** or **FALSE**.

1. Human eyes are described as unique and completely different in structure from person to person. **T / F**
2. The sclera is a transparent tissue covering the eyeball. **T / F**
3. Blue irises contain more pigment than brown ones. **T / F**
4. The standard length of the human eyeball is about one inch (24 millimeters). **T / F**
5. The beauty of human eyes mainly comes from the sclera and cornea. **T / F**

Task 4. Match the words from the text with the definitions

1	sclera	cloudiness that forms on the lens, impairing vision
2	myopia	a doctor who diagnoses and treats eye disorders

3	hyperopia	the white, tough outer covering of the eyeball
4	iris	the transparent, outer surface of the eye
5	retina	device used to examine the interior of the eye
6	pupil	the colored part surrounding the pupil
7	ophthalmoscope	near-sightedness; inability to see distant objects
8	cataract	far-sightedness; difficulty seeing close objects
9	cornea	painful condition with increased pressure in the eye
10	glaucoma	condition causing gradual loss of central vision

Task 5. Complete the sentences with the words from **Task 4**

- The _____ is the tough, white covering that protects the eyeball.
- _____ causes difficulty seeing objects that are far away.
- _____ is characterized by difficulty focusing clearly on nearby objects.
- The _____ is the colorful part of the eye that gives it its distinct appearance.
- The condition causing loss of central vision as people age is called _____.
- The _____ is a medical instrument used to examine the inside of the eye.
- The _____ is a transparent structure behind the pupil that helps focus images clearly.
- _____ occurs when high pressure within the eyeball damages the optic nerve.
- An eye specialist who diagnoses and treats eye disorders is called an _____.
- The _____ is the clear, dome-shaped front surface of the eye.

Before you watch

You are going to watch the video about optical illusions. What is an optical illusion? How does it work?

Task 1. Think of optical illusions examples. What exactly happens during an optical illusion? Is it only the eye? Are any other organs involved?



Watch!

Task 1. Watch the video *'How optical illusions trick your brain'* (TED, 2014) and complete the tasks below



Source: https://www.ted.com/talks/nathan_s_jacobs_how_optical_illusions_trick_your_brain

Task 2. Watch the video and match the phrases with their meanings

A

1. peripheral vision	cells in the retina that help transmit visual signals to the brain
2. optical illusions	when the brain interprets shading patterns as three-dimensional shapes
3. lenses	images or patterns that trick the brain into seeing something that isn't real

4. retinal ganglion cells	energy used by the brain to interpret visual information
3. lenses	the outer area of your field of vision, outside your direct focus
5. cognitive energy	darkening or coloring to create an illusion of depth or texture
6. shading patterns	transparent structures that help focus light in the eye
7. optical illusions	the misinterpretation of visual signals by the brain
7. concave shape	mistaken perceptions created by misleading visual information
8. convex shape	curved outward like the exterior of a sphere
9. retinal ganglion cells	light-sensitive cells in the eye that detect visual information
10. photo receptors	curved inward like the interior of a sphere or bowl

B

1. visual cortex	areas that appear differently due to contrasts in brightness or darkness
2. depth perception	the nerve that carries visual signals from the retina to the brain
3. optical illusions	the part of the brain responsible for processing visual information
4. fusiform face area	optical illusion that uses shading to trick the brain into seeing depth.
3. lateral inhibition	the brain region responsible for facial recognition.
5. convex shape	visual effect causing enhanced contrast between light and dark areas.
6. concave shape	incorrect visual perceptions created by ambiguous or misleading visual stimuli.
7. visual system	curved inward shape causing the appearance of depth
8. optical nerve	the area of the brain that processes visual information
9. visual illusions	curved outward shape, bulging outward like a dome

Task 4. Watch the video and match the sentences "heads" and "tails".

Heads:

1. Optical illusions trick us because...
2. Peripheral vision can detect things...
3. Retinal ganglion cells respond to contrasts...
4. The brain creates 3D illusions...
5. Abraham Lincoln's face appears distorted...
6. Shading patterns can make flat surfaces...
6. Large pupils are often perceived as attractive...
7. Belladonna historically was used...
8. Your visual cortex quickly processes...
9. The brain conserves cognitive energy by...
10. The muffin-pan illusion occurs because...

Tails:

- A. enhancing contrast between areas of different brightness.
- B. information about shading and assumes depth.
- C. selectively focusing on key facial features.
- D. due to peripheral differences in shading patterns.
- E. they exploit how our brains process visual information.
- F. as more white surrounds intersections compared to lines.
- G. using assumptions to interpret visual signals quickly.
- H. that we aren't directly looking at.
- I. the shading patterns can suggest either convex or concave shapes.
- J. because of subtle manipulations of shading and depth perception.

Task 5. Read the sentences and fill in the gaps with information from the video.

1. Optical illusions trick us by exploiting how the brain interprets _____.
2. Peripheral vision refers to what we see _____ our direct line of sight.
3. Retinal ganglion cells detect contrasts between _____ areas.
4. The white intersections in the grid illusion appear grey due to _____ inhibition.

5. Our visual cortex combines images from both eyes to create the illusion of _____.

5. Shading patterns trick the brain into perceiving flat images as _____.

6. The muffin-pan illusion happens due to conflicting clues from _____.

7. The upside-down Abraham Lincoln illusion emphasizes that the brain primarily focuses on the _____ and mouth.

8. Faces are rapidly identified by a specialized brain region known as the _____ face area.

9. 'Belladonna' historically was used to _____ the pupils.

10. Cognitive energy is conserved by the brain through _____ about visual information.

11. The muffin-pan illusion occurs because our brains interpret shading patterns as _____.

12. The cornea maintains clarity due to a special tear film composed of dissolved salts, proteins, and _____.

13. Depth perception relies on the brain combining two slightly _____ images from our eyes.

14. The process of enhancing contrast between adjacent areas of the retina is called _____.

15. Even perfectly healthy eyes will eventually experience vision loss due to _____.

Language practice

The senses

Task 1. Match the names of the five basic senses with the sense organs

1. sight 2. hearing 3. smell 4. touch a) nose 2) tongue 3) eyes
4) ears skin, finger tips

Task 2. Complete the sentences with the sensory words and their combinations (in some cases *hearing = sound*)

1. My _____ allows me to appreciate the beauty of the sunset as the colors blend in the sky.

2. Good _____ is essential for enjoying music and engaging in conversations.

3. The _____ of freshly baked bread filled the kitchen, inviting everyone to gather around the table.

4. The soft _____ of the blanket made me feel warm and cozy on a chilly evening.

5. My _____, _____, and _____ combined to create a vivid experience at the beach, where I could see the waves, hear the seagulls, and smell the salty air.

6. The _____ of the rain hitting the roof filled the room, while the _____ of a warm blanket and the _____ of brewing coffee created a cozy atmosphere.

7. My _____ was drawn to the vibrant colors of the fruit salad, and when I _____ ed it, the mixed flavors combined with the refreshing _____ of the chilled fruit were delightful.

8. The _____ of pine trees during our hike, combined with the _____ of the lush green forest and the _____ of birds chirping, made for a serene outdoor experience.

9. The touch of the cool water on my skin, the hearing of laughter from friends, and the taste of delicious food made the picnic unforgettable.

Task 3. Find the names of the five basic tastes

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

Task 4. Identify the taste of the given kinds of food and drinks
anchovies, beans, black coffee, chocolate, citric acid, feta cheese, fish and chips, gherkins, glutamate, honey, hops in beer, lemon, lime, peach, potato, crisps, soy sauce, sugar, tomatoes, tonic water, unsweetened cocoa

SWEET	SALTY	SOUR	BITTER	UMAMI

Task 5. Read the text and fill in the gaps with the terms in brackets

Take a look around the room – what do you see? All those colours, the walls, the windows – everything seems so self-evident, just so there. It's weird to think that how we perceive this rich milieu boils down to light particles – called (*electrons / photons*) – bouncing off these objects and onto our (*eyeballs / fingertips*).

This photonic barrage gets soaked up by approximately 126 million light-sensitive cells. The varying directions and energies of the photons are translated by our brain into different shapes, (*colours / sounds*), brightness, all fashioning our technicolour world.

Wondrous as it is, our sense of vision is clearly not without certain limitations. We can no more see (*radio / ocean*) waves emanating from our electronic devices than we can spot the wee (*bacteria / insects*) right under our noses. But with advances in physics and biology, we can test the fundamental limits of natural vision.

'Everything you can discern has a (*threshold / surface*), a lowest level above which you can and below which you can't,' says Michael Landy, professor of psychology and neural science at New York University.

Task 6. Read the text and choose the best alternative

How clearly can we see?

Nevertheless, why is it that we can't pick out individual stars in the Andromeda Galaxy? The limits of our visual (*resolution / reflection*),

or acuity, come into play here. Visual acuity is the ability to (*combine / discern*) a detail such as a point or lines separate from another without them (*blurring / sharpening*) together.

You might therefore think of acuity's limits as the number of (*sounds / pixels*) we can discern. Several factors set the boundaries for visual acuity, such as the spacing between the (*cells / neurons*) packed onto the retina. The (*optics / acoustics*) of the eyeball itself, which as we mentioned before prevent every available photon from alighting upon a photoreceptor cell, are important as well.

Theoretically, studies have shown, the best we can do is about (*120 / 200*) pixels per degree of arc, a unit of angular measurement. That works out to about a fingernail held at arm's length with (*60 / 120*) horizontal and vertical lines on it, alternating in black and white, creating a checkerboard pattern. 'That's about the (*largest / finest*) pattern you could ever see,' says Landy.

Vision tests, like the popular Snellen eye chart at your optician's with progressively (*larger / smaller*) letters on it, operate on the same principle. The chart gauges at what point someone can no longer separate out a white (*gap / colour*) in a black letter, distinguishing a capital F from a capital P, for instance. These acuity limits help explain why we cannot discern and focus on a single, dim, biological cell that's mere (*micrometres / centimetres*) across. But let's not sell ourselves short. A million colours; single photons; galactic realms quintillions of miles distant – not bad for the blobs of (*jelly / muscle*) in our eye sockets, wired to a 1.4 kilogram (*sponge / muscle*) in our skulls.

Task 7. Read the text and fill in the gaps with an appropriate preposition

What is the smallest and farthest thing we can see?

of / in / at / on / from / to / with / for / by / across

Now here's a fact that may surprise you: There is no intrinsic limit ___ the smallest or farthest thing we can see. So long as an object ___ whatever size, distance or brevity transfers a photon ___ a retinal cell, we can spy it. 'All the eye cares about ___ vision is the amount ___ light that lands ___ the eye,' says Landy. 'It's just the total number ___ photons. So you can make [a light source] ridiculously tiny and ridiculously brief, but if it's really strong ___ photons, you can still see it.' Psychology textbooks,

___ instance, routinely state that ___ a clear, dark night, a candle flame can be spotted ___ as far away as 48 kilometres. ___ practice, of course, our eyes are routinely inundated ___ photons, so stray quanta of light ___ great distances get lost ___ the wash.

'When you increase the background intensity, the amount ___ extra light you need ___ see something increases,' says Landy. The night sky, ___ its dark background pricked ___ stars, offers some startling examples ___ long-distance vision. Stars are huge; many we see ___ the night sky are millions ___ kilometres ___ diameter. Even the nearest stars, however, are more than 24 trillion miles away, and are therefore so diminished ___ size our eye cannot resolve them. Lo and behold, we can still see stars as intense, gleaming "point sources" ___ light because their photons cross the cosmic expanse and hit our retinas.

All the individual stars we see ___ the night sky are ___ our galaxy – the Milky Way. The absolute farthest object we can see ___ our naked eye is outside ___ our galaxy: the Andromeda Galaxy, located 2.5 million light-years ___ us, or a cool 23 quintillion miles.

Task 4. Fill in the gaps with the best option from the list below the text.

1. (A) can see (B) saw 2. (A) has been (B) have been 3. (A) didn't pinpoint (B) haven't pinpointed 4. (A) is (B) was 5. (A) remains (B) remained 6. (A) explains (B) explained 7. (A) differs (B) differed 8. (A) possess (B) possessed 9. (A) are (B) were 10. (A) have (B) had 11. (A) are (B) were 12. (A) perceive (B) perceived 13. (A) has (B) had 14. (A) possess (B) possessed

How many colours 1) ___ humans see? In fact, scientists 2) ___ trying to pinpoint the exact number for years. Yet despite ongoing research, they still 3) ___ an exact figure. Kimberly Jameson, who 4) ___ studying colour vision at the University of California, Irvine, notes that it 5) ___ difficult to assign a precise number. She 6) ___ that the colours visible to one person 7) ___ significantly from another. For instance, research 8) ___ shown that people who have colour blindness typically 9) ___ only about 10,000 colours. In contrast, people with typical vision 10) ___ approximately a million distinct colours. Recently, studies 11) ___ revealed that people called tetrachromats, who 12) ___ an additional type of colour-sensitive cone cell, 13) ___ able to perceive far more colours. Such individuals 14) ___ perhaps millions of distinct shades.

Speaking

Personal experiences

Discuss the following questions in pairs:

- Have you ever had problems with your eyesight? Describe your experience.
- How would your daily life change if you suddenly lost your vision?
- What habits do you have that might affect your eyesight positively or negatively?



Opinion exchange

In small groups, discuss your views:

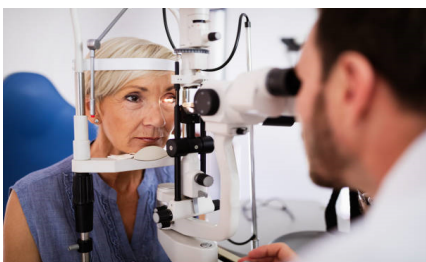
- Do you think modern technology harms or helps human vision? Why or why not?
- Should there be limits on the time we spend looking at screens? Provide reasons.
- How can we better protect our eyes in everyday life?



Writing

Writing instructions for eye care after laser surgery

Imagine you are an ophthalmologist preparing a set of post-operative care instructions for patients who have undergone laser eye surgery (LASIK). Your instructions should be clear, structured, and precise to ensure proper healing and avoid complications.



Instructions:

1. *Title & Introduction:* Start with a brief explanation of LASIK and the importance of post-surgery care.

2. *Step-by-Step Algorithm:* Use numbered steps to guide patients on what they should and shouldn't do.

3. *Dos and Don'ts:* Highlight key precautions (e.g., avoid rubbing eyes, use prescribed eye drops).

4. *Format & Clarity:* Use simple, direct language with clear headings.

Example:

✦ *Step-by-Step Guide for Post-LASIK Care*

Step 1: Rest Your Eyes

- Keep your eyes closed for the first few hours after surgery.
- Avoid bright lights and screens for at least 24 hours.

Step 2: Use Prescribed Eye Drops

- Apply antibiotic eye drops as instructed by your doctor.
- Use artificial tears to prevent dryness.

Step 3: Avoid Rubbing or Touching Your Eyes

- Do not rub or scratch your eyes, even if they feel irritated.
- Wear protective goggles while sleeping for the first few nights.

Step 4: Protect Your Eyes from Infection

• Avoid dusty environments and swimming pools for at least two weeks.

- Do not use makeup around the eyes for one week.

Step 5: Follow Up with Your Doctor

- Attend all scheduled check-ups.
- If you experience severe pain, redness, or vision problems, contact your doctor immediately.

UNIT 7

THE BODY: PROBLEMS AND CARE



Before you read

Task 1. Before reading answer the following questions:

What health problems can you name? What body systems may be affected by them? Do the named problems refer to a specific category of the population (children, adults, aged people)? How can you distinguish the difference between "disease"/ "disorder" / "dysfunction"? Is it possible to improve/disprove your health having proper lifestyle?

Task 2. Look at the useful vocabulary. Study the list of the words and their definitions

inextricably, adv. – a manner that is impossible to unravel or separate from something else

drawback, n. – a disadvantage or the negative part of a situation

negligence, n. – failure to take proper care over something

adher, v. – believe in and follow the practices of

tackle, *v.* – make determined efforts to deal with (a problem or difficult task)

contagious, *adj.* – (of disease) capable of being transmitted by infection

burden, *n.* – heaviness

mitigate, *v.* – make (something bad) less severe, serious, or painful

Reading

Task 1. Read the text and complete the tasks below

Major Health Problems of Today's Fast-Changing World

The health requirements of individuals worldwide are the main emphasis of global health. Global health issues, such as measles, malaria or malnutrition, are specific to each regional population, but they can also impact other groups globally. Global health has a significant impact on every population. All are inextricably linked as humans. The health of the environment, animals and people worldwide affects the health of each individual. There have been many advantages to the rise in international travel, trade and communication in recent decades, but there are drawbacks as well, especially when it comes to health. People moving about makes it easier for contagious diseases to spread easily, which can result in pandemics or even epidemics. For instance, COVID-19, which was a serious worldwide health concern, spread until it affected every country around the world. Not every issue pertaining to global health is associated with human mobility. For example, obesity, which is a major worldwide health burden, has nothing to do with contagious infections. Health problems arise when the body's normal metabolism is disrupted by various factors such as lifestyle choices, diseases and pathogens. Metabolism refers to the biochemical process that allows the body to grow, reproduce, repair damage and respond to the environment. When these processes are impaired, it can lead to health issues.

Communicable disease: Communicable or contagious diseases are the ones that spread from one person to another. They are global diseases, but not every disease leads to death and disability. The major reason for this disease to spread is the lifestyle, like not maintaining

hygiene, eating junk food with minimum hygiene, a complete change of lifestyle and human activities, lack of immunity power and many more. Some examples of communicable diseases are malaria, HIV, neglected tropical disease, tuberculosis, sexually transmitted diseases, COVID-19, Ebola virus and many more.

Malnutrition: Hunger is one of the main global health issues despite significant improvements in food security. Due to many natural disasters and economic inequality, hunger leading to malnutrition is a major health issue. Malnutrition is not only caused by hunger, but many factors like human negligence, not following a healthy diet, poverty and lack of education and information also lead to malnutrition.

Environmental health: Environmental pollution has a major impact on human health. Polluted air causes many illnesses and millions of deaths. Polluted water poisons both humans and animals. For example, contaminated or polluted water causes waterborne diseases like malaria, dengue, food poisoning, etc., and polluted air leads to cough, cold, flu, fever and other infectious diseases. In addition, climatic changes also impact human health.

Mental health: As more individuals seek help and recognise the significance of mental well-being, mental health has grown in prominence. They are becoming more prevalent globally, with more people receiving diagnoses for illnesses like bipolar disorder, anxiety and depression. Understanding what mental disorder is is crucial before exploring the reasons for the rise in mental disease. Mental disorders have an impact on a person's thoughts, feelings and actions. These disorders can be caused by a number of factors, such as life experience, environmental variables and heredity. The everyday life of an individual is significantly impacted by mental illness, which can range in severity from moderate to severe.

Injuries and hospitalisation in the elderly: Falls remain the major issues of injuries, hospital admissions for trauma and injury-related deaths in this age group. One in every three seniors experiences a fall each year. To mitigate these risks, strategies such as exercise to improve balance and strength medication follow-ups are crucial. In addition, ensuring home security is vital to prevent injury risks. Having accessible home-based fire prevention devices is critical, as

people aged 65 and older are twice as likely to die in a home fire compared to the general population.

Diabetes: Diabetes poses significant health problems characterised by elevated blood glucose levels. The condition is often referred to as a silent killer due to its asymptomatic nature at early stages. Diabetes is also increasingly affecting children as young as 12, driven by poor lifestyle choices and unhealthy eating habits. However, the impact of diabetes can be reduced when diagnosed at early stages and adhering to proper lifestyle changes.

Hypertension: Hypertension is a prevalent medical issue which is the primary cause of brain strokes and heart attacks. This condition is often linked to physical inactivity and unhealthy lifestyle choices. Engaging in regular exercise, following a proper diet and regularly monitoring blood pressure can help manage hypertension effectively.

Healthcare providers play a critical role in addressing major health problems by integrating clinical care with other disciplines. Healthcare providers help create awareness and educate people about their health conditions through community outreach programs such as health campaigns or workshops. They are always ready for emergencies and extended work sessions and aware of potential challenges and solutions to tackle them.

Task 2. Answer the following questions

1. What are some examples of global health issues mentioned in the text?
2. How do lifestyle choices contribute to the spread of communicable diseases?
3. What are some factors that lead to malnutrition apart from hunger?
4. How does environmental pollution affect human health?
5. What role do mental health issues play in an individual's everyday life?
6. What strategies can help mitigate the risks of injuries among the elderly?
7. Why is diabetes referred to as a "silent killer"?
8. How do healthcare providers contribute to addressing major health problems?

Task 3. Read the statements and identify whether they are **TRUE** or **FALSE**

1. The health of the environment, animals, and people is interconnected and affects individual health. T/F
2. All communicable diseases lead to death and disability. T/F
3. Malnutrition is solely caused by hunger. T/F
4. Polluted water does not affect human health. T/F
5. Mental health has become more prominent as more individuals seek help for mental well-being. T/F
6. One in every five seniors experiences a fall each year. T/F
7. Hypertension is often linked to physical inactivity and unhealthy lifestyle choices. T/F
8. Healthcare providers have no role in educating the public about health conditions. T/F

Task 4. Match the names of the diseases mentioned in the text with the body systems they may affect

anxiety / tuberculosis / waterborne diseases / sexually transmitted diseases / malnutrition / injuries / covid-19 / ebola virus / hiv / measles / bipolar disorder / diabetes / malaria / depression / hypertension

1) *Circulatory system* (affects blood pressure and cardiovascular health) _____

2) *circulatory system* (caused by parasites affecting red blood cells)

_____ 3) *Digestive system*

(often caused by contaminated water affecting the gastrointestinal tract) _____

4) *Digestive system and immune system*

(its deficiencies affect bodily functions and immune response)

_____ 5) *Endocrine system* (involves insulin regulation) and can affect multiple systems _____

6) *Immune system* (can cause complications affecting various systems) _____

7) *Immune system* (causes severe effects on the immune response)

8) *Immune system* (specifically attacks cd4 cells, compromising immune function) _____

9) *Musculoskeletal system*

(affects bones, muscles, and joints, especially related to falls)

10) *Nervous system* (affects mood and behavior regulated by the brain) _____

11) *Nervous system* (affects mood and can impact other bodily systems) _____

12) *Nervous system* (impacts mental health and can have physical manifestations) _____

13) *Reproductive system* (as well as potentially affecting the immune system) _____

14) *Respiratory system* (primarily affects the lungs and respiratory function) _____

15) *Respiratory system* (primarily affects the lungs) _____

Task 5. Match the words to make expressions from the text

1	food	follow-ups
2	normal	security
3	waterborne	outreach programs
4	medication	negligence
5	asymptomatic	metabolism
6	human	diseases
7	worldwide	nature
8	physical	infections
9	community	inactivity
10	contagious	health burden

Task 6. Fill in the gaps with the phrases from **Task 5**

1. _____ can spread rapidly in crowded places, highlighting the importance of hygiene and vaccination.

2. Effective _____ are essential for educating the public on health issues and promoting preventive measures.

3. _____ is a major risk factor for various chronic diseases, prompting health officials to advocate for more active lifestyles.

4. Obesity and diabetes are significant components of the _____, affecting millions across the globe.

5. _____ in food safety can lead to outbreaks of foodborne illnesses, underscoring the need for stricter regulations.

6. The _____ of certain diseases can make it difficult to identify and control their spread in populations.

7. Regular _____ are crucial for individuals with chronic illnesses to ensure effective treatment and avoid complications.

8. _____ remain a significant public health concern, especially in regions with inadequate sanitation and clean drinking water.

9. Disruptions in _____ can result from various factors, leading to health issues such as obesity and diabetes.

10. Improving _____ is essential for reducing malnutrition and enhancing the overall health of communities around the world.

Task 7. Name as many children's diseases as you know. Complete the diagram. Translate the names of the diseases into Ukrainian



Task 7. Match the health problems and diseases with their symptoms

1. Hay fever (inflammation of the middle ear) 2. Flu 3. Diarrhoea

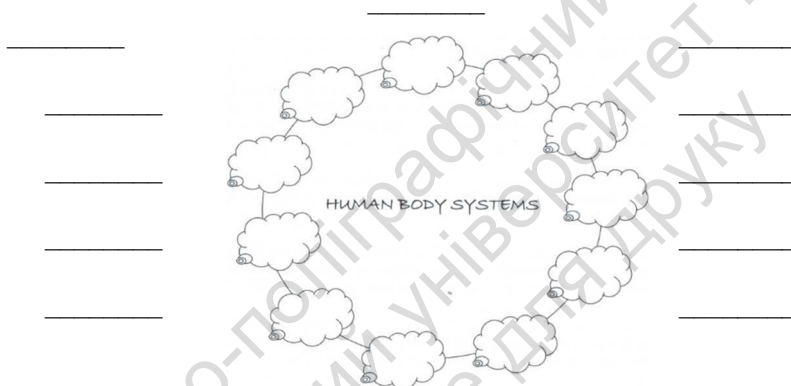
4. Concussion 5. Heart attack 6. Otitis

- a) sore throat, cough, fever, aching muscles
- b) vomiting and dizziness, headache, state of confusion
- c) temporary loss of consciousness, delayed response to questions
- d) earache, hearing problems, fever, drainage from the ear, vomiting, dizziness
- e) pain in the chest, shortness of breath, dizziness sweating
- f) you keep running to the toilet, loose/watery stools

The human body and its functions

The human body consists of a number of systems that carry out specific functions. The major systems include: the *circulatory* system, the *skeletal* system, the *digestive* system, the *nervous* system, the *lymphatic* system, the *endocrine* system, the *immune* system, the *muscular* system, the *reproductive* system, the *respiratory* system, the *urinary* system and some others.

Task 8. Read the information about the body systems. Put the names of the body systems in the scheme



Task 9. Now put the names of body systems in the gaps. There are two extra systems which are not included. Name them.

1. The _____ includes kidneys, ureters, the urinary bladder and the urethra. It eliminates the urea produced by the kidneys from the body.

2. The _____ includes the heart, blood, blood vessels, arteries and veins and is responsible for moving blood through blood vessels and thus providing the inner organs with blood, oxygen, nutrients, hormones and other substances necessary for our life.

3. The _____ includes the brain, spinal cord and nerves. This system controls all actions of the body.

4. The _____ consists of the trachea, the bronchial tubes, the diaphragm and the lungs. It is responsible for breathing, which means providing the body with oxygen and expelling carbon dioxide.

5. The _____ includes lymph nodes, the spleen, bone marrow, the thymus and white blood cells. It helps the body defend itself against harmful viruses and bacteria.

6. The _____ consists of the mouth cavity, pharynx, oesophagus, stomach, duodenum, small intestine, large intestine, rectum and anus. Its function is to absorb food, break it down into nutrients and remove waste.

7. The _____ consists of lymph nodes, lymph ducts and lymph vessels. Its function is to make and move lymph, which is important for our immunity.

8. The _____ consists of eight glands that produce hormones. These include: the pituitary gland, thyroid gland, parathyroid gland, adrenal glands, pancreas, ovaries (in females) and testicles (in males).

9. The _____ consists of bones which are connected by ligaments, tendons and cartilage. Bones support our body and bone marrow is also responsible for the production of red blood cells.

Health problems

Task 10. Choose the correct expression

1. My daughter is allergic to pollen; she has been all night _____ her nose.

breaking / shivering / sneezing / sweating

2. Bill has a fever. He keeps _____ in bed.

sweating / jumping / sneezing / snorkelling

3. Paddy has a sore throat. It hurts and he can't _____

sneeze / bleed / swallow / sweat

4. I have a bad cold. I have _____ and I can't breathe properly.

a broken toe / a fever / cramps / a runny nose

5. I have a _____ I can't lean forward and any kind of movement causes sharp pain.

backache / toothache / runny nose / pollinosis

I've cut my finger with a knife. I still keeps _____

running / bleeding / sneezing / coughing

6. I have a terrible _____ and I'm so scared to see the dentist!

headache / earache / stomach ache / toothache

7. Could you give me a _____? My nose is running.

medicine / pill / paper tissue / chewing gum

Task 11. Match the names of health problems with their explanations.

1. bleeding 2. diarrhoea 3. dizziness 4. runny nose 5. cough
6. itching 7. constipation 8. vomiting 9. congestion 10. fever

- a) throwing up, being sick
- b) a lot of watery stool
- c) hard stool and difficult defecation
- d) nose discharging mucus
- e) quick and repeated pushes of air from the mouth
- f) you can't breathe from your nose
- g) loss of blood
- h) a feeling that makes you scratch your skin
- i) very high body temperature
- j) feeling like fainting

Task 12. What should these people do? Give them some advice

- 1. feel dizzy. – *You should* _____
- 2. have a toothache. _____
- 3. have a runny nose. _____
- 4. have a fever _____

Before you watch

The video you are going to watch is about the healthy lifestyle recommendations based on the scientific studies. Before you start think about the answers to the next questions:

Why is it important to keep healthy lifestyle? How can it influence human's wellbeing? What are the reasons healthy lifestyle or lifestyle is in the focus of the scientific interest?

Task 1. Match the terms with the definitions

1	dehydration	A	relax after a period of work or tension
2	peer pressure	B	to accept or absorb an idea, opinion, belief, etc. so that it becomes part of your character
3	baseline	C	a confusing and difficult problem or question.

4	customized	D	extreme anxiety, sorrow, or pain
5	cognition	E	a view or opinion that is incorrect because based on faulty thinking or understanding
6	distress	F	<i>made or changed according to the one's needs</i>
7	conundrum	G	the use of conscious mental processes
8	unwind	H	a minimum level
9	misconception	J	<i>strong influence on a member of a group to behave in the same way as other members in the group</i>
10	internalize	K	a harmful reduction in the amount of water in the body

Watch!

Task 1. Watch the video '5 Tips for Living a Long and Healthy Life' (Facts, Oct. 2024) and complete the tasks below

Source: <https://www.youtube.com/watch?v=YNsuneGBsMY>



Task 2. Fill the table with the recommendations from the video

A

<i>hydration</i>	
<i>nutrition</i>	
<i>sleep</i>	
<i>activity</i>	
<i>socialisation</i>	

Task 3. Fill the table with the health benefits from the video

B

<i>hydration</i>	
<i>nutrition</i>	
<i>sleep (problems)</i>	
<i>activity</i>	
<i>socialisation</i>	

Task 4. Match the words to make phrases from the video

1	optimal	A	sclerosis
2	customized	B	lack
3	multiple	C	nutrition
4	drastic	D	death
5	consistent	E	training
6	sleep	F	changes
7	sleep	G	nutrition
8	trigger	H	approach
9	resistance	J	debt
10	optimal	K	one's body

Task 5. Think about 6 sentences with the phrases from the table

- 1) _____
- 2) _____
- 3) _____
- 4) _____
- 5) _____
- 6) _____



Task 6. Match the verbs from the video with their synonyms

1	make back	A	stimulate, raise
2	take up to	B	emerge, happen
3	work up	C	recover, regain
4	turn out	D	concern, love, have feelings
5	meet the eye	E	accept, take, adopt
6	shave (years) off	F	become, begin, develop
7	care about	G	<i>much more</i> , more than it seems
8	come into play	H	cut off, reduce

Task 7. Fill in the gaps with the verbs from the video

*take up to / work up / come into play / turns out / to make back /
meets the eye shave years off / care about*

1. The company hopes to _____ its initial investment within five years by increasing sales.
2. The new software _____ to 50 gigabytes of storage space, so make sure you have enough.
3. Athletes _____ a sweat during rigorous training sessions to improve their endurance.
4. It _____ that the rumors were false, and the project is still on schedule.
5. The initial appearance of the building _____, but the interior design is even more impressive.
6. A new diet plan claims to _____ your appearance by reducing the signs of aging.
7. Environmental scientists _____ protecting ecosystems and preserving biodiversity for future generations.
8. When evaluating a new project, several factors, such as market demand and resource availability, _____.

Task 8. Watch the video and match the sentences "heads" and "tails"

Heads

1. Enough water each day is vital for an abundance of reasons it helps keep your joints lubricate, delivers essential nutrients to cells all over your body, keeps organs operating efficiently prevents infections and helps regulate body temperature ...
2. The vast majority of us assume that the same healthy food choices are applicable for everybody and for the most part it is true ...
3. Vitamin D helps your body fight disease resulting in ...
4. The best way to prepare for a good night's sleep is to put away screens two hours before bed and develop a routine ...
5. When it comes to resistance training it turns out that there's more than meets the eye, ...
6. A study, done by W. Wescott, states that it may help ...

Tails

A ... a reduced risk of multiple sclerosis, heart disease and the likelihood of developing the flu it has also been found to have an impact on mood regulation and potentially improving the symptoms of depression.

B ... that's why a cold glass of water on a hot day feels like heaven.

C ... prevent and manage certain diseases such as type 2 diabetes by reducing visceral fat and improving insulin sensitivity.

D ... that helps you relax unwinding and disconnecting from your daily activities is important for getting high quality sleep.

E ... but everyone should take a customized approach.

F ... that is not just for building strength and looking fit or muscular.

Language practice

Task 1. Complete the sentences with the prepositions *of, from, for, in* or *"zero"*

1. He went through a lot _____ suffering.
2. She suffered _____ terrible pain.
3. Now you don't have to suffer _____ thirst anymore, even on the hottest days of the summer!
4. It's not necessary to suffer _____ silence – you can come and tell me everything.
5. He was suffering _____ measles.
6. She suffered _____ a nervous breakdown.
7. I am suffering _____ a terrible headache.
8. Do you suffer _____ seasonal allergies?
9. The lorry driver suffered _____ minor injuries.
10. You should have more understanding _____ the suffering other people.

Task 2. Match the idioms with the explanations

to be a pain

in the neck

to keep an eye

on somebody

to have your hands

full your face

to get a kick

in the teeth

to hold your tongue

to work your tail off

to pull someone's

to lend a hand

to have egg

on your face

1. _____ to be treated poorly or to have an unpleasant experience
2. _____ to help
3. _____ to be unpleasant, boring or annoying (a person or an activity).
4. _____ to feel ashamed and embarrassed because you have done something wrong
5. _____ to keep quiet when you feel like saying something
6. _____ to tell someone a thing which is not true, to play a joke on someone.
7. _____ to have too many things to do, to be very busy.
8. _____ to look after somebody and to be aware of what they are doing.
9. _____ to work very hard.

Task 3. Complete the sentences. Use the idioms mentioned above

1. Could you _____ with the dishes?
2. I need to see a doctor. Could you _____ on my baby?
3. Please, wait. I can't do everything at the same time. I have _____
4. I'm never going to rent my flat to anybody again. The last tenant gave me a _____
5. You can't say anything that comes to your mind. Sometimes it's necessary to _____
6. What? John is still at work on Sunday evening? He's going to _____

Task 4. Put these words in order to make proverbs. How do you say them in your language?

- 1) Apple / a / an / day / doctor / a / away / keeps.
- 2) Stitch / a / in / nine / saves / time.
- 3) The / honesty / policy / is / best.
- 4) Dinner / supper / walk / sit / a / a / mile / while / after / after.
- 5) Thicker / blood / water / than / is.

Task 5. Put the missing articles where it is necessary. How do you say these proverbs in your language?

- A** 1) ___ Christmas comes but once ___ year, but when ___ it comes it brings ___ good ___ cheer. 2) ___ curiosity kills ___ cat. 3) Early to ___ bed and early to ___ rise makes ___ man wealthy, healthy and wise. 4) ___ East or ___ West - ___ home is ___ best.

B

- 1) Find a proverb with 2 indefinite articles.
- 2) Find a proverb with the article AN.
- 3) Find proverbs with no articles at all.
- 4) Find proverbs with only 1 indefinite article.
- 5) Find a proverb with only 1 definite article.
- 6) Find proverbs where the indefinite article means "one".
- 7) Find proverbs where the indefinite article means "any".
- 8) Find a proverb where there are uncountable nouns.

Task 6. Finish the sentences. Where can you use these proverbs?

- A stitch _____
- Honesty _____
- East or _____
- An apple _____
- Early to bed _____
- Curiosity _____
- Christmas comes _____
- Blood is _____
- After dinner sit _____

Task 7. Read the text and fill in the gaps with the rejected statements

- A** A) they disagree with the way the animals are treated and then slaughtered
- B) Scientists have proven that quality sleep has a positive impact on your life in many aspects
- C) if the problems are more serious
- D) Besides that, it will improve your overall health condition
- E) For some people this may seem easy
- F) People who socialize are less likely to be sick or suffer from depression
- G) In our country, every citizen is obliged to have health insurance.

B Place the headings of the paragraphs appropriately

Medical care; Diet; Exercise; Socialization; Sleep

A HEALTHY LIFESTYLE

When it comes to health, people generally agree that it is one of the most precious things we have in life. However, as we get older, we have to care more about our health and keeping our mind and body fit. E) _____; for others, very difficult, depending on their lifestyle and habits. It is necessary to balance many key aspects of health, including diet, sleep, exercise and medical care. Even socialization counts for an important aspect of a healthy lifestyle. Let's have a look at them in detail.

1) _____

More and more people nowadays are becoming aware of what they eat; even mainstream consumers have become more health conscious. Some of them are vegetarians; some are even stricter, and avoid more than just meat. The main reason for most of them is that they have ethical problems with eating meat – A) _____. Health concerns are the second biggest reason – many people have high cholesterol and they do all they can to prevent themselves from having heart disease or a stroke. Most people simply try to avoid unhealthy food, such as burgers full of saturated fat, sweet cakes and pastries, fried foods, and sweet drinks full of sugar or artificial sweeteners. These can be generally described as "junk food". Junk food is food high in salt, saturated fats and empty calories, it often contains genetically modified ingredients and refined white sugar and wheat flour.

2) _____

Sleep plays a very important role in a healthy lifestyle. Getting enough quality sleep can help protect your mental and physical health and the quality of life in general. Sleep makes you feel better and is important for the good function of your heart and mind, and supports you in reaching and maintaining your ideal weight. B) _____ – they give the following examples: a good night's sleep improves your memory; it increases your concentration and creativity, it helps you avoid accidents, depression and obesity, it lowers stress and sharpens your attention and it leads to living a longer life. So have a good night's sleep!

3) _____

Everybody knows that regular exercise is good for them. But are we really aware of all of the benefits it provides? Regular physical activity can improve your life in many ways. You will feel

better, have more energy and get your weight under control. **D)** _____, including prevention of cardiovascular diseases, high blood pressure, high cholesterol or obesity. It also improves your mood, helps you fight depression, boosts energy and promotes better sleep. Physical activity is beneficial to anyone, regardless of sex, age, ethnicity, size or physical condition. Experts recommend swimming, relaxing martial arts such as tai chi or aikido, and walking as the most convenient types of regular physical activity for everyone. And last but not least, regular exercise increases your chances of living longer!

4) _____

No matter whether you are young or old, prevention plays the key role in healthcare. It is recommended to see your GP (general practitioner) at least once a year and undergo a regular check-up. You should also see your dentist at least twice a year for preventive measures to reduce the risk of tooth decay. If you see any specialist regularly (e.g. if you wear glasses or contact lenses or if you wear braces) you should follow their scheme of regular visits as well.

G) _____. Thus, most procedures are covered by the healthcare system and are almost free of charge, which means the services are covered by the insurance company. The first thing to do in a case where you do not feel well is to see your GP and have yourself examined. After the general examination your doctor will probably give you either a prescription for a medicine or will send you to a specialist for further examination. The most common problems that make people see their GP are colds, hay fever (often mistaken for a cold), flu (influenza), tonsillitis and various kinds of seasonal viral infections. Children who attend kindergarten are at risk due to exposure to children's diseases such as chickenpox, measles, mumps, scarlet fever or pertussis.

Sometimes, **C)** _____, the patient may be sent to the hospital to get a special treatment, or sometimes surgery. Examples of serious conditions include cardiovascular diseases (heart attack, stroke), various kinds of inflammations (hepatitis, meningitis, appendicitis, kidney inflammation or encephalitis, cholecystitis), serious injuries (e.g. broken arm or leg, head or spine injuries, injuries of the knee ligaments). Nevertheless, prevention is better than getting a cure, and

therefore it is recommended to stick to a healthy lifestyle. Keys to a healthy lifestyle include undergoing routine physical exams, avoiding stress, sleeping enough and participating in sports. Last but not least, eating healthy food, not to drink too much alcohol or coffee, and to avoid smoking.

5) _____

Being a part of a social network including family, friends, work colleagues and other relationships is certainly one of the best ways to keep good mental health and have a long life. **F)** _____ and they are less exposed to stress than those who live in social isolation. Having a network of friends also contributes to a good night's sleep and experts claim that being lonely leads to restless sleep. One word of caution: if you want to be healthier, you should socialize face-to-face: online interactions do not count since they make you become even lonelier in the end.

By H. Flamová (Source: Cvicebnice Anglickiny)

Speaking

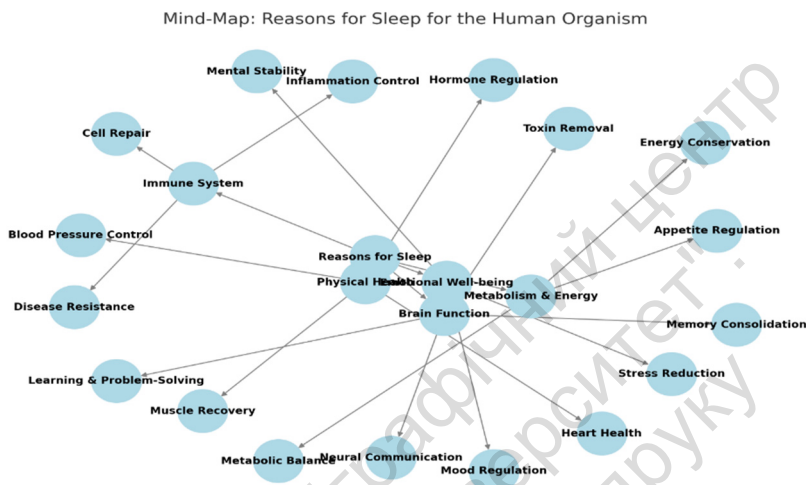
Describe the situation/scene. Compare the pictures with your partner.



Create a dialogue. *Use the questions to help you*

1. How often are you ill?
2. What do you do to stay healthy?
3. Do you have any allergies?
4. How often do you see your GP?
5. Do you see your dentist twice a year?
6. Do you clean your teeth after every meal?
6. What was your most recent health problem? How did you solve it?
7. Did you have to stay at home for some time?
8. Are you a member of a fitness club or a gym? How often do you go there?
9. Do you do any sport or exercise? (What kind of sport? How often? With whom?)
10. Do you think you need to lose weight? If yes, what do you do to lose weight?

Task 2. Look at the mind map of reasons for sleep for human organism. Discuss them in pairs. Which ones are the most relevant for you?



Reading

Task 1. Read the text and give a short summary of it to your partner

Brain Basics: Understanding Sleep

Sleep is an important part of your daily routine – you spend about one-third of your time doing it. Quality sleep – and getting enough of it at the right times – is as essential to survival as food and water. Without sleep, you can't form or maintain the pathways in your brain that let you learn and create new memories. Lack of sleep makes it harder to concentrate and respond quickly. Sleep is important to a number of brain functions, including how nerve cells (neurons) communicate with each other. In fact, your brain and body stay remarkably active while you sleep. Recent findings suggest that sleep plays a housekeeping role that removes toxins in your brain that build up while you are awake. Sleep is a complex and dynamic process that affects how you function in ways scientists are now beginning to understand. This webpage describes how your need for sleep is regulated and what happens in the brain during sleep.

There are two basic types of sleep: rapid eye movement (REM) sleep and non-REM sleep. Within non-REM sleep, scientists have identified three different stages. Each is linked to specific brain waves and neuronal activity. You cycle through non-REM and REM sleep several times during a typical night, with increasingly longer, deeper REM periods occurring later in the sleep session.

Stage 1 non-REM sleep is the changeover from wakefulness to sleep. During this short period of relatively light sleep, your heartbeat, breathing, and eye movements slow, and your muscles relax with occasional twitches. Your brain waves begin to slow from their daytime wakefulness patterns. This stage usually lasts several minutes.

Stage 2 non-REM sleep is a period of light sleep before you enter deeper sleep. Your heartbeat and breathing slow, and muscles relax even further. Your body temperature drops and eye movements stop. Brain wave activity slows but is marked by brief bursts of electrical activity. You spend more of your repeated sleep cycles in stage 2 sleep than in other sleep stages.

Stage 3 non-REM sleep is the period of deep sleep that you need to feel refreshed in the morning. It occurs in longer periods during the first half of the night. Your heartbeat and breathing slow to their lowest levels during sleep. Your muscles are relaxed and it may be difficult to awaken you. Brain waves become even slower.

REM sleep first occurs about 90 minutes after falling asleep. Your eyes move rapidly from side to side behind closed eyelids. Mixed frequency brain wave activity becomes closer to that seen in wakefulness. Your breathing becomes faster and irregular, and your heart rate and blood pressure increase to near waking levels. Most of your dreaming occurs during REM sleep, although some can also occur in non-REM sleep. Your arm and leg muscles become temporarily paralyzed, which prevents you from acting out your dreams. As you age, you spend less of your time in REM sleep. Memory consolidation most likely requires both non-REM and REM sleep.

Two internal biological mechanisms – circadian rhythm and homeostasis – work together to regulate when you are awake and when you are asleep. Circadian rhythms direct a wide variety of functions from daily changes in wakefulness to body temperature, metabolism, and the release of hormones. They cause you to be sleepy at night and

can help you wake up in the morning without an alarm. Your body's biological clock, which is based on a 24-hour day, controls most circadian rhythms.

Your body's biological clock is based on a 24-hour day and controls most circadian rhythms. These rhythms affect a variety of functions including body temperature (represented as the white line on the chart above). Melatonin – a hormone released by the pineal gland – helps you feel sleepy when it gets dark. The peaks and valleys of melatonin (shown in the gold line above) are important for matching the body's circadian rhythm to the external cycle of light and darkness.

Sleep-wake homeostasis keeps track of your need for sleep. Homeostasis refers to a balance between systems in the body. The homeostatic sleep drive reminds the body to sleep after a certain time and regulates sleep intensity. This sleep drive gets stronger every hour you are awake and causes you to sleep longer and more deeply after a period without sleep. Factors that influence your sleep-wake needs include medical conditions, medications, stress, sleep environment, age, and what you eat and drink. Perhaps the greatest influence is the exposure to light. Specialized cells in the retinas of your eyes process light and tell the brain whether it is day or night and can advance or delay our sleep-wake cycle. Exposure to light can make it difficult to fall asleep and get back to sleep if you wake up during the night. *See more p.*

(Source: National institute of neurological disorders and stroke)

Task 2. Answer the following questions

1. Why is sleep as essential to survival as food and water?
2. How does lack of sleep affect learning and memory?
3. Which brain structures are involved in regulating sleep and wakefulness?
4. How does the suprachiasmatic nucleus (SCN) influence circadian rhythms?
5. What is the function of the thalamus during sleep?
6. How does melatonin production change in response to light?
7. What are the main differences between REM and non-REM sleep?
8. What happens to heart rate, breathing, and muscle activity in different sleep stages?

Task 5. Read the statements and identify whether they are **TRUE** or **FALSE**

1. Sleep is not essential for survival, but it helps improve memory. T/F
2. The brain remains active during sleep and helps remove toxins accumulated during wakefulness. T/F
3. The hypothalamus and brainstem play a role in regulating sleep and wakefulness. T/F
4. People with damage to the suprachiasmatic nucleus (SCN) may experience irregular sleep patterns. T/F
5. The thalamus remains active throughout all stages of sleep, continuously processing sensory information. T/F
6. Melatonin production increases in response to bright light exposure. T/F
7. Stage 3 non-REM sleep is the lightest stage of sleep. T/F
8. Most dreaming occurs during REM sleep. T/F

Task 6. Match the words of sleep and brain structure with the definitions

A

1. circadian rhythms

2. rem sleep

3. non-rem sleep

4. melatonin

5. adenosine

6. suprachiasmatic nucleus (scn)

A. A sleep study that records breathing, oxygen levels, movement, and brain activity.

B. The part of the brain that controls emotions and becomes more active during REM sleep.

C. A chemical that makes you feel sleepy; its effects are blocked by caffeine.

D. A small structure in the brain that regulates sleep-wake cycles based on light exposure.

E. The natural cycle that regulates sleep, wakefulness, and body processes in a 24-hour period.

F. A sleep phase characterized by rapid eye movement, dreaming, and temporary muscle paralysis.

7. brainstem	G. A hormone produced by the pineal gland that helps regulate sleep in response to darkness.
8. thalamus	H. The deep stages of sleep when the body repairs itself and strengthens memory.
9. amygdala	I. A group of structures in the brain that control the transition between wakefulness and sleep.
10. polysomnogram	J. The brain structure that relays sensory information and is mostly inactive during sleep.

B

1. homeostasis	a. the neurotransmitter that helps calm brain activity and promotes sleep.
2. basal forebrain	b. a small gland in the brain responsible for producing melatonin.
3. neurotransmitters	c. the state of not getting enough sleep, leading to poor concentration and health risks
4. sleep deprivation	d. a neurotransmitter that keeps parts of the brain alert and is linked to the fight-or-flight response.
5. hypothalamus	e. a condition that occurs when traveling across multiple time zones, disrupting the sleep cycle., hunger, and sleep.
6. pineal gland	f. chemicals in the brain that transmit signals between nerve cells, influencing sleep and wakefulness.
7. gaba	g. the part of the brain that helps regulate body temperature
8. jet lag	h. the part of the brain that promotes sleep and wakefulness and releases adenosine.

9. sleep homeostasis

i. a system that keeps track of how much sleep is needed based on wakefulness.

10. norepinephrine

j. the balance of biological systems that maintains stability in the body.

Task 7. Complete the sentences with the words from the previous task.

1. _____ are the natural 24-hour cycles that regulate sleep, wakefulness, and other bodily functions.

2. During _____, brain activity increases, and vivid dreams usually occur.

3. The deepest stage of sleep, _____, is essential for physical recovery and memory consolidation.

4. The hormone _____ is released in darkness and helps regulate sleep-wake cycles.

5. _____ is a chemical that makes you feel sleepy, but caffeine blocks its effects.

6. The _____ in the brain receives light signals and helps regulate circadian rhythms.

7. The _____ controls the transition between sleep and wakefulness and contains important sleep-regulating structures.

8. The _____ is mostly inactive during sleep but plays a role in processing sensory information.

9. The _____ becomes highly active during REM sleep and is involved in processing emotions.

10. A _____ is a test that records brain waves, breathing, and movement during sleep.

11. _____ refers to the body's ability to maintain internal balance, including sleep regulation.

12. The _____ helps regulate sleep and wakefulness and is responsible for releasing adenosine.

13. _____ are chemical messengers in the brain that influence sleep, mood, and alertness.

14. _____ occurs when a person does not get enough sleep, leading to health issues and cognitive impairment.

15. The _____ helps regulate hunger, body temperature, and sleep-wake cycles.

Before you watch

sleep? What can be done to fix this ubiquitous problem? What do you think?

Task 1. Create a list of sleep problems and possible consequences. Check your ideas with the chart below (4-5 reasons and consequences)

- 1) _____ 2) _____
3) _____ 4) _____

Watch!

Task 1. Watch the video 'What Happens To Your Body And Brain If You Don't Get Sleep / The Human Body' (Insider Tech, 2017) and complete the tasks below



Source: <https://www.youtube.com/watch?v=Y-8b99rGpkM>

(What Happens To Your Body And Brain If You Don't Get Sleep)

Task 2. Watch the video and match the sentences "heads" and "tails".

Heads

1. A lack of sleep prevents the brain from...
2. Sleep helps clear toxic proteins from the brain...
3. Men who sleep only 5-6 hours a night...
4. After just one night of 4-5 hours of sleep, there is...
5. Lack of sleep raises the risk of cancer...
6. Daylight saving time in spring leads to...
7. Sleeping less than six hours per night...
8. Staying awake for 19–20 hours ...

Tails

- A. ...a 70 % reduction in natural killer cells, weakening the immune system.
- B. ...being able to form and store new memories properly.
- C. ...a 24 % increase in heart attacks the next day.
- D. ...which increases the risk of Alzheimer's disease.
- E. ...which is why shift work is now classified as a probable carcinogen.
- F. ...have testosterone levels of someone 10 years older.
- G. ...increases the risk of a fatal heart attack or stroke by 200 %.
- H. ...affects mental function as much as being legally drunk.

Task 3. Read the sentences and find out what is wrong with the information given.

1. Lack of sleep improves memory and learning abilities.
2. The brain remains inactive during sleep, leading to complete rest.
3. Sleeping less than five hours per night has no impact on heart health.
4. A person can stay awake for 48 hours without any cognitive decline.
5. More sleep increases the risk of Alzheimer's disease due to toxin buildup.
6. Daylight saving time reduces the number of heart attacks after the time change.
7. The immune system strengthens after just one night of sleep deprivation.
8. Shift work has no connection to an increased risk of cancer.
9. After being awake for 20 hours, cognitive abilities remain unaffected.
10. A lack of sleep has no effect on testosterone levels in men.

Task 4. Match the words to make phrases from the video

1. lack of	A. new memories
2. sleep deprivation	B. immune system
3. beta amyloid	C. deep sleep at night
4. alzheimer's-related	D. sleep

5. critical anticancer-fighting	E. immune cells
6. short sleep	F. risk of cancer
7. probable	G. cardiovascular system
8. blood pressure	H. deterioration in the body
9. memory	I. inbox of the brain
10. informational	J. new experiences
11. increased	K. duration
12. impacts your	L. protein
13. physiological	M. carcinogen
14. develop	N. heart attack or stroke
15. fatal	O. new dementia

Task 5. Fill in the gaps with the phrases from **Task 4**.

1. _____ will actually prevent your brain from forming and storing new memories.

2. People who experience _____ are at a higher risk of cognitive decline and health problems.

3. _____ accumulates in the brain and is linked to Alzheimer's disease.

4. During deep sleep, the brain clears _____, reducing the risk of dementia.

5. A _____ reduction in _____ weakens the body's ability to fight cancer.

6. Studies show that _____ increases the _____, including breast, prostate, and bowel cancers.

7. The _____ of the World Health Organization classifies shift work as increasing cancer risk.

8. One of the major effects of sleep deprivation is increased _____, leading to higher chances of heart disease.

9. When sleep-deprived, the _____ can no longer process and store information efficiently.

10. Lack of sleep disrupts _____, making it harder to process emotions and memories.

11. Research indicates that _____ activity increases in those who do not get enough sleep.

12. Insufficient sleep _____, leading to higher risks of cardiovascular disease.

13. The _____ is essential for clearing toxins and maintaining healthy brain function.

14. Individuals with chronic sleep deprivation may _____, affecting long-term cognitive health.

15. A _____ can result from years of poor sleep and high blood pressure.

Language practice

Task 1. Choose the correct option (A or B)

1. Many people have trouble sleeping due to disruptions in their (A) *circadian rhythm* / (B) *cardiovascular system*, which regulates wakefulness and sleep.

2. The condition known as (A) *encephalitis lethargica* / (B) *narcolepsy* appeared in Vienna in 1916, causing extreme drowsiness and even comas.

3. Constantin Von Economo studied the (A) *hypothalamus* / (B) *thalamus*, an area of the brain responsible for transitioning between wakefulness and sleep.

4. The (A) *suprachiasmatic nucleus* / (B) *basal forebrain* is responsible for detecting light and regulating the sleep-wake cycle.

5. People who have insomnia often have disruptions in the (A) *wake center* / (B) *sleep center*, which normally promotes wakefulness.

6. The (A) *basal forebrain* / (B) *pineal gland* releases GABA, a neurotransmitter that helps inhibit neural activity and prepare the brain for sleep.

7. Chemicals such as (A) *histamine* / (B) *melatonin* and dopamine are involved in keeping us awake and alert.

8. The (A) *serotonin* / (B) *adenosine* builds up in the basal forebrain throughout the day, increasing sleep pressure.

9. (A) *Caffeine* / (B) *Alcohol* blocks the receptors that detect adenosine, making us feel more awake.

10. People with disrupted (A) *circadian rhythms* / (B) *REM cycles* may benefit from melatonin supplements to help regulate their sleep.

11. Sleeping pills are often used as a (A) *long-term* / (B) *short-term* solution for people with insomnia, but they are not recommended for daily use.

12. The (A) *sleep network* / (B) *immune system*, when activated, inhibits neural activity in the cortex, promoting sleep.

13. Bright light exposure in the morning helps regulate the (A) *circadian rhythm* / (B) *adrenaline levels*, setting the body's sleep rhythm for the day.

14. (A) *Behavioral techniques* / (B) *Genetic modification* is a strategy that can help with sleep, including relaxation techniques and maintaining a consistent bedtime.

15. A key recommendation for better sleep is to keep your bedroom (A) *dark, cool, and quiet* / (B) *bright, warm, and noisy* to create the best environment for rest.

Task 2. Choose the correct verb form for each gap

1. Many people (*struggle* / *struggles*) to get enough sleep due to busy lifestyles.

2. Sleep deprivation (*affect* / *affects*) both the brain and the body.

3. The brain (*use* / *uses*) the sleep period to clear out toxins.

4. If a person (*do* / *does*) not get enough sleep, their risk of developing diseases increases.

5. Constantin Von Economo (*discover* / *discovered*) the connection between sleep and the hypothalamus.

6. Melatonin (*help* / *helps*) regulate the sleep-wake cycle.

7. The suprachiasmatic nucleus (*control* / *controls*) circadian rhythms in response to light.

8. The basal forebrain (*release* / *releases*) GABA to promote sleep.

9. If sleep pressure (*builds up / build up*) throughout the day, we feel increasingly tired.

10. Caffeine (*block / blocks*) the effects of adenosine, making us feel more awake.

11. Scientists (*study / studies*) how neurotransmitters influence sleep and wakefulness.

12. When a person (*stay / stays*) awake for too long, cognitive decline begins.

14. The immune system (*suffer / suffers*) when people consistently sleep less than six hours per night.

15. If we (*avoid / avoids*) screens before bed, we may improve our sleep quality.

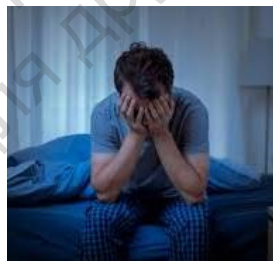
16. Researchers (*continue / continues*) to explore the mysteries of sleep disorders.

Speaking

Discussion Questions (Pair or Group Activity)

Instructions: Discuss the following questions with a partner or in a small group. Give reasons and examples to support your answers.

- How many hours of sleep do you usually get? Do you think it's enough?
- Why do you think sleep is important for our health?
- What happens to your mood and energy levels when you don't get enough sleep?
- Have you ever had trouble falling asleep? What did you do to solve the problem?
- What are some common sleep disorders, and how do they affect people's daily lives?
- What tips can you give someone who wants to improve their sleep quality?
- How does technology (phones, TVs, social media) affect sleep?



Role-Play: Sleep Consultant

Instructions: One person plays the role of a sleep consultant, and the other plays a client with sleep issues. The consultant should ask questions and give advice on how to improve sleep. *Roles:*



Client: Describe your sleep problem (e.g., trouble falling asleep, waking up frequently, feeling tired during the day).

Consultant: Ask about the client's habits (bedtime routine, screen time, caffeine intake, stress levels) and suggest practical solutions.

Example: Client: "I have trouble falling asleep at night. No matter how tired I am, I just can't sleep". *Consultant:* "I see. How long before bed do you stop using your phone or computer?"

Writing

Creating a Flyer on Healthy Sleep

Imagine you work for a health organization, and your task is to design a flyer that educates people on healthy sleep habits. Your flyer should be informative, visually appealing, and easy to read.

Instructions:

Title & Introduction: Write a short, catchy title and an engaging introduction explaining why sleep is essential.

Key Sleep Tips: Use bullet points or a numbered list to present the most important recommendations for healthy sleep.

Facts & Statistics: Include at least one fact or statistic to support your advice.

Format & Clarity: Use headings, short sentences, and visual elements (such as bold text or icons).

Example: Sleep well, live well: simple tips for healthy sleep

Why is Sleep Important?



Getting enough sleep is essential for brain function, memory, mood, and overall health. Poor sleep can lead to stress, fatigue, and even long-term health problems like heart disease and weakened immunity.

5 simple tips for better sleep

Stick to a schedule: go to bed and wake up at the same time every day, even on weekends.

Avoid screens before bedtime: blue light from phones and laptops disrupts melatonin production.

Create a relaxing bedtime routine: read a book, take a warm bath, or practice meditation.

Keep your room dark and quiet: use blackout curtains and avoid noisy distractions.

Limit caffeine and heavy meals before bed: avoid coffee, tea, and sugary snacks at night.

UNIT 9

FOOD AND HEALTHY EATING



Before you read

Task 1. Before reading answer the following questions:

How can you define healthy and unhealthy eating? What do you know about eating habits? What eating habits do you have? Why healthy eating is in the focus of modern science?

Task 2. Look at the useful vocabulary. Study the list of the words and their definitions

conviction, n. – strong persuasion or belief; the state of being convinced

mingle, v. – mix or cause to mix together

unpalatable, adj. – not pleasant to taste

deliberation, n. – long and careful consideration or discussion

speciesism, n. – prejudice or discrimination based on species; especially, discrimination against animals

arguably, adv. – used when stating an opinion or belief that you think can be shown to be true

nutritionism, n. – an ideology that began in the 1980s when the focus of food shifted from the item to the individual nutrients within the food

metabolism, n. – the chemical processes in your body, especially those that cause food to be used for energy and growth

Reading

Task 1. Read the text and complete the tasks below

Philosophy of food

Philosophy of food finds its basis on the idea that food is a mirror. You may have heard the saying 'we are what we eat.' Well, there is more to say regarding this relation. Eating mirrors the making of a self, that is, the array of decisions and circumstances that bring us to eat the way we do. In them, we can see reflected a detailed and comprehensive image of ourselves. Philosophy of food reflects on the ethical, political, social, artistic, identity-defining aspects of food. It spurs from the challenge to more actively pondering our diets and eating habits so as to understand who we are in a deeper, more authentic way.

Food is a relation. Something is food only with respect to some organism, in a set of circumstances. These, first of all, are bound to vary from moment to moment. For instance, coffee and pastry are a fine breakfast or afternoon snack; yet, to most of us they are unpalatable for dinner. Secondly, circumstances are bound to involve principles that are, at least in appearance, contradictory. Say, you refrain from eating soda at home, but at the bowling alley, you enjoy one. At the supermarket, you buy only non-organic meat, but on vacation, you crave for a McBurger with fries. As such, any given 'food relation' is first and foremost the mirror of an eater: depending on the circumstances, it represents the eater's needs, habits, convictions, deliberations, and compromises.

Probably the most obvious philosophical aspects of our diet are the ethical convictions that shape it. Would you eat a cat? A rabbit? Why or why not? It's likely that the reasons you give for your stance are rooted in ethical principles, such as: "I love too much cats to eat them!" or even "How could you do such a thing!" Or, consider vegetarianism: a large number of those who conform to this diet do so to prevent unjustified violence being done to animals other than human. In *Animal Liberation*, Peter Singer labeled "speciesism" the attitude of those who draw unjustified distinctions between *Homo sapiens* and other animal species (like racism sets an unjustified distinction

between one race and all others). Clearly, some of those rules are mingled with religious principles: justice and heaven can come together on the table at, as they do on other occasions.

Americans keep in high esteem the role of food experts; French and Italians notoriously do not. Probably, it's because of different ways to regard the practice of evaluation of a food. Is that French onion soup authentic? The review says the wine is elegant: is that the case? Food or wine tasting is arguably an entertaining activity, and it's a conversation starter. Yet, is there a truth when it comes to judgments about food? This is one of the hardest philosophical questions. In his famous essay "Of the Standard of Taste", David Hume shows how one can be inclined to answer both "Yes" and "No" to that question. On the one hand, my tasting experience is not yours, so it is totally subjective; on the other, provided an adequate level of expertise, there is nothing odd with imagining to challenge a reviewer's opinion about a wine or a restaurant.

Most foods we buy at the supermarket carry on their labels "nutritional facts". We use them in order to guide ourselves in our diet, to stay healthy. But, what do those numbers have to do really with the stuff we have in front of us and with our stomachs? What "facts" do they help us establishing really? Can nutritionism be regarded as a natural science on a par with – say – cell biology? For historians and philosophers of science, food is a fertile terrain of research because it raises basic questions regarding the validity of laws of nature (do we really know any law regarding metabolism?) and the structure of scientific research (who finances the studies on the nutritional facts you find on the labels?)

By Andrea Borghini (Source: ThoughtCo)

Task 2. Answer the following questions

1. What does the philosophy of food suggest about the relationship between food and self-identity?
2. How does the context influence our perception of what constitutes food?
3. What ethical considerations might affect a person's dietary choices according to the text?

4. How do different cultures, like Americans and French/Italians, view food expertise differently?
5. What is "speciesism", and how does it relate to dietary choices?
6. What philosophical question does David Hume raise regarding judgments about food?
7. How do nutritional labels influence our dietary decisions, according to the text?
8. What are some of the basic questions about food that historians and philosophers raise regarding science?

Task 3. Read the statements and decide whether they are **TRUE** or **FALSE**

1. The philosophy of food posits that food reflects our decisions and circumstances related to our identity. T/F
2. The text argues that food is only meaningful in isolation, without any context. T/F
3. Ethical convictions are not considered when making dietary choices according to the text. T/F
4. The French and Italians typically hold food experts in high regard compared to Americans. T/F
5. The concept of "speciesism" involves unjustified distinctions between humans and other animal species. T/F
6. David Hume suggests there is a singular truth regarding food judgments, applicable to all individuals. T/F
7. Nutritional facts on food labels are regarded as completely reliable indicators of how food affects our health. T/F
8. Historians and philosophers believe that the study of food raises important questions about scientific validity and research structure. T/F

Task 1. Fill in the gaps with the words from the list(s) below. The first letter of each word has been left in the text

Guidelines for an Authentic Approach to Eating

aspire / spurred / minor / chunks / constitution / transferred / arguably / artisans / featuring

Food as Art?

Can food be art? Can a cook ever a _____ to be an artist on a par with Michelangelo, Leonardo, and Van Gogh? This question has s _____ heated debates over the past years. Some argued that food is (at best) a m _____ art. For three main reasons. First, because foods are short-lived in comparison to, e.g., c _____ of marble. Second, food is intrinsically linked to a practical purpose – nourishment. Third, food depends on its material c _____ in a way in which music, painting, or even sculpture are not. A song such as "Yesterday" has been released on vinyl, cassette, CD, and as a mp3; food cannot be a _____ t _____. The best cooks would h _____ be very good a _____; they can be paired with fancy hairdressers or skilled gardeners. On the other hand, some think that this perspective is unfair. Cooks have recently started f _____ in art shows and this seems to concretely disprove the previous remarks. Probably the most famous case in point is Ferran Adrià, the Catalan chef who revolutionized the world of cooking over the past three decades.

*notoriously / fairness / retail / commerce / poses funding
philosophical / species*

Food as Politics

Food is also at the center of a number of p _____ questions for political philosophy. Here are some. One. The challenges that food consumption p _____ to the environment. For example, did you know that factory farming is responsible for a higher rate of pollution than airfare travel? Two. Food trades raise issues of f _____ and equity in the global market. Exotic goods such as coffee, tea, and c _____ are c _____ examples: through the history of their c _____, we can reconstruct the complex relationships between continents, States, and people over the past three-four centuries. Three. Food production, distribution, and r _____ is an opportunity to talk about the condition of workers across the earth.

Food and Self-Understanding

*refusal / meaningful /
inquiry / insight / quest*

In the end, as the average person enters at least a few 'food relations' per day, a r_____ to ponder eating habits in a m_____ manner can be likened to a lack of self-understanding or lack authenticity. Since self-understanding and authenticity are among the chief aims of philosophical i_____, then food becomes a true key to philosophical i_____. The gist of the philosophy of food is hence the q_____ for an authentic diet, a quest that can be readily furthered by analyzing other aspects of 'food relations'.

Task 3. Write the words/phrases from the text above which correspond to the following definitions.

1. _____ – sufficient, enough
2. _____ – the act of searching for something
3. _____ – similarly, equally, in the same manner, likewise
4. _____ – an orderly arrangement
5. _____ – relating or devoted to the study of the fundamental nature of knowledge, reality, and existence

Task 4. Choose the correct answer

1. to make something happen faster or sooner
 - a) deliberations
 - b) validity of laws of nature
 - c) spur heated debates
 - d) refrain from eating soda
2. used when giving your opinion to say that there are good reasons why something might be true
 - a) be inclined to answer both "Yes" and "No"
 - b) wine tasting is arguably an entertaining activity
 - c) circumstances that bring us to eat the way we do
 - d) unjustified distinctions between A & B
3. that is the reason or explanation for; therefore; His mother was Italian, ~ his name – Luca.
 - a) commerce
 - b) philosophical
 - c) credo
 - d) hence

4. large part of a type of very hard rock which has a pattern of lines going through it
 - a) a chunk of marble
 - b) meaningful manner
 - c) philosophical insight
 - d) level of expertise
5. a difference or contrast between similar things or people
 - a) question can arise from anywhere
 - b) to pose a challenge/danger/risk for
 - c) food cannot be alike transferred
 - d) unjustified distinctions between

Task 5. Circle the correct answer. Explain false statements

1. to have ambitious hopes or plans, strive toward a higher goal, desire earnestly; to ascend → to pose a challenge/danger/risk for T/F
2. saying no to thinking over unhealthy behaviors → detailed and comprehensive image T/F
3. long and careful consideration or discussion → deliberations T/F
4. a person who searches for wisdom or enlightenment → philosopher T/F
5. change → refrain from eating soda T/F

Before you watch

Task 1. Look at the strawberries in the photo. Do they look like the strawberries you usually eat? If not, what's different about them? What makes food unappealing to you? Is it the way it looks? Is it the way it tastes? Is it the way your food choices make you feel?



Task 2. Think about adjectives describing food looks and tastes

_____, _____, _____, _____, _____, _____, _____

Watch

Task 1. Watch the video *'What Makes Food Appealing?'* (Source: Muataz Azar, Jul., 2022) and complete the tasks below



Source: <https://www.youtube.com/watch?v=5TyjnQ3tFzU>

Task 2. Fill the table with the words from the video describing food

	LOOK	TASTE	MAKE YOU FEEL

Task 3. Match the words from the video to make phrases
food (3) / sliced / ugly / better / donate / taste

a) choices b) banks c) stylists d) strawberries e) food (3)

Task 4. Fill in the gaps using the words collocations from **Task 3**

1) This new ground-breaking documentary explores the impact that _____ have on people's health, the health of our planet and on the lives

2) A _____'s job is to help create the kind of irresistible images that make you want to lick the page they're printed on

3) My _____ take 5 minutes to prep with only 2 ingredients!

4) An Ohio State University researcher looked to see if explaining the value of these misshapen vegetables could improve sales of _____.

5) Most often we think of using salt to make food _____.

6) Many non-perishable and unspoiled perishable _____ can be _____ to local _____, soup kitchens, pantries, and shelters

Task 5. Find the information in the video. Let questions help you

1. What are two examples of how food stylists make food look good?

2. What happens to produce if it isn't the right size, colour or shape for some supermarkets?

3. Why do people feel better about buying food directly from the farmers?

4. What's the difference between how supermarket and farmers sell their produce?

5. What do farmers often do with the food that they can't sell?

Language practice

Task 1. Read the text and change the verbs to make them grammatically appropriate

By the time I 1) (*be*) in college, healthy eating was about following nutritional guidelines and doing everything by the book. However, it 2) (*mean*) that my view of the food on my plate 3) (*change*). I went from seeing meals I enjoyed to only seeing nutrients. Suddenly, I went from seeing traditional Costa Rican gallo pinto – or rice and beans – to 4) (*see*) complex carbs and plant-based proteins.

Then, when I 5) (*start*) practicing as a nutritionist, the notion that a dietitian 6) (*look*) a certain way or fit into a specific body type 7) (*lead*) me to believe that healthy eating meant measuring my food to know exactly what I 8) (*consume*). I 9) (*eat*) whatever I 10) (*want*), as long as the nutrients I needed were accounted for.

Task 2. Choose the correct alternative

I gave my body 1) *everything* / *nothing* it needed to be healthy, but healthy eating goes 2) *beyond* / *between* the nutrients. It's also about 3) *like* / *how* it makes you feel, and with food being an essential

4) *piece / part* of culture and social events, eating should be something we enjoy. Today I have a different approach 5) *to / for* healthy eating. I'm far 6) *more / most* flexible with my meals, and I understand 6) *that / which* balance is key to being nourished and happy 7) *with / for* food. Healthy eating 8) *now / ago* means that, most of the time, I make sure to have food 9) *in / from* all food groups on my plate 10) *without / apart* measuring anything or thinking about plant-based vs. animal-based protein or simple vs. complex carbs.

Task 3. Change the word in brackets to make it form suitable

It also means that I get to enjoy a bit of everything – 1) (*include*) sweets, fast food, and desserts – with 2) (*moderate*) and without the need to measure or account for it. As you can see, 3) (*find*) the balance that worked for me didn't happen 4) (*night*). On the contrary, my 5) (*define*) of 6) (*health*) eating has been changing as I've gone through the different 7) (*stage*) of my life. As long as you aim to nourish your body and listen to what it needs, you can also give healthy 8) (*eat*) your own 9) (*mean*), because healthy eating is for 10) (*one*).

Task 4. For questions 1 – 16, read the text below and think of the word, which best fits each gap. Use only one word in each gap

When we consider a subject as sweeping as the environment, we often focus on 1) ___ most tangible aspects – the air we breathe, the water we drink, the food we put on the table. Those things are critically important. But to me the environment is also 2) ___ something less tangible, though no less important. It is about sense 3) ___ community – the obligation we have to each 4) ___ and to future generations, to safeguard God's earth. It is about our sense of responsibility, and the realization 5) ___ natural beauty and resources that took millions of years to develop, could be damaged and depleted within a matter of decades. Today the threats 6) ___ our environment are even clearer to 7) ___ – and much greater in scope and number. We live in a world where climate change, deforestation, holes in the ozone 8) ___ and air pollution are growing sources of concern.

Task 5. Here are some common English grammar issues that may arise in the context of science. Look at the examples and correct the sentences:

1. Subject-Verb Agreement: Incorrect: "Each of the samples require careful analysis".

Correct: _____

2. Pluralization of Latin terms is: Incorrect: "The phenomena observed in the experiment are..."

Correct: _____

3. Use of Articles (a, an, the): Incorrect: "An scientific experiment was conducted".

Correct: _____

4. Verb Tense: Incorrect: "The researcher is testing the samples, and then he will submit the report".

Correct: _____

5. Prepositions: Incorrect: "The scientist is good in math".

Correct: _____

6. Pronoun Usage: Incorrect: "Every scientist should present his findings".

Correct: _____

7. Adjectives vs. Adverbs: Incorrect: "The experiment went good".

Correct: _____

8. Comma Usage in Lists: Incorrect: "The experiment included mice, rats and, rabbits".

Correct: _____

Task 6. Read the text carefully. Five sentences or phrases have been removed from the text. Choose from A-G the one that fits each gap in 1-5.

A) and they failed

B) a hot water boiler for heating

C) applying low temperatures

D) making air-tight seals with cork

E) a fortune worth about \$315,000 in today's money

F) but also protein and fat

G) and act as enzyme inhibitors

Preserving Techniques – Heat, Frost, and the Exclusion of Air

Bottling food to preserve it had been invented by French chef Nicolas Appert – without any awareness of the existence of microbes and 50 years before Pasteur discovered heat sterilization! In 1795, Napoleon offered a prize to the person who could come up with a practical method of long-term food preservation so it could be taken on army campaigns. Appert worked on it for 14 years, heating food in bottles and jars and 1) _____. The working principle of vacuum sealing had been pioneered by Otto von Guericke (1602–1686) and Denis Papin (1647–1712) with their experiments. Otto von Guericke became famous by his experiments with the Magdeburg hemispheres, in which he demonstrated the enormous power of air pressure to a baffled audience at the Reichstag in Regensburg in 1654. He created a vacuum by pumping out the air in two hemispheres he had put together and then used up to sixteen horses to try and wrench them apart, 2) _____! Little did he know that his discovery would be essential in vacuum-sealing food preserves. Appert's preserves would keep for months, and they were also tested by the French navy. In 1809, Appert received the prize of 12000 gold francs – 3) _____, according to historians. He publicized his method and thus became the founder of the modern food preserving industry. The only problem that remained was glass breakage. This was resolved by British industrialist Peter Durand (1790–1820) in 1810. He produced steel containers lined with tin. The meat preserved in those cans was called embalmed meat. On May 19, 1845, an expedition set off from London with 134 of the best British officers and crew of the British navy, under the command of Sir John Franklin (1786– 1847). They were hoping to explore the Northwest Passage. Never before had an expedition been so luxuriously equipped: 4) _____, a steam-powered propeller, iron ice shields and cans and heating materials for 3 years. One of the major mysteries that remained was why such an experienced crew was unable to rescue themselves. In 1886, three of the sailors buried in the ice were carefully examined, and it turned out that what killed Franklin's crew was not, as had been surmised, hunger, cold, or scurvy, but massive lead poisoning. The ships carried 8000 cans which had been soldered with lead. This must have been done under enormous time pressure, so the solder was applied to the inside of the cans and

not sealed. Large amounts of extremely toxic lead thus seeped into the food and were ingested with it. Heavy metals destroy the disulphide bridges in proteins 5) _____. Symptoms of lead poisoning are loss of weight, tiredness, irritability, paranoia, loss of concentration, and inability to make decisions. The tissue samples taken from the three sailors showed a 10-fold lead overdose. However, the lead hypothesis is only one of many attempts to explain the disastrous end of the expedition. Breakage was not the huge problem it would have been on an industrial scale, so glass containers were still the vessels of choice. About 100 years after Franklin's doomed expedition, US naturalist Clarence Birdseye (1886–1956) went on an expedition to Labrador for the US Geographic Service and noticed that fish and caribou meat that had been exposed to the icy arctic air still tasted fresh when cooked months later. Coming to the conclusion that rapid freezing to extremely low temperatures must be the secret to this freshness, he went home to develop a multiplate quick freeze machine which he patented. This machine could freeze meat instantly to -40°C . When, during the Second World War, there was a shortage of tin due to the initial control of the Pacific by the Japanese, all available tin cans in the United States went into army provisions. These were ideal starting conditions for Birdseye's frozen food, as it did not require any tin.

Speaking

Discuss. Find an advertisement for food product in a newspaper or magazine. Explain in pairs how the advertisement makes the food look appealing.

Imagine your local supermarket wants to start an ugly fruit and vegetable campaign. Create a poster for their campaign.

Instructions:

✓ *define your topic:* choose a clear, specific subject that you want to communicate

✓ *create a catchy title:* use a concise, engaging title that captures the essence of your topic



✓ *organize content into sections*: introduction; main points; visual elements

✓ *use visuals*: incorporate relevant images, graphs, charts, or diagrams to illustrate points; use icons and infographics to simplify complex information

✓ *keep text concise*: limit the amount of text per section; use short sentences and phrases

✓ *highlight key information*: use bold, italics, or different colors to emphasize important

Writing

Work in pairs: Choose a food product and create an advertisement for it. Think about how you can make the food look and sound as appealing as possible.

Work in groups: Compare farmers' markets with supermarkets. Include information about the look, taste and origin of the foods sold at each place. Present your findings to the class.



APPENDIX

EXTRA READING AND COMPREHENSION TASKS

Text 1. Disentangling What We Know About Microbes and Mental Health

Introduction

There is arguably no better place to witness first-hand the impact that diet and microbes have on health and the way the brain functions, than in developing countries of Africa. The parasites and pathogens that can debilitate Westerners have long been known, and the resilience of the local Africans to many of these agents has played its part in the evolution of the hygiene hypothesis, understanding chronic diseases, and creation of a range of vaccines, including against the Ebola virus. Having been party to the study of Hadza hunter gatherers and noting that they too can live to be elderly, it is clearly not a simple task to unmask the role of diet, microbes, and lifestyle in longevity.

It is challenging to dissect the effects of microbes on brain function. To date, the focus has been on pain, anxiety, depression, centered in the amygdala within the limbic system, and linked through the vagus nerve. These studies have not examined the more positive emotions of happiness, drive, and contentment that often appear to be in high abundance among Africans, despite their often-dire predicament. This paper will explore the potential interplay between food, microbes and lifestyle, and challenge researchers to verify rodent research in humans.

Trying to understand the microbiota through retracing human evolution

While the environments of Canada and east Africa certainly differ to a large extent, as do diets for the majority of citizens, there are also commonalities. For example, the vaginal microbiota shares the same dominant *Lactobacillus* strains across continents, likely indicating their contribution to successful reproduction.

In search of increasing our understanding of microbiome evolution, studies have been performed on ancient hunter gatherers in Africa and South America. While they are not free from influence by modern society, some of the habits remain intact. A recent study showed that

the Hadza gut microbiota is influenced by seasonal dietary intake, varying from meat to certain fruits. The resultant increase in diversity is likely a hallmark of how humans used to consume food, except that Westernized societies have access to clean water, unlike the Hadza who live in the Central Rift Valley in Tanzania, have significant hand-fecal (human and animal) exposure, and drink untreated water. Indeed, the introduction of un-milled maize to individuals normally consuming baobab, roots, berries, and honey significantly changed their gut microbiota.

Norway, Denmark, and Sweden are ranked in the category of happiest places to live (8), based upon governance, personal freedom, opportunity, education, safety, and healthcare. Suicide rates are around 11 per 100,000, yet approximately half Norwegians will suffer depression at some point in their life. Are rates of depression a more suitable measure of happiness and contentment, and if so, what about depression amongst hunter gatherers? Based on observations from Papua New Guinea reporting no depression in hunter gatherers, an explanation was consumption of omega-3 fatty acids, access to regular sunlight, exercise, social interaction, and healthier sleep (10). So, could a supplement of certain probiotic strains, vitamin D, and omega-3 fatty acids reduce depression rates in countries where people have good access to employment, housing, education, and healthcare? These are questions that require investigation.

The Gap Between Mouse Studies and Humans

Much has been made of the link between autism and the gut microbiota. One study using a mouse model suggested that *Bacteroides fragilis* therapy had potential to resolve behavioral symptoms in autistic humans. Whether an already unnatural mouse develops autism does not then translate into a therapeutic breakthrough for autistic children, particularly when analytical flaws in the study were exposed by others. Such studies lead to internet blogs that distort the reality and raise hope for a cure in parents. Although scientists have little control over how lay people or the media represent their work, the way that conclusions are presented and the rigor of the review process to minimize sensationalizing results have a major impact.

The basis of too many microbiome studies, to date, has been rodent experiments, or observational studies in humans, neither of which prove cause and effect. In the case at hand, parents desperate to help their autistic child might look to fecal microbiota transplant or a *B. fragilis* probiotic that does not exist and will take many years to develop, believing these treatments will alleviate certain behaviors. It is not for me to say that such interventions will or will not work, but there should be a better scientific basis for suggesting they might be effective. Instead, the senior author of the mouse paper published a review in the same journal *Cell* reiterating the link between the gut microbiota and the brain including autism spectrum disorder as if it was proven in humans, when almost all the citations refer to mouse experiments, and human observations. Indeed, the review itself cites numerous other reviews making the same points based on rodent experiments.

What has so far been lacking is identification of molecules produced by microbes that are responsible for brain effects. Arguably, the tools are available to identify these in humans through use of various metabolomic and proteomic methods, and access through surgical procedures. Descriptions of what could, and indeed should, be done in humans, has been lacking from the multitude of reviews on the gut-brain axis, with one exception. Hooks et al. (29) recently raised similar salient points as those made here, including the relevance of rodent studies to humans (30), and calling for research that deciphers the complexity of the multipathway systems. Notably, they state "It could be well-worth working with relevant public health and media experts on how to communicate this exciting body of work responsibly". They also add to the discussion the potentially important role of environmental factors in brain related illness, an issue that will be discussed below. The impact of microbial metabolites on the brain is unclear. Only a few G protein-coupled transmembrane molecular sensors have been identified metabolites in the Nav1.8-expressing vagal afferents that detect neurotransmitters, hormones, nutrients.

Certainly, omics tools could be applied now to patients with multiple sclerosis and other brain related illnesses who are receiving fecal microbiota transplants (FMT) or are taking a variety of probiotics, thereby supporting or rebuking the theories based on rodents. Such research could also be applied to verify other mouse-

based studies, for example that suggest FMT from a lean donor can make an obese recipient lose weight. Eleven years after this widely cited study, no such conclusive human verification has occurred.

The translation of *in vitro* and animal studies to human experimentation has at least started to occur, with encouraging results against depression by daily ingestion of probiotic bifidobacteria for 6 weeks. The selection of the *Bifidobacterium longum* NCC3001 subspecies *longum* strain was from mouse studies 6 years prior showing that ingestion normalized anxiety-like behavior and hippocampal brain derived neurotrophic factor (BDNF) levels. The study utilized a range of evaluative tools. Functional MRI analysis showed that reduced responses to negative emotional stimuli in multiple brain areas, including amygdala and fronto-limbic regions, occurred with probiotic treatment compared to placebo. The lack of change in serum inflammatory markers suggested the benefit did not accrue through down-regulation of inflammation. The unchanged levels of neurotrophins and neurotransmitters 5-HT, substance P, and CGRP, would suggest that gut bacteria were not increasing the circulatory levels of at least these three neurotransmitters, even though reductions were noted in urinary levels of phenylacetylglutamine, creatine, 4-cresol sulfate, and trimethylamine-N-oxide. It was no surprise that the fecal microbiota was unchanged, as 16 s rRNA Illumina sequencing is not sensitive enough to detect differences and probiotic strains do not necessarily alter microbial abundances. As to how the probiotic strain was mediating the clinical outcome the answer remains to be found but given the success of this study of 44 subjects, additional trials are warranted, perhaps accompanied by metagenomic, or transcriptomic analyses to see if the bifidobacteria were influencing other microbes or host circuitry.

A challenge for researchers wanting to use microbes to prevent autism spectrum disorder is that interventions will likely need to be tested while the fetus is developing and during early life. This will ethically be more difficult as microbiota manipulation through FMT, probiotics or prebiotics tends not to be target specific, so how the intervention affects other developmental processes will be of concern. On the other hand, if these gut-brain and microbiome-host linkages are true, then the development of every human is already being influenced

by a series of microorganisms and in-depth studies during pregnancy and the first year after birth could help to reveal some of the processes. For example, a probiotic strain that improves gut barrier integrity and therefore helps increase adsorption of arachidonic acid, docosahexaenoic acid, and omega-3 polyunsaturated fatty acids, critical for brain growth and cognitive development, could well be tested, with implications for later-in-life.

As it stands, there are similarities between the challenges facing the microbiome area, still in its infancy, and methodological issues in the field of nutritional epidemiology. The author, Ioannidis, viewed most nutritional variables could be correlated with one another if large enough data sets were analyzed. Confounding factors add to the complexity and meta-analyses become weighted averages interpreted by the examiners. As with foods that can contain thousands of chemicals with the most abundant assumed to be responsible for harm or health, so too assumptions are made that abundant microbial taxa are the key influencer. Probing low abundance species and ruling out contamination remain challenges in microbiome studies. As noted above, the propensity of journals to increase manuscript Altmetric scores does not mean the paper or its conclusions represent meaningful results. Ioannidis' call for exploration of new avenues of research and pivotal human trials should drive granting agencies to redirect funds away from often pointless or non-correlative animal experiments.

Probiotics

As eluded to by Hooks et al., the field of probiotics which faced cynicism in the earlier days of its reemergence, is yet again being slated for its lack of usefulness. Unfortunately, the number of people who not understand what probiotics are, and what they are not, is reflected in these commentaries. This is illustrated by a commentary on the Hsiao et al. paper that referred to the *B. fragilis* strain as a probiotic, which until proven to confer a health benefit on the host, it is not a probiotic. One recent poorly designed and analyzed paper stated in its title a link between small intestinal bacterial overgrowth, probiotics, and metabolic acidosis, when no such correlation was found. An Israeli group published studies with a product they referred to as "probiotic" but that had failed to meet the well-documented

criteria as a probiotic [it did not show a health benefit]. They tested it in only a handful of healthy subjects and claimed the strains did not colonize and therefore could not be effective, even though colonization is not a prerequisite for probiotic strains. In addition, they claimed that probiotics in general might cause harm if used to prevent antibiotic-associated diarrhea, even when no harm was shown. A much more thorough study of almost 400 subjects in a double-blind design, showed that a multi-strain probiotic could in fact correct undesired changes in microbiota composition and function, caused by antibiotic treatments or by cesarean birth. This adds to the meta-analysis data showing the benefits of probiotics to prevent antibiotic-associated diarrhea.

As Hooks et al. noted, too many microbiome studies, of which the two recent ones are examples, "oversell" their limited findings, and in doing so damage a reputable scientific field of probiotics. Such overselling is not exclusive to microbiome research, and of course it can be found across the scientific literature, including for some probiotic studies. But, the point of importance is that such negativity should not lead to cessation of good investigative studies on the potential for microbial interventions to provide a benefit to human mental health.

In addition to the example highlighted above (34), several other excellent studies have shown that probiotic therapy can improve mental health. In a New Zealand study of 423 women, *Lactobacillus rhamnosus* HN001 taken during pregnancy and post-partum significantly reduced depression and anxiety scores compared to placebo (50). In a study investigating neurocognitive impairment in 10 HIV-1 infected patients, 6 months intake of a product containing *Lactobacillus plantarum* DSM 24730, *Streptococcus thermophilus* DSM 24731, *Bifidobacterium breve* DSM 24732, *Lactobacillus paracasei* DSM 24733, *Lactobacillus delbrueckii* subsp. *bulgaricus* DSM 24734, *Lactobacillus acidophilus* DSM 24735, *Bifidobacterium longum* DSM 24736, and *Bifidobacterium infantis* DSM 24737 showed significant improvements in Rey auditory verbal learning test (immediate and delayed recall), Rey-Osterrieth complex figure test (copy immediate and delayed recall), phonological verbal fluency test, Toronto alexithymia scale-20, State-trait anxiety inventory Y-2, and

time and weight estimation test scores. Interestingly, while one strain of *B. longum* was shown in a small study to improve memory and reduce stress, another paired with *L. helveticus* showed no effect on psychological outcome measure (Cohen's d range = 0.07–0.16). Although study designs and subject characteristics differed, it is worth investigating strain to strain variations.

Environmental and Socio-Economic Confounders

As has been well-documented, mental health, and well-being are affected by a number of factors, not the least of which are socio-economic status and environmental pollutants. Such confounders must be considered in human studies if we are to truly differentiate the role of microbes in alleviating depression, anxiety, and improving treatment of conditions emanating from the brain. Whether this is lack of exposure to coastal waters, unemployment, being in a household where illness, and death are prevalent or being exposed to small pollutant particles penetrating the blood brain barrier, these can influence depression. One study has even suggested that exposure to air pollutants in early life can alter the gut microbiome and increase the risk of various diseases. A number of pesticides have been clearly shown to induce neurological disease. In some developing countries, sexually transmitted infections and excessive blood or hair mercury levels can be a result of poverty and women trading sex for fish from polluted lakes.

In every clinical study, efforts are made to match confounding issues in the active and placebo arms, but perhaps not to the extent of measuring levels of heavy metals and pesticides. These are not only issues for developing countries, but certainly the contamination risk appears to be higher. In a study performed in Mwanza, Tanzania, probiotic *L. rhamnosus* GR-1 yogurt intake correlated with reduced adsorption of mercury, and arsenic in pregnant women consuming contaminated fish from Lake Victoria. The lactobacilli were shown to bind to the metals. The subsequent creation of a network of 282 production units across east Africa that make probiotic yogurt made with the GR-1 or *L. rhamnosus* GG generic strain Yoba known also strengthen gut barrier function, has the potential to not only reduce toxin uptake and improve nutrient adsorption, but also

indirectly improve mental health and well-being. By increasing family income for the producers and along the value chain, the resultant lifestyle, and socio-economic changes could impact rates of depression and anxiety.

This whole-view of society is vital if diseases are to be effectively treated. Unless women are empowered, children are fed, income allows for education and healthcare, and crop losses are minimized, then disease more easily proliferates. A single vaccine or pharmaceutical agent can undoubtedly save lives, but the cost to society in waiting for them to be developed, tested, implemented, and paid for is invariably long; and by the time the shareholders reap the benefits from the consumers directly or countries donating funds for product use, many lives could have been saved or improved in developing countries by simpler remedies borne out of local empowerment. This is not to imply that a probiotic can cure Ebola or malaria, but a practical, affordable probiotic food could indeed be as effective in improving health and well-being, as a capsule imported from the North at a price many-fold higher.

Source: <https://pmc.ncbi.nlm.nih.gov/articles/PMC6384226/>
(Reid G. *Disentangling What We Know About Microbes and Mental Health*)

Study useful vocabulary

1. **Microbiome** – The community of microorganisms (such as bacteria, fungi, and viruses) that inhabit a particular environment, including the human body.
2. **Vagus nerve** – A major nerve that connects the brain to various organs, including the gut, playing a crucial role in the gut-brain axis.
3. **Probiotics** – Live bacteria and yeasts that are beneficial for health, especially for the digestive system.
4. **Neurotransmitters** – Chemical messengers in the brain that transmit signals between nerve cells, influencing mood, cognition, and behavior.
5. **Metabolites** – Small molecules produced during metabolism, some of which can influence brain function and overall health.

6. **Fecal microbiota transplant (FMT)** – A medical procedure where fecal matter from a healthy donor is transplanted into a patient's gut to restore microbial balance.

7. **Amygdala** – A part of the brain involved in processing emotions, particularly fear and anxiety.

8. **Metagenomics** – The study of genetic material recovered directly from environmental samples, used to analyze microbial communities

Answer the following questions

1. What is the gut-brain axis, and why is it significant in mental health research?

2. How do probiotics potentially influence anxiety and depression through the vagus nerve?

3. What are some of the key unanswered questions regarding the relationship between microbes and happiness?

4. Why is it important to compare the gut microbiota of hunter-gatherers and Western populations?

5. How does seasonal dietary intake influence the gut microbiota of the Hadza people?

6. Why are Scandinavian countries often ranked among the happiest places to live, and how might microbiota play a role?

7. What are the limitations of rodent studies in understanding the gut-brain connection?

8. How have some microbiome studies misled the public regarding autism treatments?

9. What is the vagus nerve's role in the microbe-gut-brain axis, and why is it difficult to isolate its effects?

10. Why is it difficult to identify specific microbial molecules responsible for brain effects?

11. How can omics technologies help in verifying microbiome research findings in humans?

12. Why is there skepticism about the ability of probiotics to significantly impact mental health?

13. How might environmental pollutants influence gut microbiota and mental health?

14. What is the potential role of probiotics in reducing heavy metal absorption and improving well-being?

15. How can socio-economic factors impact mental health and microbiome-related studies?

Read the multiple-choice questions and choose the correct option based on the article.

1. ***What is the gut-brain axis?***
 - a) A part of the nervous system that controls digestion
 - b) A bidirectional communication system between the gut and brain
 - c) A theory suggesting microbes cause all mental illnesses
 - d) A method for diagnosing depression
2. ***How might probiotics influence mental health?***
 - a) By altering serotonin production in the brain directly
 - b) Through interactions with the vagus nerve and gut microbiota
 - c) By eliminating all harmful bacteria in the gut
 - d) By increasing the size of the amygdala
3. ***What role does the vagus nerve play in the gut-brain connection?***
 - a) It directly produces neurotransmitters
 - b) It serves as a communication pathway between the gut and brain
 - c) It only controls digestion, not emotions
 - d) It is unrelated to the gut microbiota
4. ***What is one limitation of vagus nerve stimulation therapy?***
 - a) It has no medical risks
 - b) It requires an implanted device that may cause complications
 - c) It only works for anxiety disorders
 - d) It is the most effective treatment for depression
5. ***How might probiotics influence mental health?***
 - a) They have been proven to cure depression
 - b) Some studies show they may help regulate mood
 - c) They replace all gut bacteria permanently
 - d) They only affect digestion, not the brain
6. ***What common flaw exists in many microbiome studies?***
 - a) They assume correlation means causation
 - b) They only study the effects of sugar on microbiota
 - c) They ignore the role of the vagus nerve
 - d) They suggest gut microbiota never change

7. ***What was a major criticism of a study linking gut microbiota to autism?***

- a) It exaggerated the role of a single bacterial strain
- b) It was conducted only on humans
- c) It concluded autism is caused by probiotics
- d) It provided clear proof that microbes cure autism

8. ***How does socio-economic status affect mental health research?***

- a) It has no impact on mental health
- b) It can confound study results by influencing well-being
- c) It is the only factor in depression
- d) It does not affect gut microbiota studies

9. ***What is one reason probiotic studies face skepticism?***

- a) The field has no scientific support
- b) Some researchers misinterpret findings or oversell results
- c) No one has ever studied probiotics scientifically
- d) Probiotics are harmful in all cases

10. ***How might environmental pollutants impact mental health?***

- a) By altering the gut microbiota and potentially increasing disease risks
- b) By making people eat more processed foods
- c) By only affecting physical health, not mental well-being
- d) By reducing serotonin production directly in the brain

11. ***What makes Scandinavian countries notable in happiness studies?***

- a) They have lower suicide rates than other countries
- b) They rank high in governance, safety, and healthcare
- c) They consume only probiotic-rich foods
- d) They have the most diverse gut microbiomes in the world

12. ***What challenge exists in proving that gut microbes influence mental health?***

- a) Scientists cannot analyze gut bacteria
- b) Many studies lack human trials to establish cause and effect
- c) Gut bacteria never change over time
- d) The brain does not communicate with the gut

13. ***How does diet influence the gut microbiota?***

- a) It does not have any effect
- b) Seasonal and processed foods can alter microbial diversity

- c) The microbiota remains stable despite diet changes
- d) Only artificial supplements can change gut bacteria

14. ***Why are probiotics not always effective in changing gut microbiota?***

- a) They do not necessarily colonize the gut long-term
- b) They eliminate natural gut bacteria permanently
- c) They can only work in rodents
- d) They are never studied in humans

Task 6. Match the words from the text with the definitions

- | | |
|---|---|
| 1. <i>Gut-brain axis</i> | 12. <i>Hygiene hypothesis</i> |
| 2. <i>Probiotics</i> | 13. <i>Rodent models</i> |
| 3. <i>Vagus nerve</i> | 14. <i>Omics technologies</i> |
| 4. <i>Microbiome</i> | 15. <i>Bidirectional communication</i> |
| 5. <i>Neurotransmitters</i> | 16. <i>Dysbiosis</i> |
| 6. <i>Metabolites</i> | 17. <i>Inflammatory markers</i> |
| 7. <i>Fecal microbiota transplant (FMT)</i> | 18. <i>Prebiotics</i> |
| 8. <i>Amygdala</i> | 19. <i>Placebo effect</i> |
| 9. <i>Metagenomics</i> | 20. <i>Antibiotic-associated diarrhea</i> |
| 10. <i>Hunter-gatherers</i> | |
| 11. <i>Diversity (of microbiota)</i> | |

- The variety and abundance of different microbial species in the gut.
- A condition where an imbalance in gut bacteria may contribute to health issues.
- The theory that reduced exposure to microbes in early life increases susceptibility to allergies and autoimmune diseases.
- Live bacteria that can provide health benefits when consumed.
- A nerve that connects the gut to the brain and plays a role in communication between them.
- Substances produced during metabolism that may influence brain function.
- A method of studying microbial communities by analyzing their genetic material.

- A major component of the limbic system in the brain, linked to emotions such as fear and anxiety.
- A method of transferring healthy gut bacteria from a donor to a recipient to restore microbial balance.
- The chemical messengers that transmit signals between nerve cells in the brain.
- A scientific approach using large-scale biological data to study genes, proteins, and metabolites.
- The presence of gut bacteria that support digestion and immune function, often promoted by fiber-rich foods.
- The idea that gut microbiota can send signals to the brain and vice versa, affecting mental health.
- A group of people who rely on foraging, hunting, and gathering for their food.
- A technique often used in laboratory research, where mice or rats are studied to model human diseases.
- A reaction in which a patient experiences improvement in symptoms despite receiving a non-active treatment.
- A measure in the blood indicating inflammation, which is often linked to disease.
- A disorder that can occur when antibiotics disrupt gut bacteria balance, leading to digestive issues.
- A method where gut microbes influence brain function through two-way signaling.
- Indigestible food components that promote the growth of beneficial gut bacteria.

Text 2.

Growing Dangers of Antibiotic Resistance: Examining Causes and Methods of Prevention and Control Strategies

Prevention Practices

This includes hand hygiene, screening for infection with multidrug-resistant bacteria, and isolating infected patients. The importance of these practices is to ensure that bacteria and germs don't spread easily amongst other people. Ensuring patients take the right

antibiotics for their specific illness is crucial since taking the wrong antibiotics can keep bacteria in the body. Research shows that when a toilet is flushed, the waste discarded in the toilet has particles that flow into the air. This will contaminate the air and the accessories you have in your bathroom. It's essential to close the toilet seat before flushing because toothbrushes, tongue cleaners, soap bars, towels, and many more utilities will be contaminated with germs from the waste in the toilet. This will ensure that none of the bacteria will go on the appliances in your bathroom. Cleaning your toilet is also crucial since it prevents the spread of bacteria entering your body. This will cause bacterial infections leading doctors to prescribe antibiotics to treat illnesses. This causes bacteria to be immune to antibiotics. Over time this strengthens bacterial strains to be more resistant to drugs, making them harder to eliminate.

Respiratory and cough hygiene like covering your cough and sneezes plays a tremendous role in maintaining the spread of bacteria. Such hygiene prevention practices reduce the need for antibiotic use since the spread of bacteria will be minimized.

Invest in Research and Development:

Funding for alternative therapies for bacterial illnesses should be increased. Using phages to treat bacterial illnesses is known as phage treatment. Phages, also known as bacteriophages, are viruses that infect and reproduce in bacterial cells. Phages kill and selectively target bacteria⁷. Phage therapy is a biological treatment that uses bacteriophages to heal bacterial infections. To infect and lyse bacteria at the infection site, lytic phages, bioengineered phages, and isolated lytic proteins of phages are utilized. Mainly, it kills the bacteria host efficiently causing it to be a smart and effective treatment⁸ Phage therapies are criticized and not recommended by doctors because there are a few issues with how the therapy was regulated and created. However recently, studies have shown that the success rate of phage therapy is 87 %.

The benefit of phage therapy is that it can act like a bacteria-killing agent because bacteria infected by these specific phages cannot survive or recover⁹. In contrast, some antibiotics – like tetracycline – are bacteriostatic, which means that they can help the evolution of

bacterial resistance more easily. With certain restrictions, such as a reliance on relatively large bacterial densities, phages can only reproduce in the vicinity of their hosts during the bacterial-killing process; this works like auto "dosing", which is when phages establish phage dose by themselves. Lastly, phages are not toxic to the body and, therefore, safe to use¹⁰. The disadvantage of phage therapy is that further research is necessary to determine the effectiveness of this therapy¹¹. It's unknown if phages could cause harm to humans or animals in ways other than direct toxicity. Furthermore, it's unclear if phage therapy could make bacteria more resistant to bacteriophages, leading to phage resistance⁴. Lastly, it's not known how long phage therapy may take to work. The limit of phage therapy is resistance; bacteria can develop resistance to phages, which can prevent phage adsorption and DNA entry, or degrade phage DNA.

Control Practices

Reduce Antibiotic Use in Agriculture:

To reduce the amount of antibiotic-resistant bacteria that go up the food chain, more laws governing the use of antibiotics in food animal production should be implemented. Streptomycin and oxytetracycline are two antibiotics that are popularly used in agriculture in both plants and animals. Antibiotics given to humans and animals are expelled through urine and feces. Animal feces, such as manure, are high in nutrients and frequently applied as fertilizer to agricultural fields, directly contaminating the environment with germs resistant to antibiotics and antibiotic residues. Certain antibiotics are injected into the trunks of palm and elm trees. They are used to control and treat certain bacterial infections.

Antibiotics are mostly used in agriculture to treat infections, promote growth, and prevent disease in livestock. Common antibiotics include sulfonamides, which are frequently coupled with other antibiotics for an additional effect, macrolides, which are typically used for respiratory infections, and penicillins, which are effective against a variety of bacterial illnesses. Penicillins are usually dosed at 5–10 mg/kg body weight and are metabolized in the liver, with excretion occurring via urine. Macrolides are administered at dosages ranging from 10–20 mg/kg, are metabolized in the liver, and

are excreted in both bile and urine. Sulfonamides are given at a dosage of 15–30 mg/kg, metabolized in the liver, and primarily excreted through urine¹².

The widespread use of antibiotics in agriculture and livestock is a significant factor in the development of antibiotic-resistant bacteria, which can be transferred to humans through the consumption of animal or plant products, direct contact with animals, or through the environment, such as soil and water. Such a critical issue needs careful management and mitigation.

Control overdose on antibiotics (drug abuse):

Overuse or unnecessary use of antibiotics can contribute to bacteria's resistance to dying. Every year, around 2.8 million antibiotic-resistant illnesses happen in the United States. These include Methicillin-resistant *Staphylococcus aureus* (MRSA), *Streptococcus pneumoniae*, and Carbapenem-resistant Enterobacteriaceae (CRE). The number of treatment options available is limited for these illnesses, thus increasing mortality rates. As a result, about 35,000 people die every year¹³. Drug resistance makes antimicrobial medications, including antibiotics, ineffective and makes treating infections challenging or impossible. This raises the risk of infection spread, serious illness, disability, and death. AMR, antimicrobial resistance, is a natural process caused by pathogen mutations over time. An antimicrobial medication is a medicine that kills microorganisms or stops them from multiplying.

There are many steps involved in preventing antibiotic overdose. This includes following prescriptions, proper measurement, educating oneself on antibiotic safety, storing them safely, and adhering to the rules. Following prescriptions is crucial since taking more than recommended can be dangerous. Always follow the dosage and time labels prescribed by a doctor. Proper measurement is just as vital because you need to follow the required amount your body needs. Educating oneself and others about the significance of not exceeding prescribed doses and the possible risks. Store antibiotics in a safe place and prevent children from using or taking them. Adhere to the prescribed schedule provided by a doctor on when to take the recommended dosage of antibiotics.

Bacteria develop resistance to antibiotics through self-mechanisms:

Antibiotics kill or prevent bacteria from multiplying by attacking the cell wall or coating surrounding bacteria and blocking protein production in bacteria. Bacteria can develop methods to withstand antibiotics. Certain bacteria have developed biochemical "pumps" that can remove antibiotics before they reach their target, while other bacteria have evolved to produce enzymes that make antibiotics ineffective. Biochemical pumps are a process where bacterial cells pump molecules from inside the bacteria to outside. Biochemical pumps can confer antibiotic resistance by pumping antibiotics out of bacterial cells, reducing the concentration of the antibiotic inside the cell. This mechanism allows bacteria to survive in the presence of antibiotics that would otherwise kill them. These pumps are often referred to as efflux pumps and are a common mechanism through which bacteria develop resistance to antibiotics. Certain enzymes can confer antibiotic resistance in bacteria¹⁴. For example, beta-lactamase enzymes, which are enzymes produced by bacteria that break down the beta-lactam ring of antibiotics, can break down beta-lactam antibiotics like penicillin, making them ineffective. Another example is acetyltransferases, which modify antibiotics, reducing their ability to treat illnesses. These enzymes are a few examples of how bacteria can develop resistance to antibiotics through enzymatic mechanisms. Tackling these ways of self-mechanisms in bacteria can reduce their ability to resist antibiotics and make them weaker.

Source: <https://nhsjs.com/2024/growing-dangers-of-antibiotic-resistance-examining-causes-and-methods-of-prevention-and-control-strategies/>

(Growing Dangers of Antibiotic Resistance)

Answer the following questions:

1. What are some infection prevention practices that can reduce antibiotic resistance?
2. How can proper hygiene help prevent bacterial infections?
3. In what ways are antibiotics used in agriculture, and how does this impact human health?

4. How does investing in research and drug development help combat antibiotic resistance?
5. What is phage therapy, and how does it work?
6. What are the advantages of phage therapy over traditional antibiotics?
7. What are some limitations of phage therapy?
8. What steps can individuals take to help reduce antibiotic resistance in their daily lives?

Complete these sentences using the ideas and information from the article.

1. Phage therapy is a treatment that uses _____.
2. A major advantage of phage therapy is _____.
2. Proper hygiene, such as handwashing and covering coughs, helps to _____.
3. Reducing the use of antibiotics in agriculture can prevent _____.
4. Certain bacteria produce enzymes like beta-lactamases, which _____.
5. Overuse of antibiotics can result in bacteria becoming _____.
6. Following a doctor's prescription correctly can help prevent _____.

Match the words from the text with the definitions

1. *Antimicrobial resistance (AMR)*
2. *Infection control procedures*
3. *Superbugs*
4. *DNA gyrase*
5. *Penicillins*
6. *Overuse of antibiotics*
7. *Lytic phages*
8. *Multidrug-resistant bacteria*
9. *Selective targeting*
20. *Sulfonamid*

A. The ability of bacteria to withstand the effects of antibiotics, making infections harder to treat.

B. Microorganisms that have become resistant to multiple antibiotics, making them difficult to treat.

C. A protein essential for bacterial DNA replication, targeted by some antibiotics.

D. A class of antibiotics that includes amoxicillin, commonly used to treat bacterial infections.

E. A set of medical procedures designed to prevent the spread of infections in healthcare settings.

F. The excessive or inappropriate use of antibiotics, contributing to bacterial resistance.

G. Bacteria that are resistant to multiple types of antibiotics and pose a severe public health risk.

H. Viruses that infect bacteria and cause them to break apart, killing the bacterial cells

I. The ability of a drug or therapy to affect specific pathogens while leaving other microorganisms unharmed.

Complete the sentences with the words from the previous task

1. Certain bacteria produce _____ enzymes, which break down penicillin and make it ineffective.

2. The spread of _____ makes it difficult to treat infections, as bacteria become resistant to multiple drugs.

3. Hospitals follow strict _____ to reduce the spread of infections among patients and healthcare workers.

4. Drug-resistant bacteria, often called _____, pose a serious threat to modern medicine.

5. The enzyme _____ plays a key role in bacterial DNA replication and is a target for some antibiotics.

6. The _____ class of antibiotics includes amoxicillin, which is widely used to treat infections.

7. The _____ in agriculture has contributed to the rise of resistant bacterial strains.

8. _____ infect and kill bacteria by breaking down their cell walls, making them an effective treatment.

Text 3. The Elegant Eye

[...] I flirted with cardiology, then settled on neurology. Nothing rivals the complexity of the human brain, I reasoned, and no goal is more noble than curing its various ailments. The ultimate dialectic:

using the skilled synapses of my own brain, I would diagnose and cure the diseased brains of others. Fortunately, before it was too late, a six-week elective in neurology revealed the terrible truth: almost every neurology patient suffers from a stroke or a seizure or an incurable brain tumor, and they almost never – NEVER – get better. Worse yet, the rare patient with a curable lesion is usually snatched up by the neurosurgeons, the most arrogant species on earth. By the end of the elective I felt like a zombie myself.

How about Ophthalmology? Clean, precise, offering its own dialectic: with my intact eye I would diagnose and cure the diseased eyes of others. It didn't take long, only one good look into the ocular depths through a dilated pupil, and my quest was finished. There before me lay a stunning image – a delicate lacework of arteries and veins spread on a burnt umber palate swirled and streaked with shades of ocher. Most spectacular of all was the retina, a transparent wafer that gleamed like polished glass under the light of my ophthalmoscope. In the center the optic nerve shone like a rising sun. I was smitten.

Since every normal eye displays a clear cornea and a white scleral coat, any notion of special beauty attributed to the globe itself must derive from the iris, the dynamic membrane that contains the pupil and rests in front of the crystalline lens. The iris comes in many colors, but if one trusts the obsession of poets and novelists, the most beautiful irises are always blue: light-blue, velvety-blue, welkin-eyed, peacock, midnight, cobalt, ice-blue. Green gets an occasional nod – "she had jewel-bright emerald eyes, so lustrous and fetching they tore through my heart" – but most of the time blue runs the show. The rankest discrimination, and a bit ironic, since blue irises contain no intrinsic pigment, showing only the raw color of the tissue itself. The pigment cells in the Caucasian iris often add a twist to this aesthetic by lying dormant during gestation, breaking the heart of many a parent when the gorgeous blue eyes of their newborn turn muddy-brown as the months go by.

The texture of the iris is all but invisible to the unaided eye, but the ophthalmologist's slit-lamp microscope discloses a panorama of diaphanous spokes, crypts and valleys, flecks and spots and strands that dance about with each twitch of the pupil. Dark irises tend toward a tight weave, while light irises fluff up like a shag rug. And there's

the all-important pupil: constricted by morphine and bright light, dilated by fear, darkness, sexual arousal, and death. Yes, the coroner's final measure, the mark of a departed soul – enormous black pupils that give nary a twitch to even the brightest light. Despite this morbid sign, many cultures consider large pupils a sign of beauty. "Belladonna," Spanish for "beautiful lady," is also the name of a pupil-dilating poison extracted from the plant *Atropa belladonna*, more commonly known as deadly nightshade.

About myopia – if you have it, be happy. Numerous scientific studies have shown that near-sighted men and women boast a higher average intelligence than their non-myopic cohorts. The precise mechanism of this association remains unknown, but there are two popular theories: nature and nurture. Those who support nature argue that during embryologic development, the eyes develop from the same neural tube as the brain itself. Since large eyes tend to be myopic, big eyes and big brains might go together in much the same fashion as long arms and long legs.

Certain ocular tissues stand on the pinnacle of evolution. How does nature, so crude in claw and fang, create a surface that brings light to a pin-point focus? This surface must be perfectly curved, perfectly transparent, perfectly smooth. It must be – water! Which is to say, the cornea owes its optical precision to a tear film whose dissolved salts, lipids and proteins allow it to maintain a flawless wetted surface. A man who has no tears stands on the threshold of blindness. Worse yet, that man will writhe in agony: a bone-dry cornea responds to each blink with a tormenting jolt of pain, a jolt so severe its sufferers compare it to rubbing shards of glass on the eye.

Another evolutionary triumph: for light to reach the retina unimpeded, the cornea and lens must remain transparent, and yet, like all living tissues, they must be nourished by oxygen. More than 99.9 percent of all human cells obtain their oxygen from capillary blood flow, but capillaries lacing through the cornea and lens would veil our vision with an opaque net. To remain crystal clear, the outer portion of the cornea must survive on oxygen absorbed from the surrounding air, while the lens and the inner cornea depend on aqueous, a colorless fluid that flows through the chambers of the eye. Since aqueous contains neither hemoglobin nor cells of any sort, it

carries only a tiny fraction of the oxygen contained in blood. And the rate of aqueous flow must be precisely controlled: a deficiency shrivels the eye into a useless spitball, while glaucoma, caused by blockage of the trabecular drainage channels near the base of the iris, leads to throbbing pain and blindness. Thus pain-free vision, the presumed birthright of every human, demands an arrangement as delicate and wondrous as that achieved by any space-age gadget.

But surely the eye, the most delicate of organs, is afflicted by only the subtlest diseases. Or so one might think. I soon discovered the fallacy of this logic. Indeed, some of the most grotesque diseases known to medicine are those that disfigure the eye. Ophthalmology did not prove the sanitary refuge I had hoped for. On the second day of my student elective in the Stanford Eye Clinic, I examined Justine Jewell, a tall, slender diabetic in her late teens. She was accompanied by a tall mother who carried twice her daughter's bulk. Justine complained, "My eyes are full of floaters." Good, I thought. Floaters. No problem. Everything looked fine from the outside – white sclera, clear corneas, pale blue irises. Then I shined my ophthalmoscope through her dilated pupils. "Excuse me" I said, and stepped out of the room.

By that time in my career, I had seen the interior of a few dozen eyes, each a breath-taking panorama of amber and brown, yellow and pink, shading through a delicate lacework of arteries and veins. But Justine's eyes were filled with tangles of angry red spiders. Dark clots rose into the vitreous gel, trailing streamers of blood in all directions. I rushed into the hall to grab Doug Jacobson, the retinal specialist in clinic that morning. It took only an instant. Doug focused the beam of his ophthalmoscope on Justine's right eye, then her left, removed the ophthalmoscope from his head and hung it on the wall. "You have diabetic retinopathy," he said. "And I'm sorry to say it's very advanced."

The mother burst into tears. "Oh, doctor," she sobbed, "my grandmother, my cousin Ernest, this woman across the street – so many people I know went blind from diabetes! Can't you do something?" Justine said nothing. Her eyes were dry, wide open, the irises stretched into pale blue rims around the blackness of her dilated pupils. Later, in private, Jacobson gave me her diagnosis in the vernacular – jungle-osis. Jungle-osis meant dense black clots, arching streamers of blood, a traction retinal detachment bound with scars so

dense they defy the reparative efforts of even the most skillful surgeon. It meant blindness, both eyes, and soon – weeks, perhaps a month or two. Just months before Justine's arrival, our clinic had acquired the Coherent Radiation Model 800, one of the first lasers used to treat the human eye. Its console, six feet long and three feet high, looked like a coffin on legs. A glass tube buried deep within its circuitry gave off a high-pitched whine and emitted an eerie, bluish-green beam of light. Shown against a wall, the beam formed a circle of shimmering motes that scurried about like atoms in a nuclear furnace. A fabulous instrument, more precise than any razor, but now its tightly focused beam would serve a crude purpose – destroying retinal tissue.

Justine suffered. To dull the pain from those hundreds of burns, we injected Xylocaine deep behind the eye. The contact lens used to deliver the laser beam sometimes caused a painful corneal abrasion. For three or four days after every treatment, fluid leaking from the peripheral burns seeped into the central retina, blurring and distorting her vision. Justine's mother was always there, wringing her hands and squeezing her eyes shut when her daughter moaned under our long needle. But after six treatments the vitreous hemorrhages began to clear. The tangle of spiders melted away. Nine months after Justine's first visit, Jacobson announced, "That's it. All the hemorrhage is gone."

Four years later, during the last months of my residency, Justine's vision was still 20/20 in both eyes. There was no trace of hemorrhage, nor of the spidery vessels that signal recurrent proliferative retinopathy. Laser surgery for proliferative retinopathy has proved a medical triumph of the first order. Here is something crude in principle, simple to perform and easily learned, but it works. In the miracle that defeated jungle-osis, my role – treating thousands of patients with the laser, plus teaching the procedure to almost a hundred residents – has been the greatest privilege of my career.

Even with laser surgery and a host of other high-tech developments, the blind are still with us. If we live long enough, our eyes will always fail us. Old age's first target is often our crystalline lens, a lentil-shaped tissue that hangs behind the iris, suspended by a thousand translucent filaments. Tension on these filaments allows youngsters to focus their eyes from near to far with the ease and

precision of a Nikon camera, but in order to sustain its marvelous clarity, the lens must survive without capillaries, nourished only by an oxygen-poor fluid known as aqueous. Such metabolic tenuousness leaves the lens in a constant state of near suffocation, vulnerable to every biological assault. Like the canary in the mine, it is often the first tissue to fall victim when our bodies are attacked by radiation, toxins, or aging. During our fifth decade, our lenses begin to lose the elasticity that allows them to alter their focus from distance to near, bringing the curse of bifocals or reading glasses. Then, inexorable as an unloved season, cataracts appear, diffracting light into haloes, casting an odd tint on familiar objects, eventually drawing a dark veil over our world.

"It's macular degeneration, isn't it, doctor?"

"Yes, I'm afraid so."

To see clearly, we need more than a clear cornea and a clear lens. Much more: a retina to transform light into nervous impulses, an optic nerve to transmit these impulses to the brain, and a visual cortex to process the impulses. Arguably the most complex link in this chain is the retina, a delicate, multi-layered, altogether wondrous membrane. But alas, the retina suffers a fatal flaw: like the lens, it is vulnerable to aging. As we live beyond our fifth decade, an ever-increasing proportion of us will suffer degeneration of the macula, the central portion of the retina and the site of its most active, densely-packed neurons. First comes loss of the silvery sheen that adorns the retina of the young; then, as more years pass, there begins a descent into the ragged, lusterless wasteland known as "dry" macular degeneration – an insidious progress akin to the wrinkles and liver spots that transform a baby's face into the face of a crone.

"Doctor, when I got up this morning there was a black spot in my right eye. It blocks out everything I look at."

This was Sister Maria, an eighty-four-year-old nun. I have heard similar words from a sixty-nine-year-old railroad engineer and an eighty-six-year-old former prizefighter with a crooked nose. A colleague of mine, a seventy-three-year-old professor of pathology at the University of Louisville School of Medicine, spoke more bluntly. One afternoon he got up from his microscope, walked across Muhammad Ali Boulevard and barged into my clinic at the Department of

Ophthalmology and Visual Sciences. "God dammit, Gamel," he said, "what the hell's going on with my right eye?"

As I suspected the moment I heard their complaints, these were the unlucky ones. Most patients with macular degeneration suffer the "dry" form, which steals vision slowly, but a small percent suffer an abrupt hemorrhage or leakage beneath the retina that marks the onset of the "wet" form. From that point on, every object they look at disappears into a black hole. Fate makes only one concession: though the blind spot tends to enlarge over time, and though it quickly destroys the ability to read or drive, it rarely obliterates all sight, allowing the majority of sufferers to navigate a familiar environment.

"Doctor . . . please . . . tell me . . . is there a treatment?"

At the moment we can boast paltry progress against macular degeneration. For patients with the "dry" form, the only proven remedy is a regimen of vitamins and antioxidants that delays – but does not stop – the insidious loss of vision. On a more positive note, recent advances in molecular biology have given us a panoply of new drugs for treating "wet" macular degeneration. Though vastly more effective than the therapies available earlier in my career, these miracle molecules remain an imperfect cure: they must be injected repeatedly into the eye, they improve vision in only a small proportion of patients, and of these only a lucky few sustain the improvement for the remainder of their lives. Despite the triumphs of modern medicine, decay is written into our genes. It is our destiny.

Of all my patients with macular degeneration, Hans Bergerman proved the most astute observer. No surprise, given his curriculum vitae: professor emeritus, former chairman of Stanford's department of anthropology, editor of five books, author of two hundred academic publications. His bushy brows and bald, sun-darkened head gave him a gnomish look. Born in Brazil of German parents, he spoke with a crisp accent and sat stiff as a soldier in the exam chair. He never took his eyes off me for a moment.

"Let's see how this matches yours," he said, handing me a sketched outline of the blind spot he had noted in his right eye. I had just finished my exam and was drawing my own picture of the lesion that lurked beneath the macula of that eye. Both drawings resembled a childish doodle of a wolf's head, but in my doodle the snout and ears

were drawn with a red pencil to show streaks of sub-retinal blood. The wolf's bulbous jowl was formed by a tangle of pathologic vessels that threatened to hemorrhage at any moment, destroying forever Bergerman's central vision. The diagnosis was crystal clear – "wet" macular degeneration. Several years before, the same disease had destroyed the central vision in his left eye.

Bergerman was lucky. Wet macular degeneration usually strikes in the central portion of the retina, where laser therapy, the only option available at that time, would cause instant blindness. When I saw that his lesion lay a fraction of a millimetre removed from the center, I felt a shiver of anxiety. I had to treat the poor man by cauterizing the tangle of vessels with a laser beam, even though the zone that divided success from disaster was no greater than the width of a few human hairs. Doug Jacobs, the faculty attending who watched my every move through the viewing tube on the slit-lamp microscope, will never know the sweat that dripped from my armpits as I fired dozens of blue-green flashes into Bergerman's eye.

Three months later, Bergerman said, "Thank you, Doctor." His vision was 20/30. The tangle of vessels had shrunk to a dry, flat scar. He thanked me again two years later, the day he awoke to find a huge black spot in the center of his vision. My treatment had failed. I knew it would fail – unless the patient died first, treatment of macular degeneration always failed – but the sight of that dark clot beneath his retina brought me to the verge of tears.

"Thank you very much," he said. "You allowed me to read for an extra two years." On his way out of the exam room, he stopped to shake my hand and give my shoulder a friendly squeeze. With a rueful smile he said, "You sound so sad doctor, like you just lost your best friend. Who do you think you are – a magician, a god who makes old men young forever?"

Source: <https://www.thenakedscientists.com/articles/science-features/elegant-eye>

Answer the following questions based on the article

1. What does an ophthalmic pathologist do?
2. Which specialty did the author first seriously consider before ophthalmology?

3. Why did the author ultimately choose ophthalmology as his specialty?
4. What surprising fact did the author discover during his neurology elective?
5. Why are blue eyes considered special, according to the text?
6. What causes the pupils to dilate?
7. What strange historical fact about the word 'belladonna' does the text mention?
8. What is macular degeneration, according to the text?
9. What happened to Justine after her laser treatments?
10. According to the text, what eventually happens to everyone's vision if they live long enough?

Read the statements and identify whether they are TRUE or FALSE.

1. Most ophthalmologists are near-sighted (myopic). T / F
2. Neurology primarily treats conditions that patients quickly recover from. T / F
3. Pupils dilate only in response to bright light. T / F
4. The cornea receives oxygen directly from blood vessels. T / F
5. Laser treatment for diabetic retinopathy involves destroying peripheral retinal tissue. T / F
6. Justine permanently lost her vision due to diabetic retinopathy. T / F
7. The author states that no matter how good medical treatments become, age-related vision loss is inevitable. T / F
8. Eyes remain clear and bright throughout life without changing appearance significantly. T / F

Match the words from the text with the definitions

1	diabetic retinopathy	bleeding within the eye causing visual impairment
2	macular degeneration	surgical method using intense beams of light
3	laser surgery	specialist who analyzes diseased eye tissues

4	lens	black, circular opening that regulates light entry
5	vitreous gel	eye damage caused by diabetes
6	optic nerve	soft substance filling the eyeball
7	ophthalmologist	the inner lining at the back of the eye
8	ophthalmic pathologist	tissue behind the pupil that helps to focus images
9	hemorrhage	carries visual signals from eye to brain
10	blind spot	area of vision loss due to retinal damage

Complete the sentences with the words from the table

1. A cloudy area on the lens of the eye, causing blurred vision, is known as a ___.

2. Light enters the eye through the black circular opening called the ___.

3. ___ is a serious complication of diabetes that damages blood vessels in the retina.

4. ___ is a surgical method that uses focused beams of intense light to treat eye conditions.

5. The ___ fills the inner cavity of the eyeball, helping maintain its shape.

6. The ___ carries visual signals from the retina directly to the brain.

7. An ___ specializes in analyzing and diagnosing diseases from eye tissues.

8. A ___ inside the eye can cause sudden vision loss and may indicate severe disease.

9. An area of vision loss or darkness caused by retinal damage is called a ___.

10. The ___ lines the inner surface of the eye, converting images into signals for the brain.

Text 4. Brain Basics: Understanding Sleep

Sleep is an important part of your daily routine – you spend about one-third of your time doing it. Quality sleep – and getting enough of

it at the right times – is as essential to survival as food and water. Without sleep, you can't form or maintain the pathways in your brain that let you learn and create new memories. Lack of sleep makes it harder to concentrate and respond quickly.

Sleep is important to a number of brain functions, including how nerve cells (neurons) communicate with each other. In fact, your brain and body stay remarkably active while you sleep. Recent findings suggest that sleep plays a housekeeping role that removes toxins in your brain that build up while you are awake.

Sleep is a complex and dynamic process that affects how you function in ways scientists are now beginning to understand. This webpage describes how your need for sleep is regulated and what happens in the brain during sleep.

Anatomy of Sleep

The hypothalamus, a peanut-sized structure deep inside the brain, contains groups of nerve cells that act as control centers affecting sleep and wakefulness. Within the hypothalamus is the suprachiasmatic nucleus (SCN) – clusters of thousands of cells that receive information about light exposure directly from the eyes and control your behavioral rhythm. Some people with damage to the SCN sleep erratically throughout the day because they are not able to match their sleep/wake cycle (circadian rhythms) with the light-dark cycle. Most blind people maintain some ability to sense light to help them regulate their sleep/wake cycle.

The brainstem, which is made up of structures called the pons, medulla, and midbrain, controls the transitions between wake and sleep. Sleep-promoting cells within the hypothalamus and the brain stem produce a brain chemical called GABA, reduces activity in the hypothalamus and the brainstem. The brainstem (especially the pons and medulla) also plays a special role in REM sleep. It sends signals to relax muscles essential for body posture and limb movements, so that we don't act out our dreams.

The thalamus sends and receives information from the senses to the cerebral cortex. The cerebral cortex is the covering of the brain that has many functions, including interpreting and processing short- and long-term memory. During most stages of sleep, the thalamus

becomes quiet, letting you tune out the external world. But during REM sleep, the thalamus is active, sending the cortex images, sounds, and other sensations that fill our dreams.

The pineal gland, located within the brain's two hemispheres, receives signals from the SCN and increases production of the hormone melatonin, which helps put you to sleep once the lights go down. Scientists believe that peaks and valleys of melatonin over time are important for matching the body's circadian rhythm to the external cycle of light and darkness.

The basal forebrain, near the front and bottom of the brain, also promotes sleep and wakefulness, while part of the midbrain acts as a system to help us stay alert during the day. Release of a chemical called adenosine from cells helps make you feel sleepy. Caffeine counteracts sleepiness by blocking the actions of adenosine. The amygdala, an almond-shaped structure involved in processing emotions, becomes increasingly active during REM sleep.

Sleep Stages and Mechanisms

There are two basic types of sleep: rapid eye movement (REM) sleep and non-REM sleep. Within non-REM sleep, scientists have identified three different stages. Each is linked to specific brain waves and neuronal activity. You cycle through non-REM and REM sleep several times during a typical night, with increasingly longer, deeper REM periods occurring later in the sleep session.

Sleep stage number 1

Stage 1 non-REM sleep is the changeover from wakefulness to sleep. During this short period of relatively light sleep, your heartbeat, breathing, and eye movements slow, and your muscles relax with occasional twitches. Your brain waves begin to slow from their daytime wakefulness patterns. This stage usually lasts several minutes.

Sleep stage number 2

Stage 2 non-REM sleep is a period of light sleep before you enter deeper sleep. Your heartbeat and breathing slow, and muscles relax even further. Your body temperature drops and eye movements stop. Brain wave activity slows but is marked by brief bursts of electrical activity. You spend more of your repeated sleep cycles in stage 2 sleep than in other sleep stages.

Sleep stage number 3

Stage 3 non-REM sleep is the period of deep sleep that you need to feel refreshed in the morning. It occurs in longer periods during the first half of the night. Your heartbeat and breathing slow to their lowest levels during sleep. Your muscles are relaxed and it may be difficult to awaken you. Brain waves become even slower.

Sleep stage number REM

REM sleep first occurs about 90 minutes after falling asleep. Your eyes move rapidly from side to side behind closed eyelids. Mixed frequency brain wave activity becomes closer to that seen in wakefulness. Your breathing becomes faster and irregular, and your heart rate and blood pressure increase to near waking levels. Most of your dreaming occurs during REM sleep, although some can also occur in non-REM sleep. Your arm and leg muscles become temporarily paralyzed, which prevents you from acting out your dreams. As you age, you spend less of your time in REM sleep. Memory consolidation most likely requires both non-REM and REM sleep.

Sleep Mechanisms

Two internal biological mechanisms – circadian rhythm and homeostasis – work together to regulate when you are awake and when you are asleep. Circadian rhythms direct a wide variety of functions from daily changes in wakefulness to body temperature, metabolism, and the release of hormones. They cause you to be sleepy at night and can help you wake up in the morning without an alarm. Your body's biological clock, which is based on a 24-hour day, controls most circadian rhythms.

Your body's biological clock is based on a 24-hour day and controls most circadian rhythms. These rhythms affect a variety of functions including body temperature (represented as the white line on the chart above). Melatonin – a hormone released by the pineal gland – helps you feel sleepy when it gets dark. The peaks and valleys of melatonin (shown in the gold line above) are important for matching the body's circadian rhythm to the external cycle of light and darkness.

Sleep-wake homeostasis keeps track of your need for sleep. Homeostasis refers to a balance between systems in the body. The

homeostatic sleep drive reminds the body to sleep after a certain time and regulates sleep intensity. This sleep drive gets stronger every hour you are awake and causes you to sleep longer and more deeply after a period without sleep.

Factors that influence your sleep-wake needs include medical conditions, medications, stress, sleep environment, age, and what you eat and drink. Perhaps the greatest influence is the exposure to light. Specialized cells in the retinas of your eyes process light and tell the brain whether it is day or night and can advance or delay our sleep-wake cycle. Exposure to light can make it difficult to fall asleep and get back to sleep if you wake up during the night.

Night shift workers often have trouble falling asleep when they go to bed, and also have trouble staying awake at work because their natural circadian rhythm and sleep-wake cycle is disrupted. Jet lag also interferes with a person's circadian rhythms, creating a mismatch between their internal clock and the actual clock.

How Much Sleep Do You Need?

Sleep needs change with age as shown on the chart above. Initially, babies sleep 16-18 hours a day. School-age children and teens need about 9.5 hours of sleep each night. Most adults require 7-9 hours of sleep at night.

Your need for sleep and your sleep patterns change as you age, but this varies significantly across individuals of the same age. There is no magic amount of sleep that works for everybody of the same age. Babies initially sleep as much as 16 to 18 hours per day, which may boost growth and development (especially of the brain). School-age children and teens on average need about 9.5 hours of sleep per night. Most adults need 7–9 hours of sleep a night, even older people. However, older people may have more trouble getting enough sleep and are more likely to take medications that can interfere with sleep.

In general, people are getting less sleep than they need due to longer work hours and the availability of round-the-clock entertainment and other activities.

Many people feel they can 'catch up' on missed sleep during the weekend, but depending on how sleep-deprived they are, sleeping longer on the weekends may not be enough to replace the sleep they've missed.

Dreaming and Sleep Tracking

Everyone dreams. You spend about two hours each night dreaming but may not remember most of your dreams. Its exact purpose isn't known, but dreaming may help you process your emotions. Events from the day often invade your thoughts during sleep, and people suffering from stress or anxiety are more likely to have frightening dreams. Dreams can be experienced in all stages of sleep but usually are most vivid in REM sleep. Some people dream in color, while others only recall dreams in black and white.

Millions of people are using smartphone apps, bedside monitors, and wearable items (including bracelets, smart watches, and headbands) to informally collect and analyze data about their sleep. Smart technology can record sounds and movement during sleep, hours slept, and monitor heartbeat and breathing. Using apps, data from some devices can be synced to a smartphone or tablet, or uploaded to a computer. Other apps and devices make white noise, produce light that stimulates melatonin production, and use gentle vibrations to help us sleep and wake.

The Role of Genes and Neurotransmitters

Clusters of sleep-promoting neurons in many parts of the brain become more active as we get ready for bed. Chemicals called neurotransmitters can "switch off" or dampen the activity of cells that signal wakefulness. GABA is associated with sleep, muscle relaxation, and sedation. Norepinephrine and orexin (also called hypocretin) keep some parts of the brain active while we are awake. Other neurotransmitters that shape sleep and wakefulness include acetylcholine, histamine, adrenaline, cortisol, and serotonin.

Genes and sleep

Genes may play a significant role in how much sleep we need. Scientists have identified several genes involved with sleep and sleep disorders, including genes that control the activity of neurons, and "clock" genes such as *Per*, *tim*, and *Cry*, that influence our circadian rhythms and the timing of sleep. Scientists have found that different genes are linked to sleep disorders, such as sleep disorders as familial advanced sleep-phase disorder, narcolepsy, and restless legs syndrome. Some of the genes expressed in the cerebral cortex and

other brain areas change their level of expression between sleep and wake. Several genetic models – including the worm, fruit fly, and zebrafish – are helping scientists to identify molecular mechanisms and genetic variants involved in normal sleep and sleep disorders. Additional research will provide a better understanding of inherited sleep patterns and risks of circadian and sleep disorders.

Tips for Getting a Good Night's Sleep

Getting enough sleep is important for your health. Here are a few tips to improve your sleep. Set a schedule – go to bed and wake up at the same time each day. Exercise for at least 30 minutes most days of the week, but not within a few hours of bedtime. Avoid caffeine and nicotine late in the day and alcoholic drinks before bed. Relax before bed – try a warm bath, reading, or another relaxing routine. Create a room for sleep – avoid bright lights and loud sounds, keep the room at a comfortable temperature, and don't watch TV or use a smartphone or computer in your bedroom. Don't lie in bed awake. If you can't get to sleep, do something else, like reading or listening to calming music, until you feel tired.

See a doctor if you have problems sleeping or if you feel unusually tired during the day. Most sleep disorders can be treated effectively.

Source: <https://www.ninds.nih.gov/health-information/public-education/brain-basics/brain-basics-understanding-sleep>

Task 4. Answer the following questions.

1. Why is sleep as essential to survival as food and water?
2. How does lack of sleep affect learning and memory?
3. Which brain structures are involved in regulating sleep and wakefulness?
4. How does the suprachiasmatic nucleus (SCN) influence circadian rhythms?
5. What is the function of the thalamus during sleep?
6. How does melatonin production change in response to light?
7. What are the main differences between REM and non-REM sleep?
8. What happens to heart rate, breathing, and muscle activity in different sleep stages?

9. How do circadian rhythm and sleep-wake homeostasis regulate sleep?
10. Why do night shift workers and travelers experience sleep disturbances?
11. How do sleep needs change with age?
12. What are the possible health risks associated with chronic sleep deprivation?
13. How do neurotransmitters like GABA and norepinephrine influence sleep?
14. What are some effective tips for improving sleep quality?

Task 5. Read the statements and identify whether they are TRUE or FALSE

1. Sleep is not essential for survival, but it helps improve memory. T / F
2. The brain remains active during sleep and helps remove toxins accumulated during wakefulness. T / F
3. The hypothalamus and brainstem play a role in regulating sleep and wakefulness. T / F
4. People with damage to the suprachiasmatic nucleus (SCN) may experience irregular sleep patterns. T / F
5. The thalamus remains active throughout all stages of sleep, continuously processing sensory information. T / F
6. Melatonin production increases in response to bright light exposure. T / F
7. Stage 3 non-REM sleep is the lightest stage of sleep. T / F
8. Most dreaming occurs during REM sleep. T / F
9. Sleep homeostasis helps regulate sleep intensity based on how long a person has been awake. T / F
10. Circadian rhythms are independent of light exposure and do not influence the sleep-wake cycle. T / F
11. Older adults generally need less sleep than younger adults. T / F
12. Lack of sleep can increase the risk of health problems like high blood pressure and diabetes. T / F
13. Using smartphones before bed can help improve sleep quality. T / F

Text 5. Geneticists say that we are all, to some extent, the victims of our heredity: We each carry at least three defective genes and two-thirds of us will die for reasons connected with our genetic makeup. At the same time, rapid advances in genetic science have resulted in the expansion of the number and range of genetic tests. **(A)** "Insurers are primarily concerned that genetic testing will lead to a change in buying habits for insurance products," said Steve Jones, a genetics specialist at University College in London. "Studies have shown that people with poor genetic profiles would be more likely to take out insurance, while those at low risk would be less inclined to buy cover".

A growing number of insurers are trying to protect themselves by asking to see the results of genetic tests. **(B)** A study conducted by Georgetown University and the U.S. Alliance of Genetic Support Groups surveyed the perceptions of 332 members of genetic support groups who had one or more of 101 different genetic disorders in their families. **(C)** Fear of genetic discrimination led 9 percent of the respondents or their family members to refuse to be tested for genetic conditions and 18 percent said they had refused to reveal genetic information to insurers. A spokeswoman for the support groups said that this fear of testing prevented people from making important lifestyle changes that could reduce the risks and seriousness of certain genetic conditions.

With most of these tests, a positive result means that the carrier of a particular gene has a high chance of developing the disease. **(D)** Carriers of the Huntington's chorea gene, widely considered to be the most dreaded of single-gene abnormalities, will almost certainly develop the illness. "The advent of single-gene testing has not had much of an impact on the insurance industry because the current generation of tests are for rare disorders;" said a London insurance underwriter. "Huntington's chorea affects about 1 in every 10,000 people and familial breast cancer accounts for just 5 percent of all breast cancers. **(E)** "Nevertheless, if genetic testing becomes commonplace in the future, as we expect it will, insurers will undoubtedly want access to this information", he added. "Of particular concern is the new generation of predictive tests for cancer, heart disease and other common ailments. These genetic tests are not clear-cut because environmental factors have to be taken into consideration when assessing risk".

The attitude of insurers toward genetic testing will differ according to the type of insurance. If you apply for private medical insurance, it is unlikely that you will be asked to reveal your family medical history or details of any genetic tests that have been performed. **(F)** But life insurance is a different matter. Many insurers will want to see genetic test results, although they may not always take these results into consideration in the underwriting process. For example, the Association of British Insurers recommends that genetic test results not be used for coverage below £100,000 (\$159,000).

Activity: You've read the article, try to find the correct position (A-F) in the text for each of the sentences below. When you are ready, enter the correct letter in the space following each sentence.

1. In the study, 25 percent of the respondents or affected family members said that they believed they had been refused life insurance as a result of a genetic disorder and 22 percent believed that they had been refused health insurance.

2. This is because medical insurance coverage is usually only available for a limited period and it generally excludes chronic conditions.

3. Carriers of the BRCA 1 gene mutation, for example, are thought to have a 62 percent cumulative risk of developing breast cancer and an 11 percent risk of developing ovarian cancer before the age of 60.

4. But this has led to accusations of discrimination.

5. Moreover, insurers do not really need to see test results at present, as they can easily identify potential problems by looking at a proposer's family medical history.

6. As well as being of interest to potential carriers of mutant genes, these tests are attracting a great deal of attention from the life-insurance industries.

Answer the following questions

1. Do you smoke or drink alcohol? Do you consider tobacco a drug? (If you smoke, how old were you when you started smoking?)

2. Should smoking be banned in public places? Why (not)?

3. Do you eat fast food? Do you eat enough fruit and vegetables?

4. Do you take any vitamins or food supplements?

5. Do you usually get enough sleep? Do you give your bedroom a good airing? What is the temperature in your bedroom?

6. How many hours of sleep do you usually get a night? How many hours of sleep do you need to feel fit?
7. What time do you usually go to bed? When do you get up? What do you do if you can't get to sleep?
8. Have you ever broken your hand or leg? Have you ever sprained your ankle?
9. Have you ever been taken to hospital? What was the problem? How long did you stay there?
10. Have you ever donated blood or bone marrow?
11. What do you think about abortion?
12. What do you think about cosmetic surgery?
13. Name at least three things that can cause stress. How do you deal with stress? How can people avoid stress?
14. What do you think about the Czech health system? Should it be improved? If yes, how?
15. What do you know about cancer / AIDS / syphilis / flu / hepatitis?

Text 6. How Much Sleep Do You Need?

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In general, people are getting less sleep than they need due to longer work hours and the availability of round-the-clock entertainment and other activities. Many people feel they can 'catch up' on missed sleep during the weekend, but depending on how sleep-deprived they are, sleeping longer on the weekends may not be enough to replace the sleep they've missed.

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areas change their level of expression between sleep and wake. Several genetic models – including the worm, fruit fly, and zebrafish – are helping scientists to identify molecular mechanisms and genetic variants involved in normal sleep and sleep disorders. Additional research will provide a better understanding of inherited sleep patterns and risks of circadian and sleep disorders.

Tips for getting a good night's sleep

Getting enough sleep is important for your health. Here are a few tips to improve your sleep:

Set a schedule – go to bed and wake up at the same time each day.

Exercise for at least 30 minutes most days of the week, but not within a few hours of bedtime.

Avoid caffeine and nicotine late in the day and alcoholic drinks before bed.

Relax before bed – try a warm bath, reading, or another relaxing routine.

Create a room for sleep – avoid bright lights and loud sounds, keep the room at a comfortable temperature, and don't watch TV or use a smartphone or computer in your bedroom.

Don't lie in bed awake. If you can't get to sleep, do something else, like reading or listening to calming music, until you feel tired.

See a doctor if you have problems sleeping or if you feel unusually tired during the day. Most sleep disorders can be treated effectively.

*Source: <https://www.ninds.nih.gov/health-information/public-education/brain-basics/brain-basics-understanding-sleep>
(Brain Basics: Understanding Sleep)*

Answer the following questions

1. How do circadian rhythm and sleep-wake homeostasis regulate sleep?
2. Why do night shift workers and travelers experience sleep disturbances?
3. How do sleep needs change with age?
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5. How do neurotransmitters like GABA and norepinephrine influence sleep?

6. What are some effective tips for improving sleep quality?

Task 5. Read the statements and identify whether they are TRUE or FALSE

1. Sleep is not essential for survival, but it helps improve memory.

T / F

2. The brain remains active during sleep and helps remove toxins accumulated during wakefulness.

T / F

2. The hypothalamus and brainstem play a role in regulating sleep and wakefulness.

T / F

3. People with damage to the suprachiasmatic nucleus (SCN) may experience irregular sleep patterns.

T / F

4. The thalamus remains active throughout all stages of sleep, continuously processing sensory information.

T / F

5. Melatonin production increases in response to bright light exposure.

T / F

6. Stage 3 non-REM sleep is the lightest stage of sleep.

T / F

7. Most dreaming occurs during REM sleep.

T / F

8. Sleep homeostasis helps regulate sleep intensity based on how long a person has been awake.

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9. Circadian rhythms are independent of light exposure and do not influence the sleep-wake cycle.

T / F

10. Older adults generally need less sleep than younger adults.

T / F

11. Lack of sleep can increase the risk of health problems like high blood pressure and diabetes.

T / F

12. Using smartphones before bed can help improve sleep quality.

T / F

Read the text and fill in the gaps with the terms

1. Many people have trouble sleeping due to disruptions in their _____, which regulates wakefulness and sleep.

2. The condition known as _____ appeared in Vienna in 1916, causing extreme drowsiness and even comas.

3. Constantin Von Economo studied the _____, an area of the brain responsible for transitioning between wakefulness and sleep.

4. The _____ is responsible for detecting light and regulating the sleep-wake cycle.

5. People who have insomnia often have disruptions in the _____, which normally promotes wakefulness.

6. The _____ releases GABA, a neurotransmitter that helps inhibit neural activity and prepare the brain for sleep.

7. Chemicals such as _____, serotonin, and dopamine are involved in keeping us awake and alert.

8. The _____ builds up in the basal forebrain throughout the day, increasing sleep pressure.

9. _____ blocks the receptors that detect adenosine, making us feel more awake.

10. People with disrupted _____ may benefit from melatonin supplements to help regulate their sleep.

11. Sleeping pills are often used as a _____ solution for people with insomnia, but they are not recommended for daily use.

12. The _____ system, when activated, inhibits neural activity in the cortex, promoting sleep.

13. Bright light exposure in the morning helps regulate the _____, setting the body's sleep rhythm for the day.

14. _____ is a strategy that can help with sleep, including relaxation techniques and maintaining a consistent bedtime.

15. A key recommendation for better sleep is to keep your bedroom _____, _____, and _____ to create the best environment for rest.

Text 7. The Sleeping Brain

Many of us regularly struggle to get enough sleep, and while some of this is due to busy lifestyles, there are also times when we do go to bed on time, but just can't drop off. And it seems to be getting worse, thanks to the stress and changes in routine caused by the coronavirus pandemic. One survey found that levels of insomnia rose from 15 % before the pandemic to 24 % during the April 2020 lockdown. So what is going on in our brains to cause these problems? While we don't understand it fully, we are starting to pick apart the networks involved

in sleep. And the beginnings of this understanding goes back to the First World War. Many also experienced tremors and weakness of the hands or eye muscles. After a couple of weeks of these symptoms, around half of people would recover while others would fall further and further into sleep. Where at first they had been easy to rouse, over days or weeks they would become more delirious during their short periods of wakefulness, before slipping into a coma. Death would often follow.

At this time, a young man was working as a pilot on the front line for the Austrian air force. His name was Constantin Von Economo, and he was the youngest child of a Greek aristocratic family. Von Economo was a doctor, and so, pressured by his parents to stay out of danger, he moved to Vienna to work as a military physician caring for people with head injuries. It was here that he first saw patients with this mysterious illness. Realising this was something mostly unknown to science, he wrote a paper describing the disease in 1917 and giving it the name 'encephalitis lethargica', although it was more commonly known as 'sleepy sickness'.

As well as the drowsy type, he documented two other manifestations of the illness, each with its own constellation of symptoms. One form made patients restless, with physical twitches and mental frenzies as well as severe pain and, often, insomnia or a reversal of the normal sleep pattern. In some cases, this form later turned into the sleepy form, but sudden death could also occur at any stage. The symptoms of the third type were similar to those of severe Parkinson's disease, with weakness and rigidity in the muscles a prominent symptom.

Von Economo was fascinated. He wanted to know what was causing this range of symptoms so he began analysing the brains of people who had died of the disease. He soon realised that these patients, with their severe sleep disturbances, could tell us something about how sleep is controlled in the brain. He noted that his lethargic patients had damage to the back part of an area in the brain called the hypothalamus, while in people with insomnia the damage occurred further forward in the hypothalamus, near the optic nerve. He argued that these two areas were the 'sleep part' and the 'waking part' of the brain, and that neurons in these centres would initiate a chain of events

to damp down or ramp up activity in the cortex, allowing us to transition from wake to sleep and back again.

It is thought the illness killed a million people in around 10 years, but the cause of 'sleepy sickness' is still a mystery. Von Economo thought it was linked to the severe flu outbreak that was happening at the time, but more recent analysis hasn't supported a direct link. But no other definitive cause has been found. Some researchers argue that it is an autoimmune disease, where the body itself attacks and breaks down brain cells, perhaps triggered in some by the flu infection. Others believe an as-yet unidentified virus was to blame. Fortunately, the disease has all but disappeared, but this means there is very little chance of solving the mystery, unless sleepy sickness rears its ugly head again in the future.

He may not have discovered why people developed the illness, but when it comes to his findings about sleep, Von Economo was right on the mark. The regions of the hypothalamus he documented are vital for the transition to and from sleep. However, scientists now know these are just one component of sleep and wake networks. These spread throughout different areas of the brain from the brainstem at the base to the cortex on the surface, and each use a different combination of chemicals.

The sleep network, when activated, releases GABA into the cortex. Here it inhibits the neurons, making them harder to activate. This causes neurons in the cortex to fire less, calming you down ready for sleep. These neurons originate in a part of the hypothalamus which sits right in von Economo's sleep centre. The wake system uses a wide range of neurotransmitters, including dopamine, noradrenaline, serotonin, glutamate, histamine and, perhaps most importantly, acetylcholine, which activates neurons in the cortex, to make us feel awake and alert. All of these complex pathways pass through the hypothalamus at some point on their journey, right through the area von Economo called the 'wake centre'. You can think of sleep and wake as a see-saw. When we fall asleep or wake up, our brain must flip the 'switch', and tilt the see-saw.

But how does the brain know when to flip us from wake to sleep? There are at least two processes that help it decide. One is our body clock, which tells us the time of day. During the day, bright light is

detected by special cells in our eyes, which send signals to a brain region called the suprachiasmatic nucleus (SCN). This initiates a cascade of changes that make us feel awake and alert. Later in the day, as the light begins to dim, this information too is carried to the SCN, which again initiates changes to make us feel sleepy, including the release of a chemical called melatonin. Though research on its mechanisms is only just beginning, some studies have found that melatonin appears to block some of the neurons in the 'wake centre', helping you slip into sleep more easily.

The other factor is how long you have been awake. This is driven by a chemical called adenosine, which is a by-product of the metabolic processes our cells undergo all the time when we are awake, so it builds up throughout the day. The more of it there is sloshing around in an area of the brain called the basal forebrain, the higher our 'sleep pressure' and the more likely we are to drop off.

It is the adenosine system that so many of us trick with our daily dose of caffeine. When adenosine levels are low, acetylcholine is released in the basal forebrain, making us feel awake and alert. Adenosine prevents the release of acetylcholine, so we feel sleepy. But caffeine blocks the receptors that are normally triggered by adenosine, making it seem to our brains that the concentration is lower than it actually is. This, in turn, means more acetylcholine is released, activating neurons in the cortex and making us feel more alert.

It's clear the systems that control sleep and wake are highly complex, involving a huge number of different brain areas and chemicals. So perhaps it's not surprising it doesn't take much to change these processes and cause problems with dropping off. But, unfortunately, while we are starting to understand how our brains move from a state of wake to a state of sleep, this hasn't really led to any revolutions in improving individual sleep quality.

Supplementing with melatonin might benefit older people, whose circadian rhythms are blunted, as well as people with disorders of their body clock. And there are various types of sleeping pills, which can be helpful for people with clinical insomnia. But these are usually only recommended as a short-term solution, to be used for the odd bad night, not every day.

So if you do have problems with sleep, is there anything you can do? It seems that the best techniques are behavioural ones. You might focus on getting bright light in the morning to set your circadian rhythm for the day, and avoiding it late at night. It might help to eat earlier in the evening, and take some time to wind down before bed, doing breathing exercises or listening to a relaxing audiobook to reduce stress. You can make sure your bedroom is set up optimally-dark, cool and quiet. And trying to stick to a routine, even when working from home, can make a difference too. These tricks might not cure insomnia in all cases, but for many of us they just could be the difference between a good and a bad night's sleep.

In 1916, a strange disease began to present itself in Vienna. Patients suffered from a short, acute illness, feeling generally unwell with a headache and a mild fever. But then they would start to feel sleepy and confused, beginning to spend less and less time awake. Many also

Fill in the gaps with the parts of the sentences from the text

1. Many of us regularly struggle to get enough sleep, and while some of this is due to busy lifestyles, _____.
2. One survey found that levels of insomnia rose _____.
3. Patients suffered from a short, acute illness, feeling generally unwell with a headache and a mild fever. But then they would start to feel sleepy and confused, _____.
4. Von Economo was fascinated. He wanted to know what was causing this range of symptoms, _____.
5. He noted that his lethargic patients had damage to the back part of an area in the brain called the hypothalamus, _____.
6. The _____ spreads throughout different areas of the brain from the brainstem at the base to the cortex on the surface.
7. The sleep network, when activated, releases GABA into the cortex. _____, making them harder to activate.
8. The wake system uses a wide range of neurotransmitters, including dopamine, noradrenaline, serotonin, glutamate, histamine, and, perhaps most importantly, acetylcholine, _____.
9. During the day, bright light is detected by special cells in our eyes, which send signals to a brain region called the suprachiasmatic nucleus (SCN). _____.

10. The more of it there is sloshing around in an area of the brain called the basal forebrain, _____.

11. Caffeine blocks the receptors that are normally triggered by adenosine, _____.

12. It's clear the systems that control sleep and wake are highly complex, _____.

13. Supplementing with melatonin might benefit older people, _____.

14. If you do have problems with sleep, _____.

15. These tricks might not cure insomnia in all cases, _____.

Text 8. Biological Detergents – the Most Important Application Area of Hydrolytic Enzymes

Stains that contain protein (e.g., milk, egg yolk, blood, or cocoa) are difficult to remove because proteins do not readily dissolve in water. At high temperatures, the protein curdles on the textile fibres and is even harder to remove. Dirty laundry contains a mixture of dust, soot, and organic matter such as fat, protein, carbohydrates, and pigments, and in bed-linen and underwear in particular, fat and proteins act as glues that make dirt stick. During the laundering process, 1) _____, while proteins are still stuck to the material. Otto Rohm (1876–1939), a former student of Eduard Buchner's, pioneered the use of enzymes in laundering. However, the pancreatic enzymes used initially proved to be not very stable and very expensive. The first biological detergents were unsuitable for mass production until 1960, when subtilisin was discovered in *Bacillus licheniformis*. The enzyme is active under alkaline conditions of washing. These days, biological laundry detergents are widely used. They contain alkaline proteases at a ratio of 1:50, which reach their optimal activity during the washing process. Their low substrate specificity makes them ideal omnivores, able to degrade sticky proteins into amino acids and short-chain peptides. Proteins are thus detached from textile fibres and washed away. 2) _____, biological detergents have been widely sold in the United States, Western Europe, and Japan. Initially, the dust arising from detergent production caused allergies in factory workers, but the problem was quickly solved by granulation. The particles were coated with wax to form granules. Liquid detergents and detergent powders

in tablet form avoid the problem altogether. Raised energy awareness in recent years shifted the focus to a further property of biological detergents. As the enzymes involved reach their optimum action at 120–140°F (50–60 °C), the laundry need not be boiled any more, thus saving precious energy. Often, amylases and lipases are added to the proteases in order to degrade starch residues and fat. Celluloses are added to detergents to degrade microfibers sticking out from cotton fibres, 3) _____. Dishwasher detergents also make more and more use of enzymes, mainly of amylases and lipases. Enzymatic stain remover contains proteases, lipases, and amylases, and dissolves not only stubborn stains of red wine, grass, fruit, coffee, and tea, but also the much more common mixed stains. Fruit ice cream or yogurt or tomato sauce contain not just pigment, 4) _____. Gravy, ketchup, and many ready meals contain a bit of everything: pigment, protein, fat, and starch. Like detergents, stain removers also contain oxidizing bleaches that destroy enzymes. However, through successful protein engineering, it has been possible to fine-tune the *Bacillus* proteases to the laundering process. One thousand tons of genetically engineered proteases are produced every year. These are mainly subtilizing variants in which 5) _____ by a more stable amino acid. The enzymes retain their stability at pH 10 at 140 °F (60 °C) and are resistant to surfactants, complexing agents (water softeners), and oxidants.

Read the text carefully. Five sentences or phrases have been removed from the text. Choose from A-G the one that fits each gap in 1-5.

- A) from the mid-1960s
- B) an amino acid sensitive to oxidation has been substituted
- C) the research involved different types of enzymes
- D) but also protein and fat
- E) detergents detach fat from the fabric and distribute it in the washing liquid
- F) the experiment lasted more than a week
- G) giving the fabric a softer feel and making colours appear more vibrant

EXTRA SPEAKING TASKS

1. Personal reflection: "how do germs affect your daily life?"

Instructions:

- Each participant shares their daily interactions with microbes (e.g., hygiene habits, diet, exposure to germs).
- *Discuss* how certain habits might affect physical and mental health (e.g., excessive hand sanitizing vs. exposure to good bacteria).
- *Share* personal experiences with probiotics, antibiotics, or illnesses related to microbes.

2. Problem-solving discussion: "designing a healthy building for mental well-being"

Instructions:

- *Imagine* you are an architect designing a hospital or school that promotes mental and physical health through microbial balance.
- *Discuss* ventilation, natural light, exposure to outdoor microbes, and materials that support a healthy microbiome.
- *Present* your ideas in a small group or class discussion.

3. Exploring the causes and consequences of antibiotic resistance

Prompt:

Explain how bacteria become resistant to antibiotics and discuss the impact of this resistance on public health.

Discussion Points:

Describe the genetic changes and mechanisms (e.g., enzyme production, cell surface modifications, antibiotic pumps) that lead to resistance.

Discuss real-world examples such as MRSA, TB, or drug-resistant gonorrhea.

Reflect on how antibiotic resistance might affect future treatment options and healthcare outcomes.

Instructions:

Work in pairs or small groups. Each participant should take turns explaining one aspect of how resistance develops and its consequences. Conclude with a group discussion on potential strategies to combat antibiotic resistance.

4. Role-play: doctor-patient conversation on antibiotic treatment

Prompt:

Imagine you are a healthcare provider discussing antibiotic treatment with a patient who is worried about the potential side effects, including depression, and the risk of antibiotic resistance.

Discussion Points:

- The doctor should explain why antibiotics are necessary for treating infections.
- The patient should voice concerns about possible side effects and the risk of contributing to antibiotic resistance.
- The conversation should include information on proper antibiotic use, the importance of completing prescribed courses, and alternative strategies for managing infections.

Instructions:

Pair up. One person takes on the role of the doctor and the other as the patient. After role-playing the scenario for about 5–7 minutes, switch roles so that both get a chance to practice. Finally, discuss as a group which strategies were most effective in addressing patient concerns.

5. Group discussion on innovative solutions to combat antibiotic resistance

Prompt:

Antibiotic resistance is an evolving challenge. What innovative treatments or strategies could help us overcome this issue?

Discussion Points:

- Consider emerging research such as new antibiotics, bacteriophage therapy, and microbiome-based treatments.
- Discuss the role of diagnostic tests in ensuring the correct antibiotics are used for infections.
- Debate the potential benefits and limitations of alternative treatments compared to traditional antibiotics.

Instructions:

Form small groups (3–4 participants) and discuss for 10–15 minutes. Each group should identify at least three innovative approaches and evaluate their feasibility and potential impact on public health. Wrap up with each group sharing a summary of their discussion with the class.

6. Describing Optical Illusions

Find some optical illusions and discuss in small groups:

- Describe what you see and explain how your brain is being tricked.
- Why do you think our brains can be deceived so easily?
- Have you seen other illusions or visual tricks in daily life? Share examples.

7. Debate on vision and aging

Hold a mini-debate:

- Statement: 'Vision loss is inevitable with aging, and we should accept it as natural.'
- One group supports the idea, giving reasons why accepting aging-related vision loss is beneficial.
- Another group disagrees, proposing reasons and strategies for actively preserving eyesight as we age.

8. Colour vision

In pairs or small groups, discuss the following:

- Why might people perceive colours differently?
- Imagine having an enhanced ability to see millions more colours. How might your life change?
- What difficulties do people with colour blindness face in daily life? Suggest solutions to help them.

9. Debate: "Sleeping Less vs. Sleeping More"

Instructions: Work in two teams. One team argues that sleeping more than 8 hours is better, while the other team argues that sleeping fewer than 6 hours is better. Each team must provide arguments and examples to support their position.

Possible points:

- ✓ Pro More Sleep: Improves memory, boosts the immune system, prevents diseases.
- ✓ Pro Less Sleep: More time for productivity, some people function well with less sleep.

After presenting arguments, teams can discuss and conclude what they think is the healthiest amount of sleep.

10. Personal Storytelling: A Time You Didn't Get Enough Sleep

Instructions: Share a personal experience when you didn't get enough sleep. Use the following prompts:

- When was it? (e.g., before an exam, after a long trip)
- Why didn't you sleep enough? (e.g., stress, work, socializing, insomnia)
- How did you feel the next day? (e.g., tired, irritable, unproductive)
- What did you do to recover? (e.g., take a nap, drink coffee, sleep earlier the next night)

After sharing stories, discuss:

- How does sleep deprivation affect people differently?
- How can we avoid situations like this in the future?

EXTRA WRITING TASKS

1. Comparative Essay:

Write an essay comparing the characteristics of living and non-living things (100-150 words).

Establish a basis of co comparison

A basis of comparison represents the main idea, category, or theme you will investigate. You will have to do some preliminary reading, likely using your course materials, to get an idea of what kind of criteria you will use to assess whatever you are comparing. A basis of comparison must apply to all items you are comparing, but the details will be different. For example, if you are asked to "compare neoclassical architecture and gothic architecture," you could compare the influence of social context on the two styles

Gather the details of whatever you are comparing

Once you have decided what theme or idea you are investigating, you will need to gather details of whatever you are comparing, especially in terms of similarities and differences. Doing so allows you to see which criteria you should use in your comparison, if not specified by your professor or instructor

Example:

Neoclassical Architecture

Appeal to Greek perfection

Columns

Formulaic and mathematical

Based on this information, you could focus on how ornamentation and design principles reveal prevailing intellectual thought about architecture in the respective eras and societies

Develop the thesis of statement

After brainstorming, try to develop a thesis statement that identifies the results of your comparison. Here is an example of a fairly common thesis statement structure:

e.g., Although neoclassical architecture and gothic architecture have [similar characteristics A and B], they reveal profound differences in their interpretation of [C, D, and E]

Organize your comparison

You have a choice of two basic methods for organizing a comparative essay: the point-by-point method or the block method. The point-by-point method examines one aspect of comparison in each paragraph and usually alternates back and forth between the two objects, texts, or ideas being compared. This method allows you to emphasize points of similarity and of difference as you proceed. In the block method, however, you say everything you need to say about one thing, then do the same thing with the other. This method works best if you want readers to understand and agree with the advantages of something you are proposing, such as introducing a new process or theory by showing how it compares to something more traditional.

2. Email exchange between two ophthalmologists about digital eye strain

Write an email conversation between two ophthalmologists discussing the increasing problem of **digital eye strain**. One doctor expresses concern about the rising number of patients with eye fatigue due to excessive screen time (the email is provided below), while the other suggests solutions (you are going to write this email).

Structure:

- *Opening:* Greeting and reason for writing.
- *Body:* One doctor explains the issue, the other doctor responds with advice.
- *Closing:* A polite conclusion with suggested actions.

Example:

Dr. Patel,

I hope you're doing well. I wanted to reach out regarding the growing number of patients complaining about **digital eye strain**. Many report **headaches, dry eyes, and blurred vision** due to prolonged screen exposure.

I've noticed that even young patients are developing symptoms at an alarming rate. I believe we need to address this issue before it leads to **long-term vision problems**. Do you have any suggestions for how we can educate our patients about prevention?

Looking forward to your thoughts.

Best regards,

Dr. Sarah Johnson

Useful Words & Phrases for Writing the Email

Opening the Email	<ul style="list-style-type: none"> – I hope you're doing well. – I wanted to discuss an issue that has been increasingly concerning me... – I am writing to share my observations on...
Expressing Concern	<ul style="list-style-type: none"> – I have noticed a growing trend in... – Many patients are reporting symptoms of... – This could lead to long-term health consequences if not addressed.
Providing Examples	<ul style="list-style-type: none"> – Just yesterday, I saw a patient who... – A significant number of patients now experience... – Recent studies suggest that...
Suggesting Solutions	<ul style="list-style-type: none"> – I believe we should promote the... – One possible solution is to... – We could introduce new guidelines to...
Requesting Feedback	<ul style="list-style-type: none"> – What do you think about this approach? – I would love to hear your thoughts on this. – Do you have any suggestions for tackling this issue?
Closing the Email	<ul style="list-style-type: none"> – Let's set up a meeting to discuss this further. – Looking forward to your response. – Best regards, / Sincerely, / Best wishes

Argumentative Essay on Sleep and Brain Function

Write an **argumentative essay** discussing the role of sleep in brain function. Your essay should present a clear **thesis statement**, provide **scientific evidence**, and address possible counterarguments.

Instructions:

1. Introduction:

- Start with a **hook** (e.g., a surprising fact or a question).
- Present your **thesis statement** (e.g., "Sleep is essential for memory consolidation, cognitive function, and emotional regulation").

2. Body Paragraphs:

• **Paragraph 1:** Explain how sleep improves **memory and learning** (use research-based evidence).

• **Paragraph 2:** Discuss the impact of **sleep deprivation** on brain function and mental health.

• **Paragraph 3 (Counterargument):** Mention an opposing viewpoint (e. g., "Some people claim they can function well on little sleep") and refute it with scientific data.

3. Conclusion:

- Summarize your main points.
- Emphasize the importance of sleep for brain function.
- End with a **call to action** (e.g., "To maximize cognitive performance, we must prioritize sleep").

Useful Words & Phrases for Writing the Essay

Purpose	Useful Phrases
Introducing Arguments	<ul style="list-style-type: none">– Scientific research has shown that...– It is well-established that...– Studies indicate that sleep plays a crucial role in...– One key function of sleep is...
Providing Evidence	<ul style="list-style-type: none">– A study conducted by [Author] in [Year] found that...– According to neuroscientists, sleep is essential for...– Research suggests that individuals who get sufficient sleep...
Presenting Counterarguments & Rebuttals	<ul style="list-style-type: none">– Some argue that sleep is not essential for cognitive performance, but...– While it may seem possible to function on little sleep, long-term effects include...– A common misconception is that...– However, evidence contradicts this claim by showing...

Purpose	Useful Phrases
Adding More Points	<ul style="list-style-type: none"> – Furthermore,... – In addition,... – Moreover,... – Not only that, but...
Contrasting Ideas	<ul style="list-style-type: none"> – On the other hand,... – However,... – In contrast,... – Despite this,...
Drawing Conclusions	<ul style="list-style-type: none"> – In conclusion, it is evident that... – This discussion highlights the importance of... – Ultimately, sleep is not a luxury but a biological necessity. – These findings suggest that... – Taking everything into account,...

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