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ENGLISH FOR BIOLOGY STUDENTS

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спеціальностей «Біологія»

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Посібник-практикум містить комплекс завдань, спрямованих на розвиток набутих знань, вмінь та навичок з іноземної мови (англійської). Посібник розроблений для проведення практичних занять та організації самостійної роботи з англійської мови для студентів-біологів природничого факультету. Матеріал у посібнику викладено за темами, які відповідають змісту фахових дисциплін. У виданні подано тексти і вправи різної складності.

Рекомендовано студентам денної та заочної форми навчання.

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CONTENTS

PREFACE	4
UNIT 1. BIOLOGY – THE SCIENCE OF LIFE	5
UNIT 2. CELL THEORY	12
UNIT 3. EVOLUTION	17
UNIT 4. GENETICS	25
UNIT 5. VIRUSES	32
UNIT 6. PHOTOSYNTHESIS	38
REFERENCES	44

PREFACE

Посібник-практикум «English for Biology Students» («Англійська для студентів-біологів») призначений для студентів природничого факультету спеціальності «Біологія». Його метою є вдосконалення навичок усного та писемного мовлення за допомогою автентичних текстів для читання, укладених відповідно до тематики вивчення курсу «Іноземна мова» на вказаному факультеті.

Посібник-практикум відповідає програмі вивчення іноземної мови на природничому факультеті і вимогам необхідного кваліфікаційного рівня.

Мета посібника — підвищення фахової мовленнєвої компетенції студентів-біологів на матеріалі автентичних наукових джерел та сприяння розвитку наступних вмінь та навичок: ефективне читання англійської наукової літератури; нагромадження словникового запасу та його закріплення й активізація в усному мовленні; ведення бесіди в межах фаху; реферування та переклад наукових текстів.

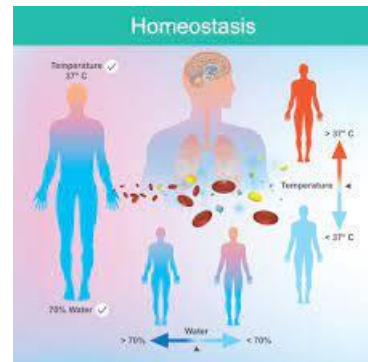
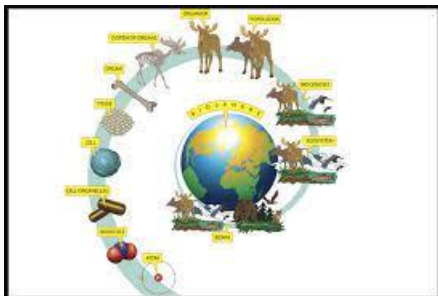
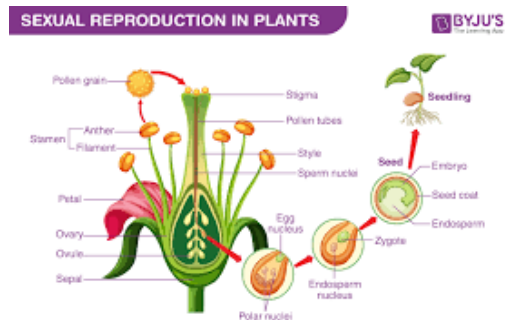
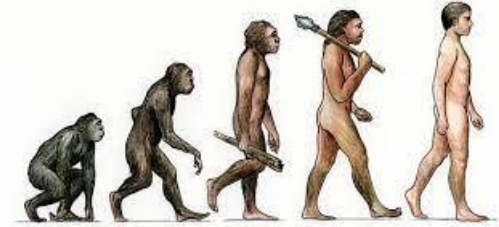
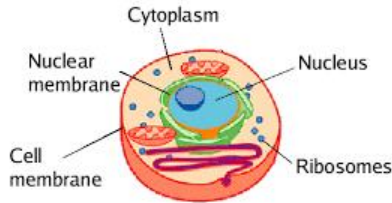
Матеріал поділено на шість розділів, тексти яких охоплюють інформацію про: біологію як науку, еволюцію, генетику, теорію клітин. Кожен блок занять завершується розділом із завданнями для додаткового тренінгу, розвитку вмінь та навичок, сформованих під час роботи із матеріалом блоку. Сюди включено тексти, що стосуються сучасних важливих та цікавих проблем у галузі біології та спонукають студентів до обговорення цих проблем; кросворди та ребуси на перевірку якості засвоєння базової термінології; також подано теми для підготовки та презентації доповідей.

Сучасні матеріали посібника відповідають змінам у сфері біології, оскільки у сучасному світі виникає потреба в оволодінні новою фаховою термінологією та вмінням вільно використовувати її у галузі біології в актах комунікації фахового характеру та під час перекладу фахових текстів українською мовою.

UNIT 1

BIOLOGY - THE SCIENCE OF LIFE

1. **Brainstorming.** Look at the pictures and answer the questions below.



1. How would you define the term *biology*? Think of this term. What comes to your mind?
2. What does biology study?
3. What branches of biology do you know?
4. What do biologists do?
5. What careers in biology can you think of?
6. What areas of biology do you consider as the most important for human society nowadays?

2. Pronounce, define the part of speech of the following words and translate them into Ukrainian.

- a) science, scientific, scientist.
- b) biology, biological, biologist.
- c) gene, genetics, geneticist.

Choose the correct word to complete each sentence.

- 1. 50 years ago _____ sequenced a gene for the first time.
- 2. _____ is a natural science concerned with the study of life and living organisms.
- 3. The definition of biology states that it is a _____ study.
- 4. The students of our department take many _____ courses.
- 5. Cell _____ study individual cells or groups of cells.
- 6. The _____ levels of organization of living things arranged from the simplest to most complex.
- 7. _____ study genes and their involvement in inheritance and development.

3. Match a word with its definition.

- 1. environment
- 2. matter
- 3. diversity
- 4. cell
- 5. specie
- 6. heredity
- 7. composed of
- 8. development

- a) the smallest unit of living matter
- b) a substance in general that everything in the world consists of
- c) the transmission of genetic characters from parents to offspring
- d) made of, consists of
- e) the act or process of developing, growth
- f) a group of living organisms with similar characteristics
- g) natural world in which people and animals live
- h) variety

4. Read the text and name the main principles or ideas of biology.

What is biology?

Biology is a natural science concerned with the study of life and living organisms. It studies living organisms and how they interact with one another and their **environment**.

The term is derived from the Greek words “*bios*” meaning “life” and “*logos*” meaning “study”. Biology examines the classifies and describes organisms, their functions, how **species** come into existence, and the interactions they have with each other and with the natural environment. Biology also includes the study of living organisms at the molecular, cellular, and organismal levels.

The current approach to the study of living things is based on the levels of biological organization involved — whether molecules, **cells**, individuals, or populations — and on the specific subject matter under investigation — for example, structure and function, types and classification, and growth and **development**.

The scope of biological science is so broad that it has been subdivided into separate **branches** for convenience of study. The main branches are:

- ✓ *Biochemistry*: the study of the material substances that make up living things.
- ✓ *Botany*: the study of plants, including agriculture.
- ✓ *Zoology*: the study of animals, including animal behavior.
- ✓ *Evolutionary biology*: the study of the origins and changes in the **diversity** of life over time.
- ✓ *Genetics*: the study of **heredity**.
- ✓ *Molecular biology*: the study of biological molecules.
- ✓ *Cellular biology*: the study of the basic cellular units of living things.
- ✓ *Sociobiology*: the study of genetic and social interactions among animal populations.
- ✓ *Ecology*: the study of how organisms interact with their environment.

All the branches of biology can be unified within a framework of five basic ideas about living things:

- *Cell Theory*: There are three parts to cell theory — the cell is the basic unit of-life, all living things are **composed of** cells, and all cells arise from pre-existing cells.
- *Evolution*: This is the overall unifying concept of biology. Evolution is the change over time that is the engine of biological diversity.
- *Genetics*: All living things have DNA and genetic information codes the structure and function of all cells.
- *Homeostasis*: All living things must maintain homeostasis, a state of balanced equilibrium between the organism and its environment.
- *Energy*: All living things require energy, and energy flows between organisms and between organisms and the environment.

5. Decide if the following statements are true or false.

1. Biology studies plants and animals and how they interact with one another and their environment.
2. Biology studies living organisms at different levels.
3. The term “Biology” means the study of life.
4. The science of biology is divided into different branches.
5. The main branches of biology are zoology and botany.
6. The scope of biological science is based on seven main ideas about living things.

6. Fill in the gaps using appropriate words and expressions from the text.

1. Biology studies living organisms and how they interact with one another and their
2. Biology also ... the study of living organisms at the molecular, cellular, and organismal levels.

3. The current approach to the study of living things is based on the ... of biological organization.

4. The scope of biological science is so broad that it has been subdivided into separate ... for convenience of study.

5. Zoology studies the ... and changes in the diversity of life over time.

6. ... biology studies the basic cellular units of living things.

7. Evolution is the change over time that is the engine of biological

8. All living things must ... homeostasis.

7. Fill in prepositions.

into, between, about, from, with, of, over, up, on

1. All living organisms interact ... one another and their environment.

2. "Biology" derives ... the Greek words "bios" and "logos".

3. The study of living things is based ... the levels of biological organization involved.

4. Biology is divided ... separate branches for convenience of study.

5. Biochemistry studies material substances that make ... living things.

6. Cellular biology studies the basic cellular units ... living things.

7. The science of biology is based on five main ideas ... living things.

8. Evolutionary biology studies the origins and changes in the diversity of life ... time.

9. Energy flows ... organisms and between organisms and the environment.

8. Answer the following questions.

1. What is biology?

2. What does the term "Biology" mean?

3. What levels do biologists study living organisms at?

4. What are the branches of biology?

5. Name five basic ideas about living things in biology.

6. What is evolution?
7. How do you define homeostasis?

9. Look at the picture and answer the following questions:



- ✓ *What skills and qualities should a biologist possess?*
- ✓ *What do biologists do?*
- ✓ *What careers in biology can you think of?*
- ✓ *What areas of biology do you consider as the most important for human society nowadays? Give your reasons.*

10. Match the definitions with jobs from the box.

ecologists geneticists biochemists physiologists
 cell biologists pathologists zoologists
 marine biologists pharmacologists pathologists

1. _____ study the origin and uses of drugs and their effects on the body, work on the development and delivery of medicines to patients.
2. _____ study genes and their involvement in inheritance and development.
3. _____ find out how organ systems work in a healthy body.
4. _____ study individual cells or groups of cells, often by culturing them outside organisms.

5. _____ study diseased and dysfunctional organs;
6. _____ study interactions between organisms and their environment.
7. _____ work at the chemical level, with the aim of revealing how DNA, proteins, and other molecules are involved in biological processes.
8. _____ study animals.
9. _____ study marine organisms, their behaviors and interactions with the environment.

11. Give the summary of the text (7-10 sentences). First complete these notes. Use them in your presentation.

Biology is a natural science.....

The term is derived from

There are several branches in biology. They are

The science of biology is based on five main ideas about living things:

.....

Biologists work as,,, and

In conclusion, biology is about

12. Write an essay “My future careers plans”.

UNIT 2

CELL THEORY

1. **Brainstorming.** Look at the pictures and answer the questions below.



1. What is a cell?
2. Why do you think the basic unit of life was called the cell?
3. What do you know about cells as units of life?
4. Who discovered cells?
5. Do plant cells differ from animal cells?
6. What do you know about Robert Hooke?

2. **Match these words with their definitions:**

1. cell	a) the process of being separated
2. microscope	b) a central part of a cell
3. observe	c) the DNA-containing area of a prokaryotic cell
4. division	d) the smallest part of a living thing that can exist independently
5. inherit	e) fluid inside a cell but outside the cell's nucleus
6. nucleus	f) watch carefully the way something happens
7. cytoplasm	g) hold or include within

8. membrane	h) a scientific instrument that lets us see very small things not seen by the naked eye
9. nucleoid	i) a thin soft pliable sheet or layer
10. contain	j) have the same character or appearance as your parents

3. Read the text and name the main ideas of cell theory.

Cell Theory

The cell is the basic unit of organization in living things. All organisms are composed of cells, and all cells come from preexisting cells — these two statements constitute the cell theory.

Cells were discovered in 1665 by the English scientist and inventor Robert Hooke. Hooke designed his own compound light microscope to observe structures too small to be seen with the naked eye. Among the first structures he examined was a thin piece of cork. Hooke described the cork as being made of hundreds of little boxes, giving it the appearance of a honeycomb. He called these little boxes cells. It soon became clear that virtually all living things are made of cells, and that these cells have certain features in common.

The concept that cells are the basic units of life became embodied in a theory called the cell theory, which embraces the following main ideas:

- cells form the building blocks of living organisms;
- cells arise only by the division of existing cells;
- cells contain inherited information which controls their activities;
- the cell is the functioning unit of life;
- given suitable conditions, cells are capable of independent existence.

A comparison of numerous kinds of cells shows that there are two distinct general arrangements, with only a few intermediate forms in evidence. One general arrangement is the *prokaryotic* type; they lack nuclei. The rest of the living world is

eukaryotic: its cells contain true nuclei. These cells usually include additional internal compartments that are surrounded by membranes.

Prokaryotic cells have three things in their structure:

✓ *plasma membrane*, separating the cell from its environment and regulating the inward and outward traffic of material.

✓ *nucleoid*, a relatively clear area containing the hereditary material (DNA) of the cell. Each cell has at least one of these, and some may contain more than one.

✓ *cytoplasm*, a fluid inside a cell, full of ribosomes, enzymes and the other chemical constituents of the cell. The function of ribosomes is to coordinate the synthesis of proteins.

The three main parts of a eukaryotic cell are the *cell membrane*, the *cytoplasm* and the *nucleus*. The cell membrane, also called the plasma membrane, is the outer layer that encloses the cell.

The eukaryotic cell is full of membranous structures of wondrous diversity. **Many of the structures are completely enclosed by one or two membranes, have distinct and characteristic external and internal forms, and carry on particular biochemical functions.** These membranous structures as well as other structures lacking membranes but possessing distinctive shapes and functions are referred to as organelles.

4. Watch and listen to the video “All About Cells and Cell Structure” and fill in the missing words in the right spaces.

(Video Link: <https://www.youtube.com/watch?v=3nBtY6LR030>)

General Structure of the Cell:

1) All plant cells and animal cells are surrounded by a _____, which is a thin, flexible layer that separates the inside of the cell from the outside of the cell.

2) Plant cells have an extra layer called the _____ that surrounds the _____.

3) Inside the _____, cells have smaller parts called _____, which are like tiny organs that each do specific jobs inside the cell.

4) All of the _____ are held in a special gel called _____.

Major Organelles:

5) The _____ is the control centre of the cell, which acts kind of like the brain, and contains the DNA of the cell.

6) _____ are basically storage tanks, to hold water or other materials that the cell needs.

7) A plant cell usually has one large _____, whereas animal cells may have several smaller ones, called _____.

8) _____ are the “powerhouses” of the cell – they take food and convert it into energy that the cell can use.

9) _____ are shaped like tiny balls and make things the cell needs, like proteins.

10) _____ or ER, is the “cellular highway”, acting as a transportation network that takes molecules where they need to go.

11) The ER takes proteins to the _____, which acts as a “post office”, checking proteins for flaws, packaging them up, and sending them where they need to go.

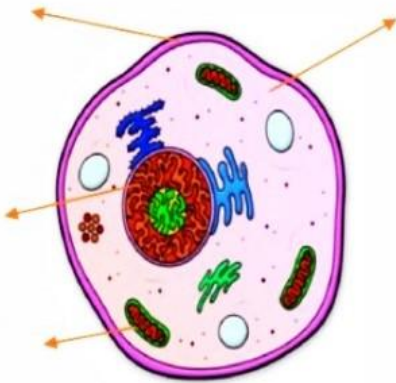
12) _____ are found only in plant cells, and contain chlorophyll,

the substance that allows plants to carry out photosynthesis.

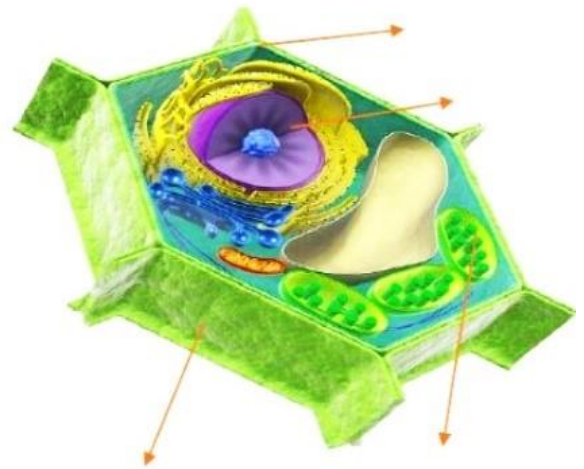
5. Look at the diagrams and fill in the words “an animal” or “a plant”, then label their parts.

nucleus - mitochondria – cell wall - cell membrane - cytoplasm - chloroplast

This is _____ cell.



This is _____ cell.



6. Match the parts of the cells to their functions.

NUCLEUS

MITOCHONDRIA

CHLOROPLAST

CELL MEMBRANE

CELL WALL

CYTOPLASM

- _____ This is responsible for controlling what goes in and out of the cell.
- _____ It's where most of reaction take place. It's also responsible for giving the cell its shape.
- _____ This part holds all of the DNA.
- _____ Provides structure and rigidity to the plant cell.
- _____ It's where respiration takes place and that produces energy.
- _____ It's used in the photosynthesis process to give plants energy from the

sun.

7. Using the following words complete the table.

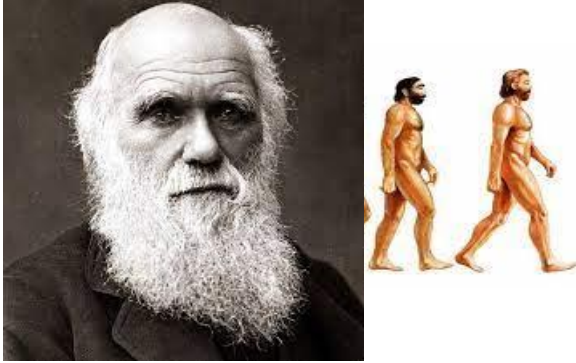
cell membrane – irregular shape – greenish – needs the sun for energy – mitochondria – cytoplasm – pinkish – cell wall – needs food for energy - rectangular shape – nucleus - chloroplasts

ANIMAL	BOTH	PLANT

8. Write an essay “Cell theory”.

UNIT 3
EVOLUTION

1. Brainstorming. Look at the pictures and answer the questions below.



1. Define the term “evolution”.
2. What do you know about the theory of evolution?
3. What is natural and artificial selection?
4. Who developed the theory of evolution?
5. What do you know about Charles Darwin?

2. Match these words with their definitions:

1. ancestor	a) the act, process, or accident of varying in condition, character or degree
2. offspring	b) a group of living organisms with similar characteristics
3. inherit	c) continue to live after someone
4. variation	d) the product of the reproductive processes of a person, animal or plant
5. evolution	e) have the same character or appearance as your parents

6. generation	f) the state or condition of being dead
7. specie	g) a group of people who are about the same age within a society or within a particular family
8. mortality	h) the act or process of selecting
9. survive	i) a person who was in someone's family in past times one of the people from whom a person is descended
10. selection	j) the way in which living things change and develop over millions of years

3. Fill in the missing words and and translate them into Ukrainian.

	Verb	Noun	Adjective
1	reproduce		
2	evolve		
3	develop		
4	inherit		
5	select		
6	reproduce		

4. Read the text and name the main ideas of evolution.

Evolution

The theory of evolution is one of the fundamental keystones of modern biological theory. It postulates that the various types of animals and plants have their origin in other pre-existing types. According to most biologists, the millions of species (including humans) are descended from other species that inhabited the world in the past. This change has come about by a process called evolution.

The term “evolution” was introduced into the scientific lexicon by Jean-Baptiste de Lamarck in 1809. The word evolution (from the Latin *evolutio*, meaning "to unroll like a scroll") was initially used to refer to embryological development.

Evolution happens when the genetic composition of a population changes over successive generations. Biological evolution is the process of change and diversification of living things over time, and it affects all aspects of their lives — morphology, physiology, behaviour, and ecology.

The theory of evolution by natural selection was first formulated in Darwin's book “On the Origin of Species” in 1859. The 19th-century English naturalist Charles Darwin argued that organisms come about by evolution and he provided a scientific explanation, essentially correct but incomplete. He came to the conclusion that, over successive generation, a new species comes into being by slow and gradual changes from a pre-existing one. He believed that these changes are brought about by a process which he called natural selection.

The basic principles of evolution are simple and seem obvious to the modern reader. The four key points of Darwin's Theory of Evolution are: individuals of a species are not identical; traits are passed from generation to generation; more offspring are born than can survive; and only the survivors of the competition for resources will reproduce. The variations of individuals give some members of the species advantages in the competition to survive and reproduce. Those advantageous traits will be passed to the next generation.

Variation in Populations. In every species there is variation. This variability occurs even between related individuals. Siblings vary in color, height, weight and other characteristics. Other characteristics rarely vary, such as number of limbs or eyes. The observer must be careful when making generalizations about a population. Some populations show more variation than others, particularly in geographically isolated areas such as Australia, the Galapagos, Madagascar and so forth. Organisms in these areas may be related to those in other parts of the world. However, due to very specific conditions in their surroundings, these species evolve very distinct characteristics.

Inherited Traits. Each species has traits determined by inheritance. Inherited traits passed from parents to offspring determine the characteristics of the offspring. Inherited traits that improve the odds of survival are more likely to be passed on to

subsequent generations. Of course, some characteristics, like weight and muscle mass, may also be affected by environmental factors such as food availability. But, characteristics developed through environmental influences will not be passed on to future generations. Only traits passed by genes will be inherited.

Offspring Compete. Most species produce more offspring each year than the environment can support. This high birth rate results in competition among the members of the species for the limited natural resources available. The struggle for resources determines the mortality rate within a species. Only the surviving individuals breed and pass on their genes to the next generation.

Survival of the Fittest. Some individuals survive the struggle for resources. These individuals reproduce, adding their genes to the succeeding generations. The traits that helped these organisms to survive will be passed on to their offspring. This process is known as “natural selection”. Conditions in the environment result in the survival of individuals with specific traits which are passed through heredity to the next generation. Today we refer to this process as “survival of the fittest.” Darwin used this phrase, but he credited a fellow biologist, Herbert Spencer as its source.

4. Decide whether the following statements are true or false according to the text.

1. The theory of evolution is one of the fundamental keystones of modern biological theory.
2. The term “evolution” was introduced into the scientific lexicon by Charles Darwin.
3. The theory of evolution is a new one.
4. Biological evolution is the process of change and diversification of human beings.
5. Charles Darwin is considered as the “father of evolutionary biology”.
6. The basic principles of evolution are very complicated.
7. There two main principles of Darwin's Theory of Evolution.
8. Individuals of a species are not identical.

9. Traits are passed from generation to generation of different species.
10. The advantageous traits are usually passed to the next generation.

5. Match the sentence halves. Make complete sentences.

1. In every species there is ...	a) ... and muscle mass, may also be affected by environmental factors such as food availability.
2. Each species has traits determined ...	b) ... resources determines the mortality rate within a species.
3. Inherited traits passed from parents to ...	c) ... variation.
4. Some characteristics, like weight ...	d) ... their genes to the next generation.
5. The struggle for	e) ... for resources.
6. Only the surviving individuals breed and pass on ...	f) ... by inheritance.
7. Some individuals survive the struggle ...	g) ... specific traits which are passed through heredity to the next generation.
8. Conditions in the environment result in the survival of individuals with ...	h) ... offspring determine the characteristics of the offspring.

6. Fill in prepositions.

into, of, in, through, by, from, to, for, on, over

1. The theory of evolution is one ... the fundamental keystones of modern

biological theory.

2. According ... most biologists, the millions ... species (including humans) are descended from other species that inhabited the world ... the past.

3. The term “evolution” was introduced ... the scientific lexicon ... Jean-Baptiste de Lamarck in 1809.

4. Evolution happens when the genetic composition of a population changes ... successive generations.

5. The theory ... evolution ... natural selection was first formulated in Darwin's book “On the Origin of Species” in 1859.

6. The basic principles of evolution are simple and seem obvious ... the modern reader.

7. There are four keys points ... Darwin's Theory of Evolution.

8. ... every species there is variation.

9. Organisms in these areas may be related ... those in other parts ... the world.

10. Each species has traits determined ... inheritance.

11. Inherited traits passed ... parents to offspring determine the characteristics of the offspring.

12. Inherited traits that improve the odds of survival are more likely to be passed ... to subsequent generations.

13. The struggle ... resources determines the mortality rate within a species.

14. The traits that helped these organisms to survive will be passed ... to their offspring.

15. Conditions in the environment result in the survival of individuals with specific traits which are passed ... heredity to the next generation.

7. Study different sources (encyclopedia, the Internet) and complete the chart with the contribution to the theory of evolution by each scientist.

	Scientist	Contribution
1	Charles Darwin	
2	Carolus Linnaeus	
3	Jean-Baptiste Lamarck	
4	George Buffon	
5	Erasmus Darwin	

8. Answer the following questions. Use all information given before:

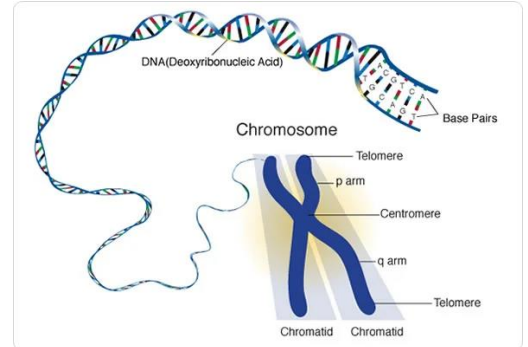
1. How does the evolution usually take place?
2. Who developed the theory of evolution?
3. What did Darwin mean by “natural selection”?
4. What are four key points of Darwin’s theory? Give examples.
6. What does “struggle for existence” mean?
7. What book is considered to be the most important in biology?
8. Do the majority of biologists accept Darwin’s theory?
9. What is neo-Darwinism?

9. Make a presentation on the topic “Artificial selection”.

UNIT 4

GENETICS

1. Brainstorming. Look at the pictures and answer the questions below.



1. How would you define the term *genetics*? Think of this term. What comes to your mind?

2. What does genetics study?

3. What branches of *genetics* do you know?

4. What do genetics do?

5. What methods and techniques of genetics?

Why do some people call genetics “a science of the future”?

2. Translate the following words and practice their pronunciation.

Animal husbandry, artificial insemination, chromosomal variation, chromosome, crossbreeding, cytogenetics, dominant, enzyme deficiency, experimental breeding, galactosemia, gene distribution, gout, molecular genetics, pharmaceutical industry, polygenic, recessive, strain, yeast.

3. Match a word with its definition.

Term	Definition
1. crossbreeding	a) variants of plants, viruses or bacteria
2. variation	b) A type of microorganism that is found almost everywhere, including inside the body
3. recessive gene	c) change or slight difference in a level, amount, or quantity
4. strain	d) being in an early stage of development
5. chromosome	e) failure of the body to produce a specific enzyme
6. budding	f) the act of mixing different species or varieties of animals or plants and thus to produce hybrids
7. yeast	g) occurring on or transmitted by a chromosome other than one of the sex chromosomes
8. autosomal	h) a long DNA molecule with part or all of the genetic material of an organism
9. enzyme deficiencies	i) a gene that can be masked by a dominant gene

4. Match the words to definitions.

<i>dominant</i>	<i>recessive</i>	<i>intermediate</i>	<i>polygenic</i>	<i>sex-</i>
	<i>linked</i>	<i>autosomal</i>		

- ✓ always expressed
- ✓ subordinate to a dominant trait
- ✓ partially expressed
- ✓ due to multiple genes
- ✓ result from the action of a gene on the sex, or X, chromosome
- ✓ result from the action of a gene on a chromosome other than a sex chromosome

5. Read the text and name the main areas of genetics.

GENETICS

Genetics is the study of genes, the way they operate and transmit from parents to offspring. Modern genetics involves study of the mechanism of gene action — the way in which the genetic material affects physiological reactions within the cell. Although genes determine the features an individual may develop, the features that actually develop depend upon the complex interaction between genes and their environment. Genetics overlaps many different branches of different sciences such as chemistry, biology, physics, mathematics, psychology, medicine etc.

Areas of study

Classical genetics. It studies the method by which genetic traits classified as dominant, recessive, intermediate or polygenic are transmitted in plants and animals. These traits may be sex-linked or autosomal. Classical genetics began with Mendel's study of inheritance in garden peas and continues with studies of inheritance in many different plants and animals.

Cytogenetics studies the structure and activities of cells, relationship between the mechanism of heredity and cellular activities. Cytologists discovered chromosomes and the way in which they duplicate and separate during cell division at about the same time that geneticists began to understand the behaviour of genes at the cellular level.

Genomics is an interdisciplinary field focusing on the structure, function, evolution, mapping, and editing of genomes. A genome is an organism's complete set of DNA, including all of its genes as well as its hierarchical, three-dimensional structural configuration.

Molecular genetics includes the study of the molecular nature of the gene and the method by which genes control the activities of the cell.

Population genetics is a study of genes in populations of animals, provides information on past migrations, evolutionary relationships and extents of mixing among different varieties and species, and methods of adaptation to the environment. Statistical methods are used to analyze gene distributions and chromosomal

variations in populations.

Human genetics. When classical geneticists first determined the principles of heredity in plants, fruit flies, mice, and other forms of life, they tried to interpret man's heredity in a similar way but found many traits that did not fit the patterns. As techniques improved, it was found that the method of inheritance of human characteristics is the same as that for other living things.

Methods and techniques of genetics

Experimental breeding. When animals that differ with respect to one or more primary traits are bred, and their offspring then are bred among themselves to give a second generation, the method of inheritance of the trait can be determined.

Cytogenetic techniques are closely associated with experimental breeding.

Biochemical techniques are used to determine the activities of genes within cells. Chemical tests are used to distinguish certain inherited characteristics of man; e.g., urinalysis and blood analysis reveal the presence of certain inherited abnormalities.

Mathematical techniques are used extensively in genetics. The laws of probability are applicable to **crossbreeding** and are used to predict ratios concerning the appearance of specific traits in offspring.

Nowadays genetic techniques are used nearly in all spheres of human activities. Agriculture and animal husbandry apply genetic techniques to improve plants and animals. Plant geneticists produce new species by special treatment.

Plant breeders use the techniques of **budding** and **grafting** to maintain desirable gene combinations originally obtained from crossbreeding. The use of the chemical compound **colchicine**, which causes chromosomes to double in number, has resulted in many new varieties of fruits, vegetables, and flowers.

Animal breeders use **artificial insemination** to propagate the genes of prize bulls. Prize cows can transmit their genes to hundreds of offspring by hormone treatment, which stimulates the release of many eggs that are collected, fertilized, and transplanted to foster mothers.

Various industries employ geneticists; the brewing industry, for example, may

use geneticists to obtain strains of yeast that produce large quantities of alcohol. The pharmaceutical industry has developed strains of molds, bacteria, and other microorganisms high in antibiotic yield.

Genetic techniques are used in medicine to diagnose and treat inherited human disorders. Knowledge of a family history of cancer or tuberculosis may indicate a hereditary tendency to develop these afflictions. Cells from embryonic membranes reveal certain genetic abnormalities, including *enzyme deficiencies*, that may be present in newborn babies, and thus permit early treatment.

6. Decide whether the following statements are true or false according to the text.

1. Genetics is the study of cells and their functions.
2. Genetics studies the mechanism of how genes affect physiological reactions within the cell.
3. Genetics is connected with algebra and geometry.
4. Classical genetics studies how genetic traits are classified as dominant, recessive, intermediate or polygenic.
5. Mendeleev was the first scientist who studied the inheritance in garden peas and continued to study the inheritance in many different plants and animals.
6. Genomics studies the structure and activities of cells, relationship between the mechanism of heredity and cellular activities.
7. Chromosomes were discovered by cytologists.
8. ***A genome is an organism's complete set of DNA.***
9. Population genetics studies populations of animals, their way of life.
10. Statistical methods are not important in genetics.
11. Genetics uses various methods and techniques.
12. Biochemical techniques are used to determine the activities of genes within cells.
13. Mathematical techniques have no connection to crossbreeding.
14. Agriculture and animal husbandry apply genetic techniques to improve

plants and animals.

15. Plant geneticists reproduce old species by special treatment.

16. Genetic techniques help doctors to diagnose and treat inherited human disorders.

7. Fill in prepositions.

as, of, with, in, as well as, by, between, within, by, to, on

- 1) Genetics is the study... genes.
- 2) Modern genetics involves study of the mechanism ... gene action.
- 3) Classical genetics studies the method ... which genetic traits classified ... dominant, recessive, intermediate or polygenic.
- 4) Classical genetics began ... Mendel's study of inheritance ... garden peas.
- 5) Cytogenetics studies the structure and activities of cells, relationship ... the mechanism of heredity and cellular activities.
- 6) Genomics is an interdisciplinary field focusing ... the structure, function, evolution, mapping, and editing of genomes.
- 7) A genome is an organism's complete set of DNA, including all of its genes ... its hierarchical, three-dimensional structural configuration.
- 8) Statistical methods are used ... analyze gene distributions and chromosomal variations in populations.
- 9) Cytogenetic techniques are closely associated ... experimental breeding.
- 10) Biochemical techniques are used to determine the activities of genes ... cells.
- 11) Mathematical techniques are used extensively ... genetics.
- 12) The laws of probability are applicable ... crossbreeding.
- 13) Prize cows can transmit their genes to hundreds of offspring ... hormone treatment.

8. Answer the following questions.

1. What is genetics?
2. Why it is important in our life?
3. What branches of genetics do you know? Give examples.
4. Name the basic methods of study used in genetics.
5. What is gene?

9. Give the summary of the text (7-10 sentences). First complete these notes.

Use them in your presentation.

Genetics is a natural science.....

The term is derived from

There are several branches in genetics. They are,..... and

Geneticists use the following methods,,
and

In conclusion, genetics

10. Study different sources (encyclopedias, books, the Internet) and complete the chart.

GENETIC DISORDERS OCCUR WHEN A MUTATION AFFECTS YOUR GENES OR CHROMOSOMES. SOME DISORDERS CAUSE SYMPTOMS AT BIRTH, WHILE OTHERS DEVELOP OVER TIME

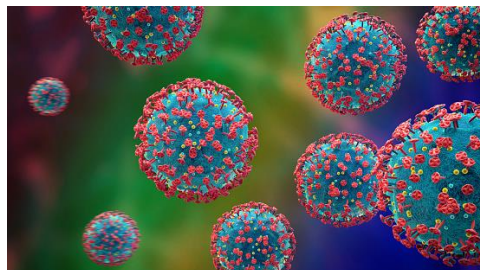
Name of the disease	Problems caused	Type of genetic disorder
Down's syndrome		
,, death	
		single gene disorder caused by a dominant allele

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UNIT 5

VIRUSES

1. Brainstorming. Look at the pictures and answer the questions below.



1. How would you define the term *virus*? What comes to your mind?
2. What do viruses cause?
3. What virus diseases do you know?
4. In what way are viruses different from all other living “things”?
5. How do you think: would life on earth change for better if all viruses suddenly disappeared?

2. Translate the following words and practice their pronunciation.

- a) virus, virion, viroid;
- b) bacteria, bacteriological, bacteriophage;
- c) capsid, parasite, vaccine, ultraviolet, incubation period.

3. Match a word with its definition.

Term	Definition
1) virion	a) the protein shell of a virus particle surrounding its nucleic acid
2) capsid	b) constant; habitual
3) viroid	c) a type of protein that can trigger normal proteins in the brain to fold abnormally
4) parasite	d) the molecule that carries genetic information for

	the development and functioning of an organism
5) prion	e) an infectious agents that consist only of naked RNA without any protective layer such as a protein coat
6) acute	f) small, virus-like organisms that infect bacteria
7) bacteriophage	g) an animal or plant that lives on or in another animal or plant of a different type and feeds from it
8) chronic	h) the time it takes for an infection to develop after a person has been exposed to a disease-causing organism
9) incubation period	i) means "sharp" or "severe" or "intense"
10) DNA	j) a complete viral particle, consisting of RNA or DNA surrounded by a protein shell and constituting the infective form of a virus

4. Read the text and explain the meaning of highlighted words.

VIRUSES

Viruses occupy a special taxonomic position: they are not plants, animals, or prokaryotic bacteria, and they are generally placed in their own kingdom or imperia. In fact, viruses should not even be considered organisms, in the strictest sense, because they are not free-living.

Viruses are small obligate intracellular parasites, which by definition contain either a RNA or DNA genome surrounded by a protective, virus-coded protein coat. Viruses may be viewed as mobile genetic elements, most probably of cellular origin and characterized by a long co-evolution of virus and host.

A complete virus particle is called a virion. The main function of the virion is to deliver its DNA or RNA genome into the host cell so that the genome can be expressed (transcribed and translated) by the host cell. The viral genome, often with associated basic proteins, is packaged inside a symmetric protein capsid.

All true viruses contain nucleic acid, either DNA or RNA, and protein. The

nucleic acid encodes the genetic information unique for each virus. The infective, extracellular form of a virus is called the *virion*. It contains at least one unique protein synthesized by specific genes in the nucleic acid of that virus. In virtually all viruses, at least one of these proteins forms a shell (called a *capsid*) around the nucleic acid. Certain viruses also have other proteins internal to the capsid; some of these proteins act as enzymes, often during the synthesis of viral nucleic acids.

Viroids are disease-causing organisms that contain only nucleic acid and have no structural proteins. Other viruslike particles called *prions* are composed primarily of a protein tightly complexed with a small nucleic acid molecule. Prions are very resistant to inactivation and appear to cause degenerated brain disease in mammals, including humans.

Viruses are quintessential *parasites*; they depend on the host cell for almost all of their life-sustaining functions. Unlike true organisms, viruses cannot synthesize proteins, because they lack ribosomes for the translation of viral messenger RNA into proteins. Viruses are also energy parasites; unlike cells, they cannot generate or store energy in the form of adenosine triphosphate (ATP). The true infectious part of any virus is its nucleic acid, either DNA or RNA but never both.

The virion capsid has three functions:

- ✓ to protect the viral nucleic acid from digestion by certain enzymes (*nucleases*),
- ✓ to furnish sites on its surface that recognize and attach (adsorb) the virion to receptors on the surface of the host cell, and
- ✓ to provide proteins that form part of a specialized component which enables the virion to penetrate through the cell surface membrane or, in special cases, to inject the infectious nucleic acid into the interior of the host cell.

Biologists use several criteria to classify viruses, including their nucleic acid content, their size, the shape of their protein capsid, the presence of a surrounding lipoprotein envelope, as well as the types and range of organisms the viruses infect, and the disease they cause.

Although viruses were originally discovered and characterized on the basis of the diseases they cause, most viruses that infect bacteria, plants, and animals (including humans) do not cause disease. Of those viruses that cause disease, some cause short-term (*acute*) diseases and others recurring or long-term (*chronic*) diseases. Some viruses cause acute disease from which there is fairly rapid recovery but may persist in the tissues, remaining dormant for long periods of time, and then become active again, bringing about serious disease decades later. Slowly progressive viruses have long *incubation periods* before the onset of disease.

5. Split the text “Viruses” into several logical parts and give titles to them .

6. Decide whether the following statements are true or false according to the text.

1. Viruses are not plants, animals, or prokaryotic bacteria.
2. Viruses are not considered to be organisms because they are not free-living.
3. Viruses are considered to be intracellular parasites.
4. A complete virus particle is called a virion.
5. The main function of the bacteria is to deliver its DNA or RNA genome into the host cell.
6. The viral genome is packaged inside a symmetric protein capsid.
7. All true viruses contain only DNA and protein.
8. The nucleic acid encodes the genetic information unique for each virus.
9. Virion contains at least one unique protein synthesized by specific genes in the nucleic acid of that virus.
10. Viroids are not harmful organisms that contain nucleic acid and have no structural proteins.
11. Viruslike particles (prions) are composed of a protein tightly complexed with a small nucleic acid molecule.
12. Prions are rather resistant to inactivation.
13. Viruses are quintessential and energy parasites.
14. Viruses can't leave without a host.

15. The virion capsid has only one function.

7. Fill in prepositions.

unlike, as, into, for, before of, either, with, in,

as well as, by, to, on

1. Viruses are generally placed ... their own kingdom or imperia.
2. Viruses are small obligate intracellular parasites, which contain either a RNA or DNA genome surrounded ... a protective, virus-coded protein coat.
3. Viruses may be viewed ... mobile genetic elements.
4. The main function of the virion is to deliver its DNA or RNA genome ... the host cell.
5. All true viruses contain nucleic acid, ... DNA or RNA, and protein.
6. The nucleic acid encodes the genetic information unique ... each virus.
7. The infective, extracellular form ... a virus is called the virion.
8. Certain viruses also have other proteins internal ... the capsid.
9. Prions are composed primarily of a protein tightly complexed ... a small nucleic acid molecule.
10. Prions are very resistant ... inactivation and appear to cause degenerated brain disease in mammals, including humans.
11. Viruses depend ... the host cell for almost all of their life-sustaining functions.
12. ... true organisms, viruses cannot synthesize proteins.
13. Biologists use several criteria to classify viruses, including their nucleic acid content, their size, the shape of their protein capsid, the presence of a surrounding lipoprotein envelope, ... the types and range of organisms the viruses infect, and the disease they cause.
14. Viruses were originally discovered and characterized ... the basis of the diseases they cause.
15. Slowly progressive viruses have long incubation periods ... the onset of

disease.

8. Use the words from the box to fill in the blanks in the sentences below.

nucleic, capsid, prokaryotic, parasites, functions, protein, genetic, virion,
disease-causing, function, viruses, particle

1. Viruses are not plants, animals, or _____ bacteria, and they are generally placed in their own kingdom or imperia.
2. _____ are not free-living.
3. Viruses contain either a RNA or DNA genome surrounded by a protective, virus-coded _____ coat.
4. A complete virus _____ is called a virion.
5. The main _____ of the virion is to deliver its DNA or RNA genome into the host cell.
6. All true viruses contain _____ acid.
7. The nucleic acid encodes the _____ information unique for each virus.
8. The infective, extracellular form of a virus is called the _____.
9. Certain viruses also have other proteins internal to the _____.
10. Viroids are _____ organisms that contain only nucleic acid and have no structural proteins.
11. Viruses are quintessential _____.
12. The virion capsid has three _____.

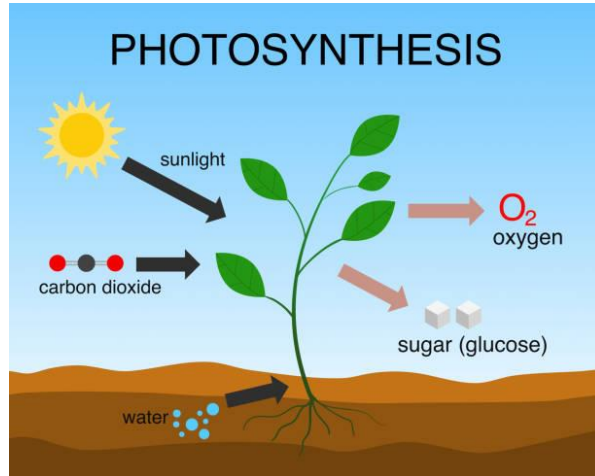
9. Answer the following questions.

1. What is virus?
2. What diseases can virus cause?
3. Describe the structure of viruses.
4. Name the virion capsid functions.

UNIT 6

PHOTOSYNTHESIS

1. Brainstorming. Look at the picture and answer the questions below.



1. What is photosynthesis?
2. Why is photosynthesis considered as the basis of life?
3. What is the structure and function of a chloroplast?
4. What do you know about the process of photosynthesis?

2. Match a word with its definition.

Term	Definition
hydrogen	the process by which plants use sunlight, water, and carbon dioxide to create oxygen and energy in the form of sugar
photosynthesis	a type of membrane-bound organelle known as a plastid that conducts photosynthesis mostly in plant and algal cells
substance	any of several related green pigments found in cyanobacteria and in the chloroplasts of algae and plants
chloroplast	the light that comes from the sun
respiration	a single step or degree in a process

chlorophyll	a nonmetallic gaseous chemical element with atomic number 1
carbon dioxide	the movement of oxygen from the outside environment to the cells within tissues
sunlight	a colourless gas having a faint sharp odour and a sour taste
stage	a material with particular physical characteristics

3. Read the text and describe the process of photosynthesis.

Photosynthesis

A typical plant takes in carbon dioxide (from the air) and water (from the soil) and builds these up into sugars and other complex substances. Oxygen is released as a waste product. The energy in the chemical bonds of the raw materials carbon dioxide and water is less than the energy in the chemical bonds of the products. Therefore the reaction is endergonic and requires an external source of free energy. This energy is supplied by sunlight that falls on the plant. A green substance, chlorophyll, enables the plant to trap light energy and use it to make sugars. The process of using sunlight to build up complex substances from simpler ones is called photosynthesis.

Photosynthesis is a complex process which takes place in a series of small steps. There are two main stages in photosynthesis: a light-dependent stage in which water is broken down into hydrogen and oxygen using light energy; and light-independent stage in which the hydrogen reacts with carbon dioxide to form a carbohydrate. Water is re-formed in this reaction. The light-dependent stage happens only in the light; the light-independent stage happens both when it is light and when it is dark.

The glucose formed by photosynthesis is used as the raw material for other chemical reactions. It is the main substrate used in respiration. Green life has been steadily pumping out oxygen as a waste product of photosynthesis for millions of years. Animals cannot make their own food. The only way they can obtain complex organic substances is by eating other organisms. These organisms ultimately depend on the ability of plants to harvest energy from sunlight to make food from carbon dioxide and water. Life on Earth is almost entirely solar powered.

The green parts of plants have chloroplasts, which contain all the biochemical machinery necessary for the light-dependent and light-independent stages of photosynthesis. Chloroplasts act as compartments, isolating the photosynthetic reactions from other cellular activities.

4. Decide whether the following statements are true or false according to the text.

1. A typical plant takes in carbon dioxide and water.
2. Hydrogen is released as a waste product.
3. The energy is taken by plants from the sunlight.
4. A green substance which enables the plant to trap light energy and use it to make sugars is called chloroplast.
5. The process of using sunlight to build up complex substances from simpler ones is called breeding.
6. There are four main stages in photosynthesis.
7. The light-dependent stage happens both in the light and darkness.
8. The glucose formed by photosynthesis is used in different chemical reactions. It is the main substrate used in respiration.
9. Animals produce the food themselves.
10. Life on Earth is wind powered.
11. All parts of plants have chloroplasts.

5. Fill in prepositions.

up, as, into, for, from, of, with, in, by, to, on

1. A typical plant takes ... carbon dioxide (from the air) and water (from the soil) and builds these ... into sugars and other complex substances.
2. Oxygen is released ... a waste product.
3. The energy is supplied ... sunlight that falls on the plant.
4. The process of using sunlight to build ... complex substances ... simpler ones is called photosynthesis.
5. Photosynthesis is a complex process which takes place ... a series of small steps.
6. There are two main stages ... photosynthesis.
7. In the light-independent stage the hydrogen reacts ... carbon dioxide to form a carbohydrate.
8. The glucose formed ... photosynthesis is used as the raw material ... other chemical

reactions.

9. The organisms ultimately depend on the ability of plants to harvest energy from sunlight to make food from carbon dioxide and water.

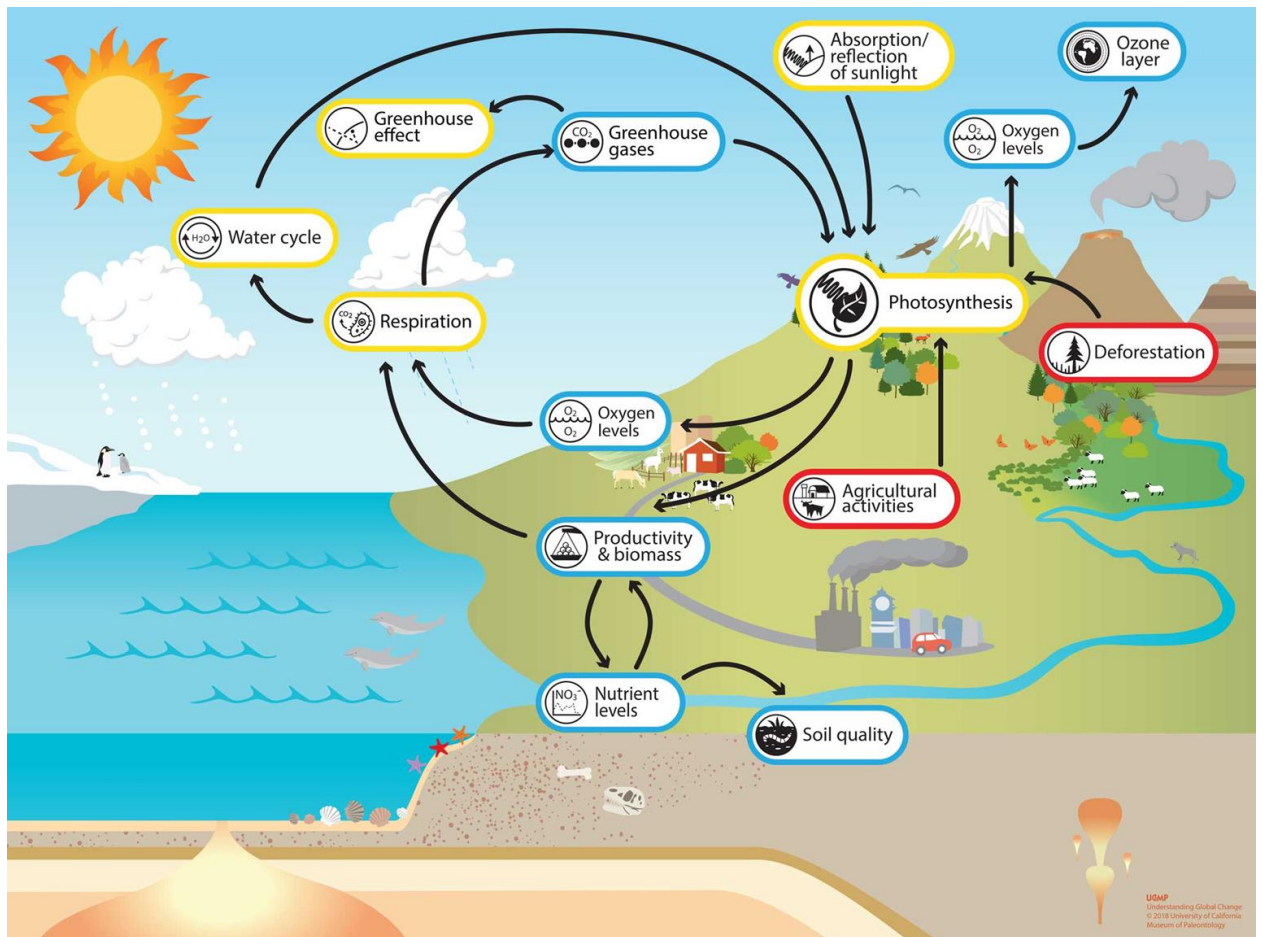
10. Life ... Earth is almost entirely solar powered.

11. The green parts ... plants have chloroplasts.

12. Chloroplasts act ... compartments, isolating the photosynthetic reactions ... other cellular activities.

6. Using the model below describe the process of photosynthesis in your own words.

- ✓ definition of the main terms
- ✓ stages of photosynthesis
- ✓ the role of photosynthesis for fauna and humans



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