أسئلة تدريبية وتغطية منهج لنهاية الفصل



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UNITED ARAB EMIRATES · MINISTRY OF EDUCATION

GRADE 7 SCIENCE

ADVANCED INSPIRE · END OF TERM 1 (EOT1)

Coverage Practice Questions · 2026–27

Mr. Ahmed Elhddad "The 1st Sci Teacher"

0563720249

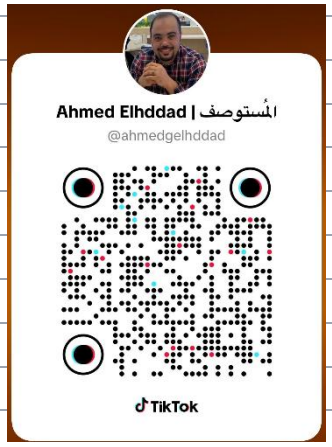
Student name: _____ Class: _____

Each learning outcome below includes the textbook reference, the practice questions, and **past-paper questions** from previous end-of-term exams (2021–2023) that match it.

LEARNING OUTCOMES INDEX

No.	Learning outcome	Past-paper Qs
1	The cell as the basic unit of structure and function	1
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3	Structure and support in plants and animals	2
4	Role of ligaments at joints	–
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22C	Main structures of the eye	–
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23B	Kidney function and waste filtering	–
23C	Photosynthesis	–
24A	Punnett squares and offspring traits	3
24B	Ratios of dominant and recessive phenotypes	1
24C	Pedigrees	–





1 LEARNING OUTCOME

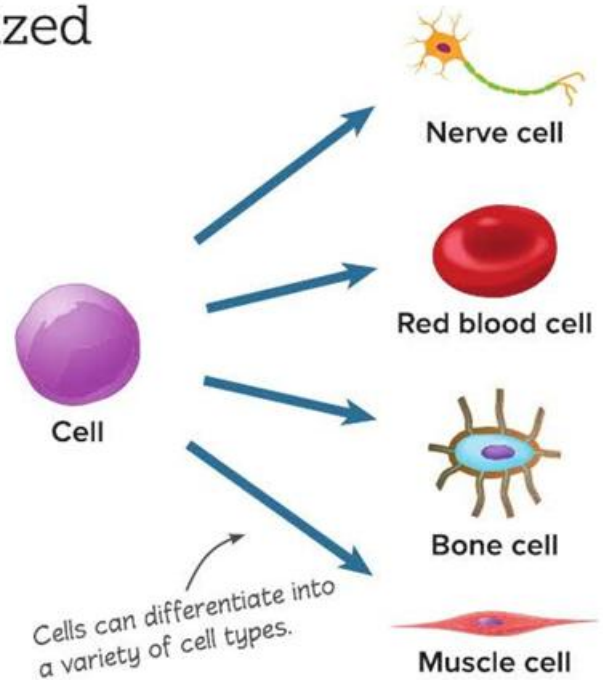
Explain that the cell is the basic unit of structure and function in living organisms.

REFERENCE

How are cells organized in the body?

Organisms can be unicellular—made of one cell, or multicellular—made of more than one cell. You've learned that your own body has trillions of cells! Multicellular organisms have different types of cells that each perform a specific job.

As multicellular organisms grow, cells divide to produce new cells. The first cells made can become any type of cell, such as a muscle cell, a nerve cell, or a blood cell, through the process of **cell differentiation.** As the number of cells in an organism increases, similar types of cells are organized into groups.



PRACTICE QUESTIONS

1. **What happens when a cell differentiates?**

.....

2. **Why do multicellular organisms need different types of cells?**

.....

3. **Some cells in the body become muscle cells, while others become bone cells. What does this tell you about cell differentiation?**

.....

PAST-PAPER QUESTIONS

4. **What is the significance of bone marrow in human health?** *[EOT 2021–22]*





A. It produces healthy nerve cells which can fight infection and carries messages to the brain.
B. It produces healthy blood cells which can fight infection and transport oxygen.
C. It produces healthy bone cells which can fight infection and protect vital organs.
D. It produces healthy muscle cells which can fight infection and causes movement.

2

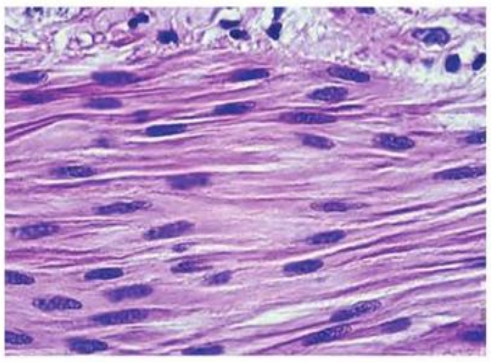
LEARNING OUTCOME

Compare the organization of structures in plants and animals, identifying similarities and differences in how cells, tissues, organs, and organ systems are organized.

REFERENCE

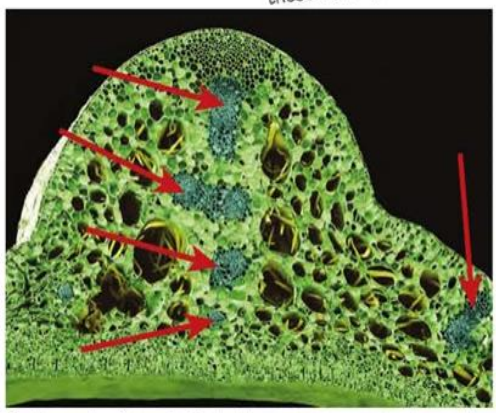
Tissues Cells group together to form tissues. **Tissues** are groups of similar types of cells that work together to carry out specific tasks. Humans, like most other animals, have four main types of tissue—muscle, connective, nervous, and epithelial (eh puh THEE lee ul). Muscle tissue, shown in the photo to the right, causes movement. Connective tissue provides structure and support and often connects other types of tissue together. Nervous tissue carries messages to and from the brain. Epithelial tissue forms the protective outer layer of the skin and the lining of major organs and internal body cavities.

Plants also have different types of tissues. The three main types of plant tissue are dermal, vascular (VAS kyuh lur), and ground tissue. Dermal tissue provides protection and helps reduce water loss. Vascular tissue, shown in the photo to the right, transports water and nutrients from one part of a plant to another. Ground tissue provides storage and support and is where photosynthesis takes place.

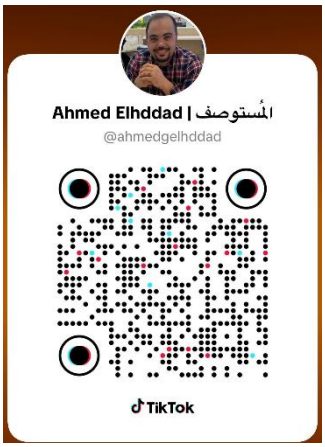


This muscle tissue contracts the stomach to help digestion.

What do you think these dark spots are?



Plant vascular tissue, indicated by arrows, moves water and nutrients throughout a plant.



THREE-DIMENSIONAL THINKING

WRITING Connection Write an argument that explains which human tissue is most similar in function to dermal tissue in plants.

PRACTICE QUESTIONS

1. **How are plant tissues and animal tissues similar and different in the functions they perform? Give one example of each.**

.....

.....

2. **Compare the functions of human connective tissue and plant vascular tissue.**

.....

.....

3. **A student says, "All tissues perform the same function." Do you agree or disagree? Give two examples to support your answer.**

.....

.....

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PAST-PAPER QUESTIONS

4. Most plants have specialized tissues called vascular tissue. How does vascular tissue help to transport materials inside plants? *[EOT 2021–22]*

- **A.** A type of vascular tissue called phloem carries water and dissolved nutrients from the roots to the stems and leaves; another type of vascular tissue called xylem carries dissolved sugars throughout the plant.
- **B.** A type of vascular tissue called xylem carries water and dissolved nutrients from the roots to the stems and leaves; another type of vascular tissue called phloem carries dissolved sugars throughout the plant.
- **C.** A type of vascular tissue called stomata carries oxygen, carbon dioxide and water from the leaves to the stems and roots; another type of vascular tissue called epidermis carries dissolved sugars throughout the plant.
- **D.** A type of vascular tissue called epidermis carries oxygen, carbon dioxide and water from the leaves to the stems and roots; another type of vascular tissue called stomata carries dissolved sugars throughout the plant.

5. Which of the following human tissue is most similar in function to dermal tissue in plants and why do you think so? *[EOT 2022–23]*

- **A.** muscle tissue because it helps in movement
- **B.** epithelial tissue because it provides protection
- **C.** connective tissue because it provides structure
- **D.** nervous tissue because it carries messages

6. What are the two major organ systems in plants? *[EOT 2022–23]*

- **A.** dermal system and vascular system
- **B.** shoot system and root system
- **C.** vascular system and shoot system
- **D.** shoot system and ground system

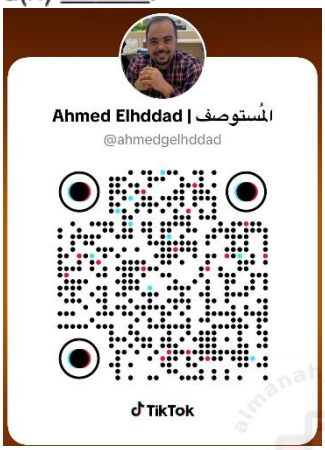


2) What makes up tissue?

- ○ **A)** a group of cells
- ○ **B)** a group of muscles
- ○ **C)** a group of organs
- ○ **D)** a group of organ systems

3) A group of organs that work together to perform a specific task is called a(n) _____.

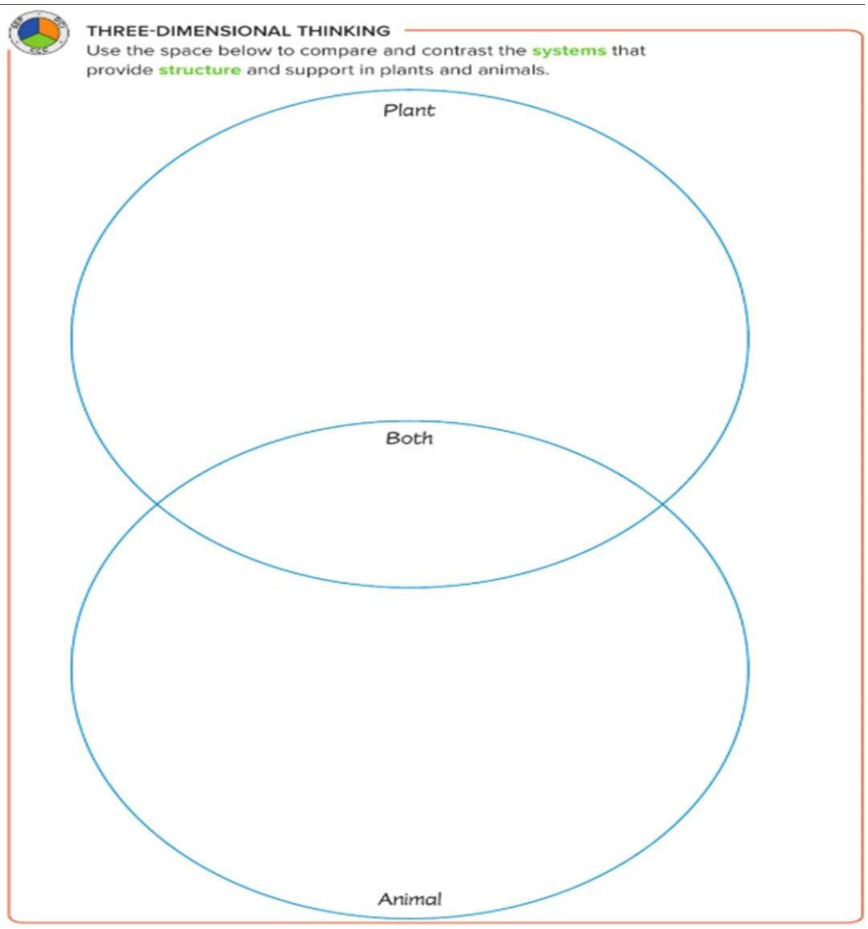
- ○ **A)** cell system
- ○ **B)** tissue system
- ○ **C)** organ system
- ○ **D)** organ vessel



3 LEARNING OUTCOME

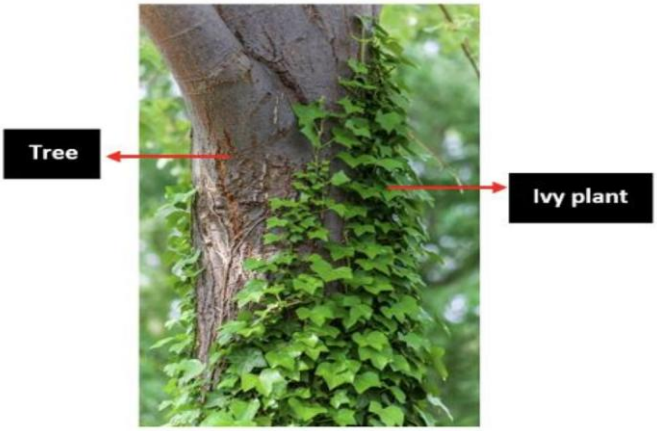
Compare how plants and animals are structured and supported.

REFERENCE



PAST-PAPER QUESTIONS

1. A student was doing research about plant stems in a forest as part of his science project. He found a climber (ivy plant) on a tree and discovered that their stems are of different kind. Determine the type of stem in both cases and justify your answer. *[EOT 2021–22]*





A. The climber has an herbaceous stem because it is green and soft; the tree has a woody stem because it is rigid and not green.

B. The climber has an herbaceous stem because it is rigid and not green; the tree has a woody stem because it is green and soft.

C. The climber has a fibrous stem because it is green and soft; the tree has a prop stem because it is rigid and not green.

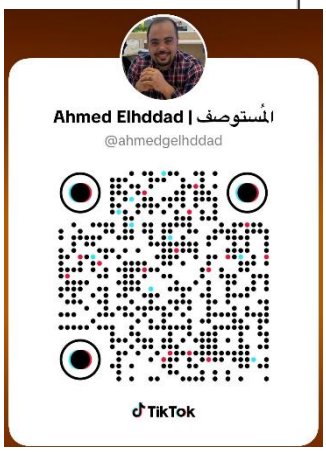
D. The climber has a fibrous stem because it is rigid and not green; the tree has a prop stem because it is green and soft.

2. Which of the following is/are not a function of the skeletal system? *[EOT 2022–23]*

I. protects the internal organs
II. stores fat and calcium
III. produces white blood cells

A. II only
B. I only
C. I & II only
D. III only

6) List the order of the body's organization, starting with the cell.



7) What is an effect of the organization of tissues into groups?

- **A)** They can carry out more complex functions.
- **B)** They can form new organisms.
- **C)** They can develop more than one cell type.
- **D)** They can carry out all functions required for life.

9) Identify three organ systems in the human body.



4 LEARNING OUTCOME

Explain the role of ligaments at joints.

REFERENCE

Joints Your bones work together at places called joints. A **joint** is where two or more bones meet. Joints provide flexibility and movement, like you saw with the girl doing a handstand at the start of the lesson. Bones are connected to other bones by tissues called **ligaments.** When the bones in joints move, ligaments stretch and keep the bones from shifting away from each other.

PRACTICE QUESTIONS

1. **What is a joint?**

   .....

2. **What are ligaments?**

   .....

3. **How do ligaments connect bones?**

   .....

4. **What happens to ligaments when bones move at a joint?**

   .....

1) Which of the following is stored in the skeletal system?

- ○ **A)** potassium
- ○ **B)** calcium
- ○ **C)** sodium
- ○ **D)** water

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3) Name the three types of skeletons.

10) Of the following, which is NOT a function of the skeletal system?

- ○ **A)** protects interior organs
- ○ **B)** gives shape and support to body
- ○ **C)** stores minerals
- ○ **D)** produces vitamin D

5 LEARNING OUTCOME

Explain how an earthworm moves without a rigid skeleton.

REFERENCE

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Fluid Support Some animals have a hydrostatic skeleton, which is a fluid-filled internal cavity surrounded by muscle tissue. Muscles help the organisms move by pushing the fluid in different directions. Flatworms, such as the one shown to the right, sea anemones (uh NE muh neez), and earthworms are organisms that have hydrostatic skeletons.

PRACTICE QUESTIONS

1. **How do muscles help an earthworm move?**

   ……..

2. **How does the fluid inside an earthworm's body help it move?**

   ……..

3. **An earthworm has no rigid skeleton. Explain how it can still move from one place to another.**

   ……

PAST-PAPER QUESTIONS

4. **How are animals with hydrostatic skeletons different from the ones with exoskeletons?** *[EOT 2021–22]*





   A. Animals with hydrostatic skeleton have a fluid-filled internal cavity surrounded by epithelial tissue which helps the organisms move; animals with exoskeleton have a thin, soft outer covering that protects and supports the animal's body.

   B. Animals with hydrostatic skeleton have a thin, soft outer covering that protects and supports the animal's body; animals with exoskeleton have a fluid-filled internal cavity surrounded by epithelial tissue which helps the organisms move.

   C. Animals with hydrostatic skeleton have a thick, hard outer covering that protects and supports the animal's body; animals with exoskeleton have a fluid-filled internal cavity surrounded by muscle tissue which helps the organisms move.

   D. Animals with hydrostatic skeleton have a fluid-filled internal cavity surrounded by muscle tissue which helps the organisms move; animals with exoskeleton have a thick, hard outer covering that protects and supports the animal's body.

6

LEARNING OUTCOME

Identify taproots, prop roots, and fibrous roots.

REFERENCE

Roots Even though the roots of most plants are never seen, they are vital to a plant's survival. Roots anchor a plant, either in soil or onto another plant or an object such as a rock. All roots help a plant stay upright. Some plants have roots that spread out in all directions several meters from a plant's stem. All root systems help a plant absorb water and other substances from the soil.

Many plants have a large main root, called a taproot, with smaller roots growing from it. Some plants have additional small roots above ground, called prop roots, that help support the plant. Other plants have fibrous root systems that consist of many small branching roots.



Taproot



Prop Roots



Fibrous Roots

Plants such as radishes and carrots store food in their roots. This food can be used to grow new plant tissues after a dry period or a cold season. Sugar stored in the roots of sugar maple trees over the winter is converted to maple sap in the spring. Farmers drain some of the sap from these trees and boil it to make maple syrup.

PRACTICE QUESTIONS

1. **Which type of roots grow above the ground and help support the plant?**

   .....

2. **Which root system consists of many small branching roots?**

   .....

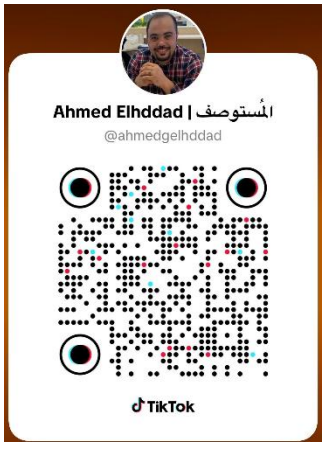
3. **Compare taproots and fibrous roots based on their structure.**

   .....

4. **How are prop roots different from taproots and fibrous roots?**

   .....

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7

LEARNING OUTCOME

Explain the function of the kidneys in filtering waste from the blood and why kidney function is important to the whole body.

REFERENCE

Kidneys The kidneys are bean-shaped organs that filter, or remove, waste from blood. They enable harmful substances to be removed from the body. If waste was allowed to build up in the blood, it would become toxic and harm the entire body.

Why is the function of the kidney so important for the entire body?

1.

PRACTICE QUESTIONS

1. **Why is the function of the kidney so important for the entire body?**

   .....
   .....

2. **What is the main function of the kidneys in the body?**

   .....
   .....

3. **How do the kidneys help remove harmful substances from the body?**

   .....
   .....

PAST-PAPER QUESTIONS

4. What is the function of kidneys in the human body? *[EOT 2021–22]*

- **A.** filter waste from blood
- **B.** filter waste from urine
- **C.** release waste in the form of carbon dioxide
- **D.** release waste in the form of salt

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5) What are the functions of the excretory system?

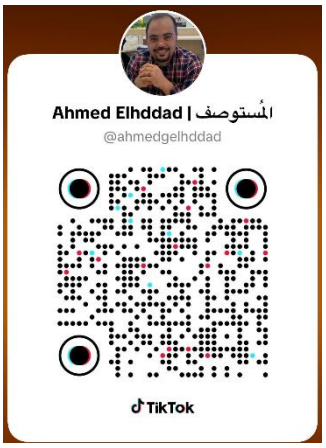
9) Explain how the respiratory system and the skin play a role in in the excretory system. How does this information support the statement that the body is a group of interacting systems and subsystems?

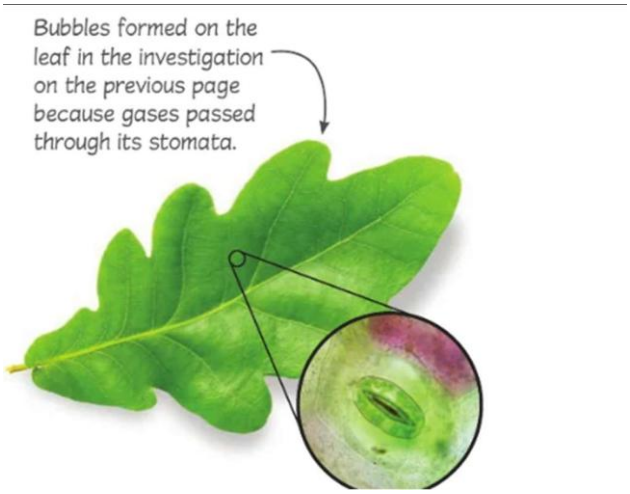
8

LEARNING OUTCOME

Explain the role of stomata in plants, including their role in the movement of carbon dioxide, oxygen, and water vapor.

REFERENCE





Carbon dioxide, oxygen, and water vapor pass into and out of a plant through small openings in the epidermis, or surface layer, of a leaf called **stomata** (STOH ma tah; singular, stoma). A stoma is shown in the figure to the right. Plants require oxygen and carbon dioxide to make food. Like you, plants produce water vapor as a waste product. This process is called transpiration.

PRACTICE QUESTIONS

1. **What are stomata?**

   ……

2. **Name the three substances that pass into and out of a plant through its stomata.**

   ……

3. **Why does a plant need to take in carbon dioxide and oxygen through its stomata?**

   ……

4. **Layla looks at a leaf under a microscope. She sees many tiny openings on its surface. Name these openings and describe what they do.**

   ……



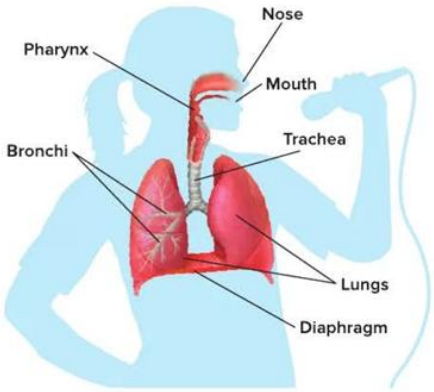
9

LEARNING OUTCOME

Describe the main functions of the human respiratory system, including how it brings oxygen into the body and removes carbon dioxide.

REFERENCE

The Respiratory System Gases are exchanged between the body and the environment. The parts of the respiratory system, shown to the right, work together and supply the body with oxygen. They also rid the body of wastes, such as carbon dioxide.



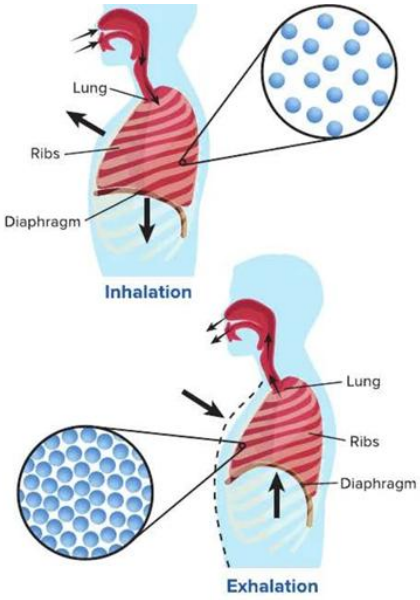
Oxygen enters the body when you inhale, or breathe in. Carbon dioxide leaves the body when you exhale. When you inhale, air enters the nostrils and passes through the pharynx. The **pharynx** is a tubelike passageway at the top of the throat that receives air, food, and liquids from the mouth or nose.

Because the pharynx is part of the throat, it is a part of both the digestive and respiratory systems. Food goes through the pharynx to the esophagus. Air travels through the pharynx to the **trachea,** a tube that is held open by C-shaped rings of cartilage. The trachea is also called the windpipe because it is a long, tubelike organ that connects the pharynx to the bronchi.

The **bronchi** are two narrower tubes that lead into the lungs. **Lungs** are the main organs of the respiratory system. Inside the lungs, the bronchi continue to branch into smaller and narrower tubes called bronchioles.

PHYSICAL SCIENCE Connection When high levels of carbon dioxide build up in your blood, the nervous system signals your body to breathe out. How does this happen?

The **diaphragm,** (DI uh fram) is a large muscle below the lungs that contracts and relaxes as air moves into and out of your lungs. The movement of your diaphragm causes changes in the air pressure inside your chest. Breathing occurs because of these changes in air pressure. For example, when your diaphragm contracts and moves down as you inhale, air rushes in to equalize air pressure. The diaphragm relaxes and moves up when you exhale. Air then rushes out to equalize the pressure.



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PRACTICE QUESTIONS

1. **What are the two main functions of the respiratory system?**

   .....

2. **What happens when you inhale, and what happens when you exhale?**

   .....

2) Oxygen moves between the respiratory system and the circulatory system when it transfers from _____ to _____.

- ○ **A)** alveoli, capillaries
- ○ **B)** bronchi, trachea
- ○ **C)** capillaries, veins
- ○ **D)** bronchi, capillaries

PAST-PAPER QUESTIONS

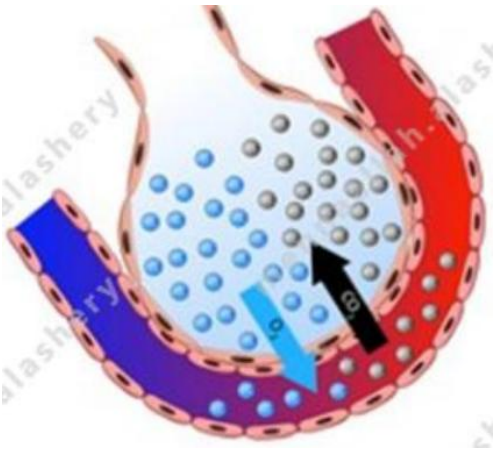
3. Breathing is the movement of air into and out of the lungs. Breathing enables you to take in oxygen and to eliminate carbon dioxide. Which of the following statements about the process of breathing exhibits an interaction of the respiratory system and muscular system?

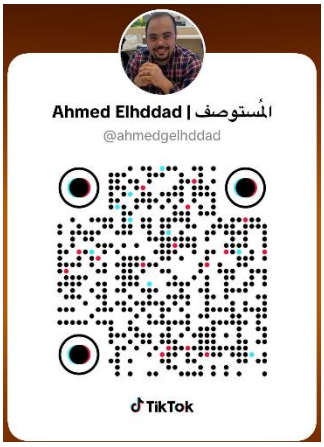
[EOT 2021–22]

I. Oxygen from the air you breathe moves into the blood.
II. Carbon dioxide from your blood moves into the alveoli.
III. The diaphragm contracts and relaxes as air moves into and out of your lungs.

A. I & III
B. II & III
C. I & II
D. III

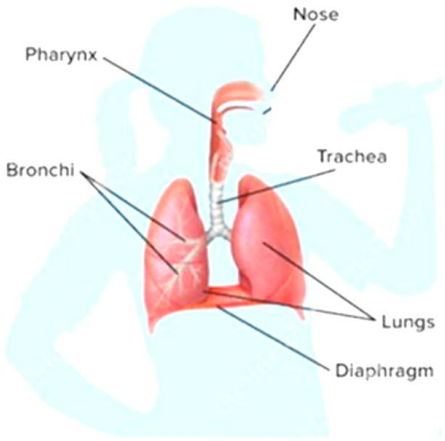
4. Which statement best describes the interaction between the respiratory system and the circulatory system shown here? *[EOT 2022–23]*





A. Oxygen moves from the bronchi into the trachea and carbon dioxide from the trachea moves into the bronchi.
B. Oxygen moves from the capillaries into the veins and carbon dioxide from the veins moves into the capillaries.
C. Oxygen moves from the alveoli into the blood in the capillaries and carbon dioxide from the capillaries moves into the alveoli.
D. Oxygen moves from the bronchi into the blood in the capillaries and carbon dioxide from the capillaries moves into the bronchi.

5. This illustration shows organs involved in the respiratory system. Which organ is a part of both digestive and respiratory systems? *[EOT 2022–23]*





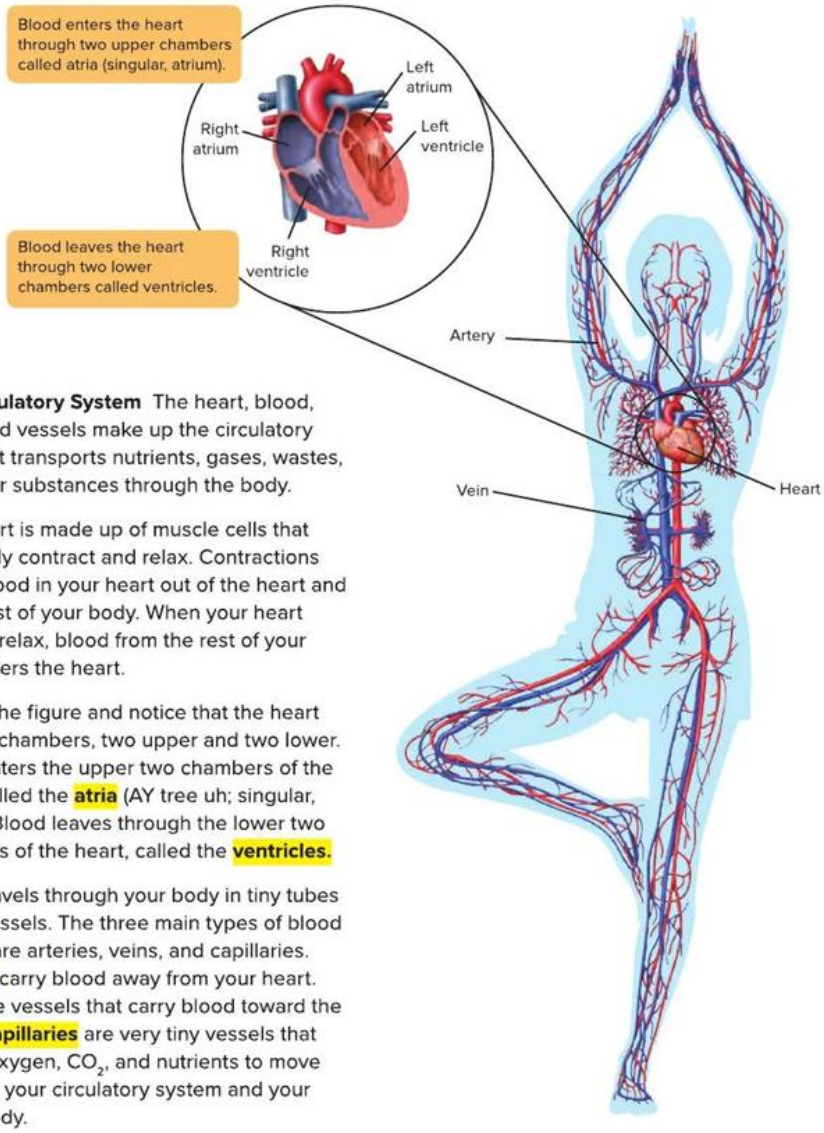
A. diaphragm
B. nose
C. pharynx
D. trachea

10

LEARNING OUTCOME

Distinguish between arteries, veins, and capillaries based on their roles in transporting blood.

REFERENCE



The Circulatory System The heart, blood, and blood vessels make up the circulatory system. It transports nutrients, gases, wastes, and other substances through the body.

Your heart is made up of muscle cells that constantly contract and relax. Contractions pump blood in your heart out of the heart and to the rest of your body. When your heart muscles relax, blood from the rest of your body enters the heart.

Look at the figure and notice that the heart has four chambers, two upper and two lower. Blood enters the upper two chambers of the heart, called the **atria** (AY tree uh; singular, atrium). Blood leaves through the lower two chambers of the heart, called the **ventricles**.

Blood travels through your body in tiny tubes called vessels. The three main types of blood vessels are arteries, veins, and capillaries. **Arteries** carry blood away from your heart. **Veins** are vessels that carry blood toward the heart. **Capillaries** are very tiny vessels that enable oxygen, CO_2, and nutrients to move between your circulatory system and your entire body.

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PRACTICE QUESTIONS

1. **What is the role of arteries?**

   ……

2. **What is the role of veins?**

   ……

3. **What is the role of capillaries?**

   ……

4. **Blood leaves the heart and travels to the arm. Which type of blood vessel carries this blood? Explain your answer.**

   ……

5. **Blood from the leg travels back to the heart. Which type of blood vessel carries this blood? Explain your answer.**

   ……

PAST-PAPER QUESTIONS

6. Which of the following correctly explains the functions of veins and capillaries? *[EOT 2022–23]*

- **A.** Veins enable oxygen, carbon dioxide, and nutrients to move between your circulatory system and your entire body and capillaries carry blood back to your heart.
- **B.** Veins enable oxygen, carbon dioxide, and nutrients to move between your circulatory system and your entire body and capillaries carry blood away from your heart.
- **C.** Veins carry blood away from your heart and capillaries enable oxygen, carbon dioxide, and nutrients to move between your circulatory system and your entire body.
- **D.** Veins carry blood back to your heart and capillaries enable oxygen, carbon dioxide, and nutrients to move between your circulatory system and your entire body.

4) Name the three main types of blood vessels and identify the function of each. Then, explain how a disease or disorder that affected the capillaries could affect the body as a whole.

5) What role does the trachea play in respiration?

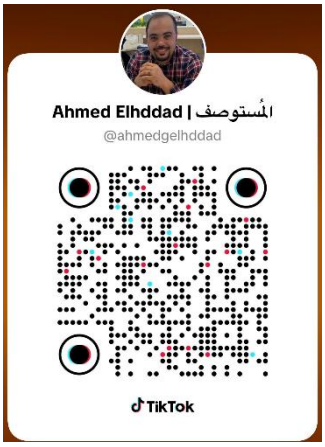
6) During gas exchange, oxygen moves into the blood, and carbon dioxide moves into the alveoli.

- ○ True
- ○ False

9) Which of the parts of the circulatory system brings blood from a part of the body to the heart?

- ○ **A)** arteriesa
- ○ **B)** capillaries
- ○ **C)** arterioles
- ○ **D)** veins





11

LEARNING OUTCOME

Explain how touch receptors detect stimuli such as pressure, temperature, and pain, and how differences in skin sensitivity help the body respond to its environment.

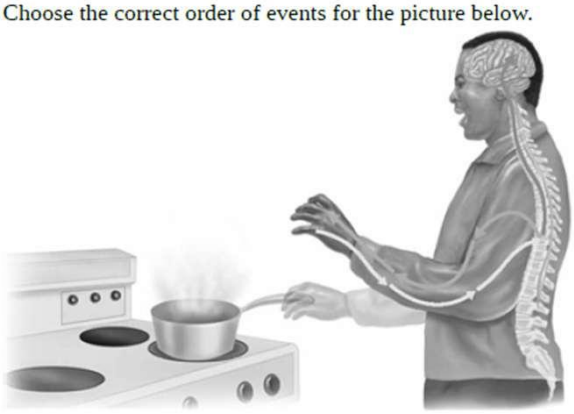
REFERENCE

Touch Like all the other senses, the sense of touch also uses special receptors that detect mechanical inputs in the environment. Receptors in your skin can detect temperature, pain, and pressure. Just like the other senses, touch receptors send messages to the brain where information is processed and memories are created. If you touch something hot and burn your hand, you'll remember how it felt.

THREE-DIMENSIONAL THINKING

Explain the cause and effect relationship involving touch and the ability to respond to an input or form a memory.

6) Choose the correct order of events for the picture below.



A) Receptors in your hand detect the heat and send signals to the spinal cord.
You feel pain.
Nerve signals travel from your spinal cord to your arm muscles and you pull your hand away.
Nerve signals travel from the spinal chord to the brain.

B) Receptors in your hand detect the heat and send signals to the spinal cord.
Nerve signals travel from your spinal cord to your arm muscles.
Nerve signals travel from the spinal cord to the brain.
You feel pain and you pull your hand away.

C) Receptors in your hand detect the heat and send signals to the spinal cord.
Nerve signals travel from your spinal cord to your arm muscles and you pull your hand away.
Nerve signals travel from the spinal cord to the brain.
You feel pain.

D) Receptors in your hand detect the heat and send signals to the spinal cord.
Nerve signals travel from the spinal cord to the brain.
Nerve signals travel from your spinal cord to your arm muscles.
You feel pain and you pull your hand away.

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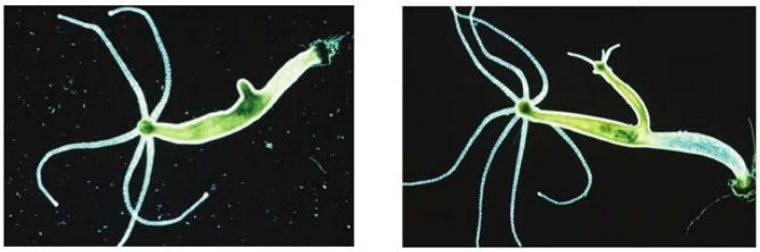
Ahmed Elhddad | المُستوصف
@ahmedgelhddad
TikTok

12 LEARNING OUTCOME

Explain how organisms reproduce asexually through budding, regeneration, and vegetative reproduction.

REFERENCE

Break Off a Piece



1. Examine the pictures of the hydra above. What evidence do you observe that the hydra reproduced?

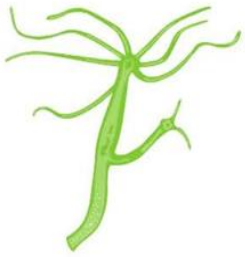
2. What are some advantages and disadvantages of this type of reproduction?

The hydra seen in the photos is budding. **Budding** is a form of asexual reproduction where an organism grows on the body of its parent.

COLLECT EVIDENCE

How can one organism such as the sea star produce offspring that are identical to itself? Record your evidence (A) in the chart at the beginning of the lesson.

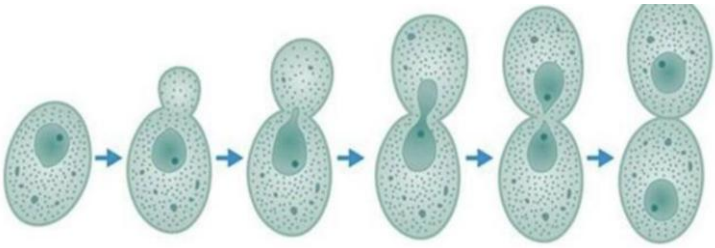
Hydras are organisms that live in freshwater environments. They have a tubelike body and a mouth at one end. Around the mouth are stinging tentacles that help to capture food. Depending on the conditions, hydras can reproduce sexually or asexually.



3. Based on your observations, which statement best explains what is happening to the hydra in the figure above?
   - **A** The hydra is reproducing asexually by budding a new hydra.
   - **B** The hydra is reproducing asexually by splitting in two.
   - **C** The hydra is reproducing sexually by grafting to another hydra.
   - **D** The hydra is reproducing sexually by releasing sex cells into the water.

PAST-PAPER QUESTIONS

1. Yeast are single-celled fungi. The diagram shows the stages of reproduction of yeast. Identify the type of reproduction observed in yeast and explain why this type of reproduction is advantageous. *[EOT 2021–22]*



- **A.** Yeast reproduces asexually through regeneration, and only one parent is required for reproduction.
- **B.** Yeast reproduces asexually through budding, and only one parent is required for reproduction.
- **C.** Yeast reproduces asexually through budding, and two parents are required for reproduction.
- **D.** Yeast reproduces asexually through regeneration, and two parents are required for reproduction.

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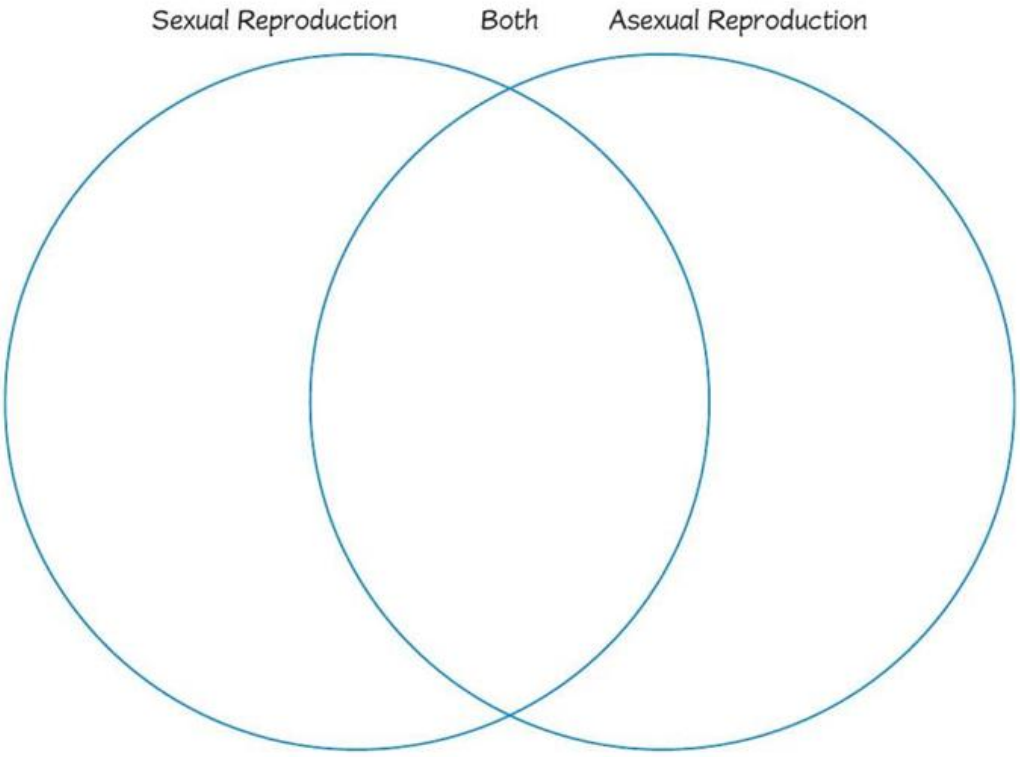
13 LEARNING OUTCOME

Distinguish between sexual and asexual reproduction.

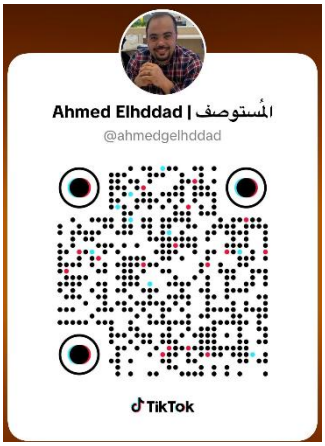
REFERENCE

	Asexual Reproduction	Sexual Reproduction
Advantages	Asexual reproduction enables organisms to reproduce without a mate. Searching for a mate takes time and energy. Asexual reproduction also enables some organisms to rapidly produce a large number of offspring.	Genetic variation occurs in all organisms that reproduce sexually. Due to genetic variation, individuals within a population have slight differences, which might be an advantage if the environment changes. Some individuals might have traits that enable them to survive unusually harsh conditions such as a drought or severe cold. Other individuals might have traits that make them resistant to disease.
Disadvantages	Asexual reproduction results in little genetic variation within a population. Genetic variation can give organisms a better chance of surviving if the environment changes. Another disadvantage of asexual reproduction involves genetic changes, called mutations. If an organism has a harmful mutation in its cells, the mutation will be passed to asexually reproduced offspring. This could affect the offspring's ability to survive.	Sexual reproduction takes time and energy. Organisms have to grow and develop until they are mature enough to produce sex cells. Then the organisms have to form sex cells—either eggs or sperm. Before they can reproduce, organisms usually have to find mates. Searching for a mate can take a long time and requires energy. The search for a mate might also expose individuals to predators, diseases, or harsh environmental conditions.

1. **Compare and contrast** asexual reproduction and sexual reproduction by filling in the Venn diagram below.







PAST-PAPER QUESTIONS

1. Which of the following correctly explain(s) how organisms produced through sexual reproduction are different from those produced by asexual reproduction? *[EOT 2022–23]*

	Sexual reproduction	Asexual reproduction
I	genetically unique and different from parents	genetically identical to parent organism
II	only one parent organism involved	two parent organisms involved
III	offspring are more resistant to disease due to genetic variation	offspring are less resistant to disease due to little genetic variation

A. I, II & III
B. I only
C. I & II only
D. I & III only

COLLECT EVIDENCE

What are the advantages and disadvantages of the different types of reproduction, such as that of the sea star at the beginning of the lesson?

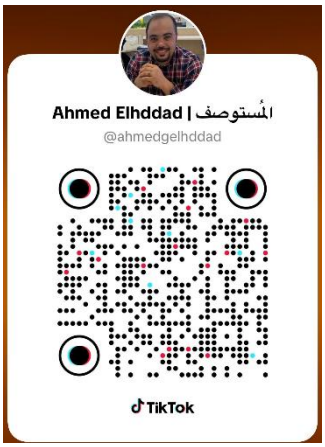


1) Asexual reproduction involves two parent organisms.

- ○ True
- ○ False

2) Hydra reproduce by _____.

- ○ **A)** budding
- ○ **B)** fission
- ○ **C)** regeneration
- ○ **D)** sexual reproduction



4) In _____, an offspring grows from a piece of its parent.

- ○ **A)** fission
- ○ **B)** budding
- ○ **C)** regeneration
- ○ **D)** sexual reproduction

14

LEARNING OUTCOME

Explain how organisms reproduce asexually through budding, regeneration, and vegetative reproduction.

REFERENCE

Asexual Reproduction Recall in the beginning of the lesson you read about sea stars reproducing after being cut up. This happened through regeneration. **Regeneration** occurs when an offspring grows from a piece of its parent. Just like sea stars, some plants don't need seeds to make new plants. Some plants can be grown from a leaf, a stem, or another plant part through vegetative reproduction. **Vegetative reproduction** is a form of asexual reproduction in which offspring grow from a part of a parent plant. **Asexual reproduction** occurs when only one parent organism or part of that organism produces a new organism. The new organism is genetically identical to the parent.

PRACTICE QUESTIONS

1. **Explain how regeneration and vegetative reproduction produce new organisms from parts of a parent organism.**

   .....
   .....

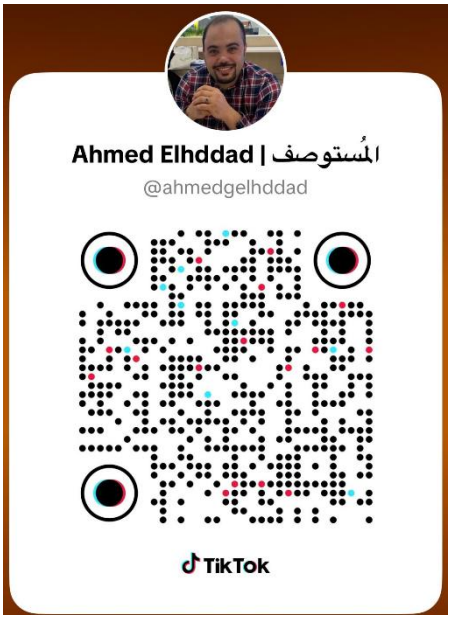
2. **A gardener grows a new plant from a stem cutting instead of a seed. Explain how the stem cutting can grow into a new plant.**

   .....
   .....

3. **A sea star is cut into pieces, and one piece grows into a new sea star. Explain how this happens through regeneration.**

   .....
   .....





15

LEARNING OUTCOME

Explain how animal behaviors increase the probability of successful reproduction.

REFERENCE

Animal Mating Behaviors — Key Points

Competition & Aggression

- **Same species** compete for mates.
- Rivals may compete **physically** or through **displays**.
- **Male deer** can become **very aggressive** when competing.
- **Peacocks** show **feathers**, and **male frigate birds** inflate **throat sacks** to attract mates.



Chemical Attraction (Pheromones)

- Some animals (e.g., white female gypsy moth) release **pheromones** (chemical signals) that attract males.
- Many moths and butterflies can detect these signals.
- They can detect pheromones by **smell** from up to **six miles** away.

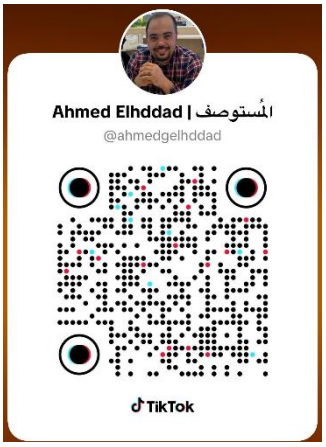


Courtship to Gain Attention

- Other animals (e.g., birds and frogs) use **mating songs** to gain attention from mates.
- Some male birds bring the female a **gift of food** (e.g., a male tern brings a fish).
- Male fiddler crabs wave **enlarged claws** and skitter across the ocean floor.
- Male bowerbirds build **elaborate nests** using **brightly colored objects** during courtship.



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PRACTICE QUESTIONS

1. **How do pheromones help moths find mates?**

   .....

2. **How do colorful feathers help male peacocks attract females?**

   .....

3. **How does bringing food to a female help a male bird attract a mate?**

   .....

4. **How do birds use songs to attract mates?**

   .....

5. **Why do male mule deer fight with each other during the breeding season?**

   .....

6. **How does waving enlarged claws help male fiddler crabs attract females?**

   .....

7. **How do male bowerbirds use colorful objects to attract females?**

   .....

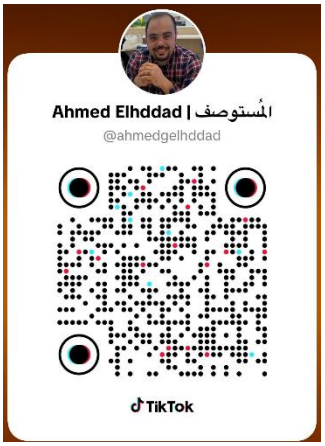
8. **Animals use different behaviors to attract mates. For example, some birds sing, male fiddler crabs wave their enlarged claws, and male bowerbirds arrange colorful objects. Choose two examples and explain how each behavior helps the animal attract a mate.**

……
……

PAST-PAPER QUESTIONS

9. **Animals reproduce and ensure the growth of their young by engaging in specific behaviors. Which of the following is a courtship behavior in mule deer?** *[EOT 2021–22]*





A. herd their offspring
B. compete physically with members of same species
C. running away from predators
D. searching for food

10. **Animals reproduce and ensure the growth of their young ones by engaging in specific activities. Which of the following is a courtship behaviour in sandhill cranes?** *[EOT 2022–23]*



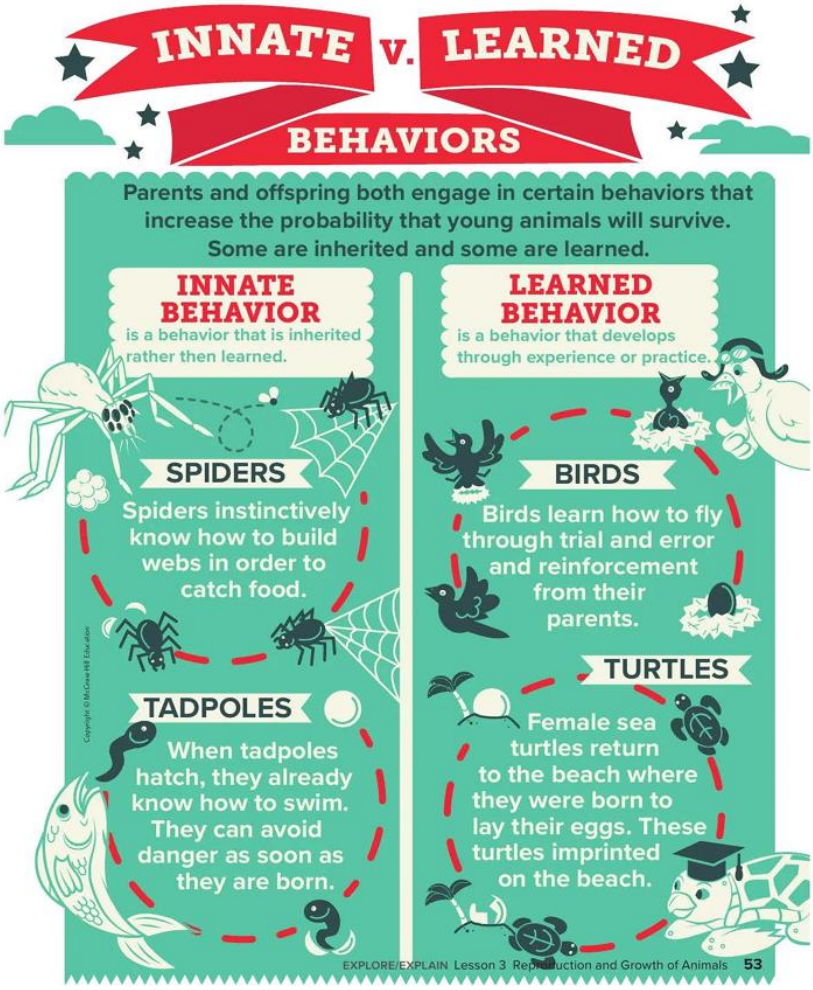


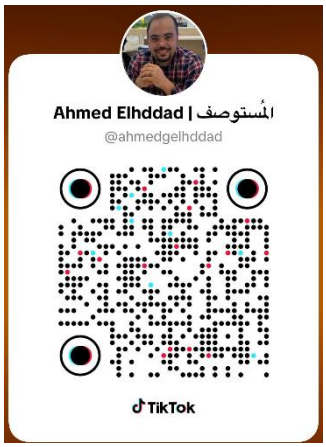
A. compete physically with members of the same species
B. performing a dance
C. searching for food
D. herd their offspring

16 LEARNING OUTCOME

Identify innate behaviors that help young animals survive.

REFERENCE







PRACTICE QUESTIONS

1. **How do spiderlings use innate behavior to get food?**

   ……

2. **How do tadpoles survive soon after they hatch?**

   ……

3. **Why is swimming innate behavior in tadpoles?**

   ……

4. **How does innate behavior help young animals survive?**

   ……

5. **What is the difference between innate and learned behavior?**

   ……

PAST-PAPER QUESTIONS

6. **A variety of mammals, amphibians, fish, reptiles, and insects engage in characteristic behaviors to protect their young. Which of the following behavior is an example for this?** *[EOT 2021–22]*

   A. birds build nests on trees
   B. peacocks perform dance
   C. moths release chemical substances called pheromones
   D. fiddler crabs wave their enlarged claws and skip across the ocean floor

7. When tadpoles hatch, they already know how to swim. How would you classify this behavior, and what is its advantage? *[EOT 2022–23]*

A. This is an innate behavior, and it helps them to avoid danger as soon as they are born.
B. This is an innate behavior, and it helps them to attract their mate as soon as they are born.
C. This is a learned behavior, and it helps them to attract their mate as soon as they are born.
D. This is a learned behavior, and it helps them to avoid danger as soon as they are born.

8) Which of the following is NOT a disadvantage of asexual reproduction?

- **A)** do not need a mate
- **B)** little genetic variation
- **C)** mutations can occur
- **D)** all susceptible to same disease



1) Of the following, which is NOT a courtship behavior?

- **A)** birds singing
- **B)** fireflies lighting up
- **C)** frogs croaking
- **D)** dogs digging

2) Animal communication includes _____.

- **A)** courtship behavior
- **B)** aggression
- **C)** pheromones
- **D)** all of the above

3) Innate behavior increases the survival of young animals because it allows an animal to respond to a stimulus without choosing the proper response.

- True
- False

4) Which animal behavior attracts mates by competing with members of the same species?

- **A)** aggression
- **B)** submission
- **C)** territory
- **D)** courtship

17

LEARNING OUTCOME

Explain how plants respond to external stimuli through tropisms, including phototropism (light), gravitropism (gravity), and thigmotropism (touch).

REFERENCE



In the investigation *Testing Plant Growth* you observed environmental factors that affect how plants grow. A tropism (TROH pih zum) is a response that results in plant growth toward or away from a stimulus. The growth of a plant toward or away from light is called **phototropism.** A plant has a light-sensing chemical that helps it detect light. The response of a plant to touch is called **thigmotropism** (thihg MAH truh pih zum). The vine growing up the fence in the photo clings to the fence in response to touching it. The response of a plant to gravity is called **gravitropism.** Stems grow away from the pull of gravity, while roots grow toward the pull of gravity.

Genetic factors also affect how plants grow. Plants inherit genes from their parents that determine traits, such as what color flowers they will have and where on the plant the flowers will bloom.

PRACTICE QUESTIONS

1. **What is phototropism?**

   ……

2. **How does a plant respond to light?**

   ……

3. **What is gravitropism?**

   ……

4. **How do a plant's roots respond to gravity?**

   ……

5. **What is thigmotropism?**

   ……

6. **How does a vine respond when it touches a fence?**

   ……

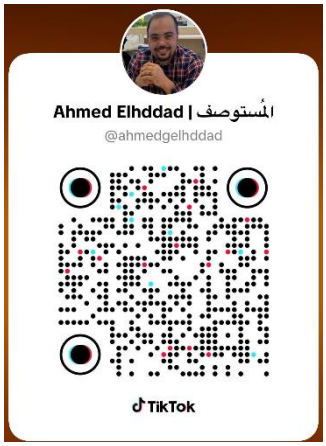
7. **How do plants respond to different external stimuli through tropisms?**

   ……

PAST-PAPER QUESTIONS

8. **What is thigmotropism?** *[EOT 2021–22]*

   A. the response of a plant to gravity
   B. the response of a plant to light
   C. the response of a plant to touch
   D. the response of a plant to water





18 LEARNING OUTCOME

Identify and compare seed-producing plants and seedless plants.

REFERENCE

Types of Plant Reproduction Some plants reproduce sexually, some plants reproduce asexually, and some plants can reproduce in both ways. Asexual reproduction occurs when a portion of a plant develops into a separate new plant. Sexual reproduction occurs when a plant's male reproductive cell (sperm) combines with a plant's female reproductive cell (egg). The way a plant reproduces depends on the structures it has.



These hens and chicks can reproduce without seeds, or asexually. New "chicks" can grow from the stolons on the main "hen" plant.

Seedless Plants Not all plants grow from seeds. The first land plants to inhabit Earth most likely were seedless plants—plants that grow from spores, not from seeds. Mosses and ferns are examples of seedless plants found on Earth today.

Seed Plants There are two groups of seed plants—flowerless seed plants and flowering seed plants. Both produce seeds that result from sexual reproduction. The plants produce pollen grains, which contain sperm. They also produce female structures, which contain one or more eggs. **Pollination** occurs when pollen grains land on a female plant structure of the same species. If the pollen joins with an egg, fertilization occurs and a seed develops. In nonflowering plants, the pollen is produced by the male cone, and the eggs are contained within the female cone. In flowering plants, the female reproductive organ is the pistil, and the male reproductive organ is the stamen.

PRACTICE QUESTIONS

1. **What are seedless plants? Give two examples.**

   ……

2. **What are seed-producing plants?**

   ……

3. **How do seedless plants reproduce?**

   ……

4. **How do seed-producing plants reproduce sexually?**

   ……

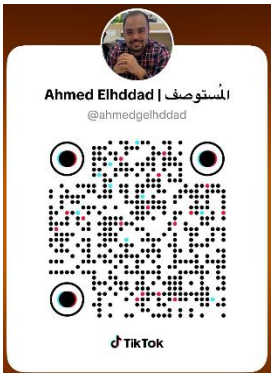
5. **What is the main difference between seedless plants and seed-producing plants?**

   ……

6. **How are mosses and ferns different from flowering plants?**

   ……



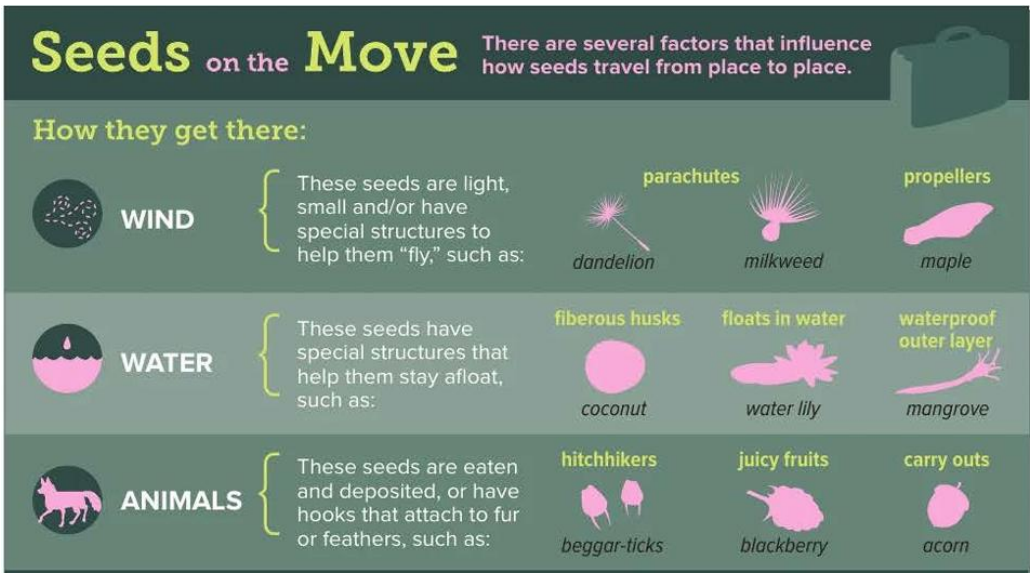


19

LEARNING OUTCOME

Identify different methods of seed dispersal and explain how seeds are dispersed by wind, water, and animals.

REFERENCE



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PRACTICE QUESTIONS

1. **What are the three main methods of seed dispersal?**

   ……

2. **How does wind help seeds move to new places?**

   ……

3. **How does water help seeds spread to new places?**

   ……

4. **How do animals help disperse seeds?**

   ……

5. **How does a dandelion seed spread by wind?**

   ……

6. **How does a coconut seed spread by water?**

   ……

7. **How do hooks on some seeds help them spread through animal fur?**

   ……

PAST-PAPER QUESTIONS

8. **You poked your finger on a burr as you pulled it out of your dog's fur. When you look at the burr more closely, you notice that it has sharp hooks. How does this special feature (sharp hooks) help the plant in its survival?** *[EOT 2021–22]*



A. This is a strategy to escape from predators by poking them with hooks.
B. This is a strategy to attract a mate which ensures that fertilization and seed formation occur.
C. This is a reproductive strategy that helps the plant spread its seeds as far away as possible.
D. This is a strategy to attract bees which ensures the transfer of pollen.

9. The child in the photograph is helping a dandelion disperse its seeds. What are the characters ideal for dispersion by wind? *[EOT 2022–23]*

A. small, light, and hair-like
B. big, light, and sharp hooks
C. big, light, and fibrous husk
D. small, light, and sharp hooks

4) Which is the most likely description of a seed that is dispersed by wind?

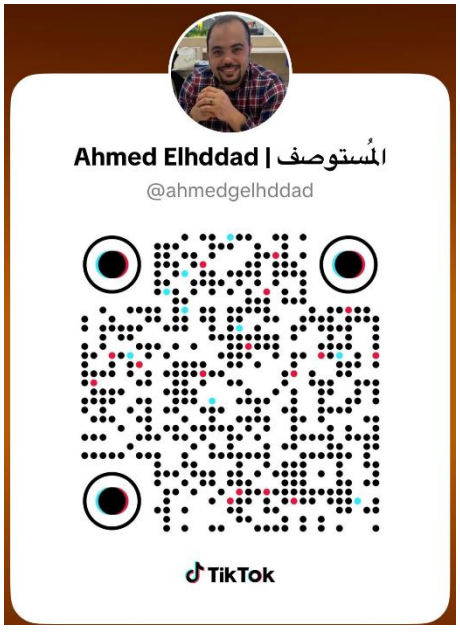
- **A)** It can float.
- **B)** It has a thick, hard shell.
- **C)** It has a waterproof coating.
- **D)** It is small and light.

6) Which is an example of an animal behavior that directly affects plant reproduction?

- **A)** birds building a nest using twigs
- **B)** squirrels burying nuts
- **C)** ducks hiding in predators in marsh grass
- **D)** horses moving in a herd over prairie grass

9) Name three ways seeds can be dispersed.





20

LEARNING OUTCOME

Identify environmental factors that affect plant growth, including light, water availability, temperature, soil conditions, and salinity.

REFERENCE

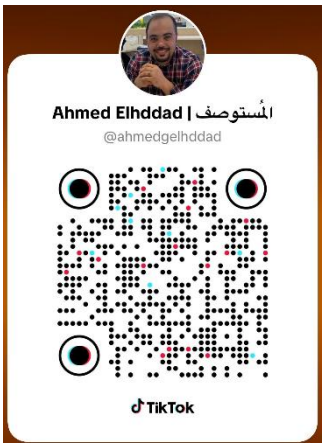
Testing Plant Growth

What factors affect how plants can grow?

In this investigation, you will observe and collect data on plants in different environments. How does high salinity, cold, heat, or drought affect the growth of plants?

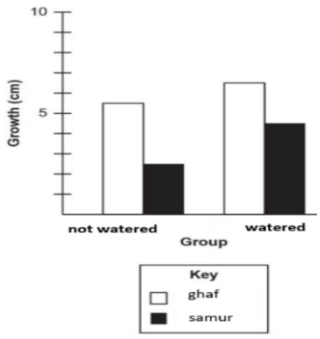
1. Inspect the plants that your teacher has prepared for this investigation, and record your observations about each plant in the chart.

Treatment	Plant height	Number of leaves	Wilting? Yes/No	Color of leaves	Root length
Control					
Drought					
Cold					
Saline					
Heat					



PAST-PAPER QUESTIONS

1. A student investigated the effect of water on the growth of two desert plant species, samur and ghaf. He had two groups of both species' saplings. One group was watered regularly and the other group was not. All plants were the same height at the start of the study. The graph below shows his experimental results. Explain how the data in the graph support the idea that environmental factors affect the growth of organisms. *[EOT 2021–22]*



A. The presence of water caused both types of plants to grow larger than the plants grown without water indicates the contribution of environmental factors.

B. For both treatments, the ghaf tree grew taller than the samur tree indicates the contribution of environmental factors.

C. For both treatments, the samur tree grew taller than the ghaf tree indicates the contribution of environmental factors.

D. There is no evidence in the graph to support the idea that environmental factors contributed to the growth of the plants.



21A LEARNING OUTCOME

Identify and sequence the levels of organization.

REFERENCE

Three-Dimensional Thinking

Cade is making a presentation on the way systems are organized in plants and animals for his science class. He prepared this flowchart to illustrate his presentation.



2. After further study, Cade realized his flowchart was incorrect. Which change should he make to correct the flowchart?

   A add the phrase *Cell Membranes*

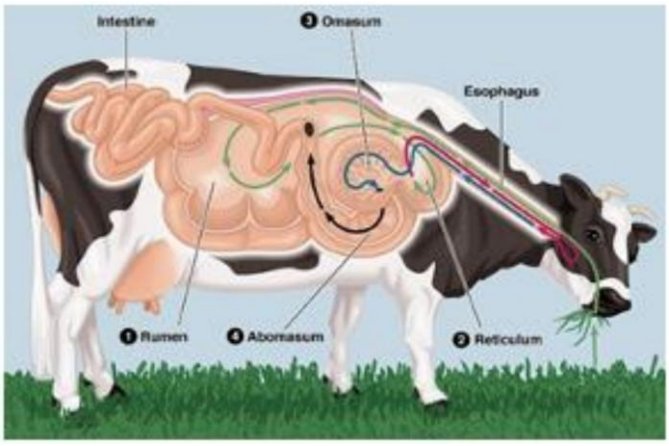
   B move *Organ Systems* to the beginning

   C remove *Tissues* and *Cells*

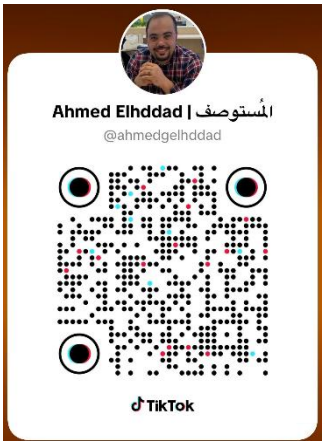
   D switch *Organs* and *Cells*

PAST-PAPER QUESTIONS

1. The diagram shows the structures involved in the digestion of food for a cow. Which level of organization within an organism do these structures make up? *[EOT 2021–22]*



A. The structures make up a specialized cell.
B. The structures make up a tissue.
C. The structures make up an organ system.
D. The structures make up an organelle.





21B

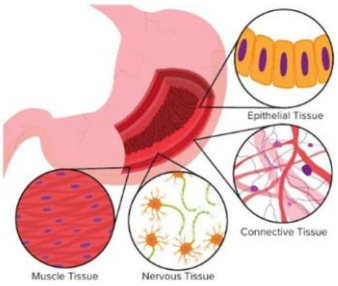
LEARNING OUTCOME

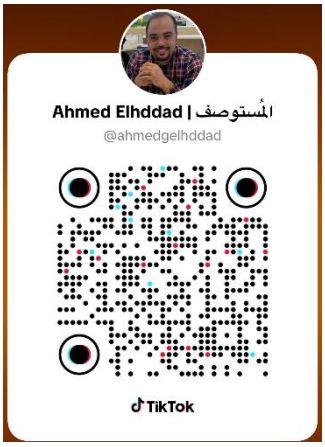
Explain how different tissues are organized into organs and how the tissues within an organ work together to perform a specific function.

REFERENCE

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Organs Complex jobs in organisms require more than one type of tissue. **Organs** are groups of different tissues working together to perform a particular job. For example, your stomach, shown in the image below, is an organ specialized for breaking down food. It is made of all four types of tissue: muscle, epithelial, nervous, and connective. Each type of tissue performs a specific function necessary for the stomach to work properly. Layers of muscle tissue contract and break up pieces of food, epithelial tissue lines the stomach, nervous tissue sends signals to indicate the stomach is full, and connective tissue supports the stomach wall.





PRACTICE QUESTIONS

1. **Which four types of tissue are found in the stomach?**

   ……

2. **How does muscle tissue help the stomach break up food?**

   ……

3. **What is the function of epithelial tissue in the stomach?**

   ……

4. **How does nervous tissue help the stomach?**

   ……

5. **How does connective tissue support the stomach wall?**

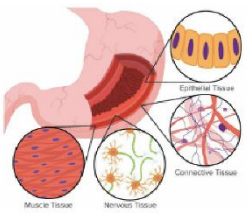
   ……

6. **How do the four types of tissue work together to help the stomach break down food?**

   ……

PAST-PAPER QUESTIONS

7. **Your stomach, shown in the image below, is an organ specialized for breaking down food. A person meets a doctor due to severe vomiting and abdominal pain. The doctor diagnosed that food is not being broken down properly before it can move out of the stomach into the small intestine. Which of the following could be the possible reason for this condition?** **[EOT 2021–22]**



   A. The epithelial tissue in his stomach is not functioning properly.
   B. The connective tissue in his stomach is not functioning properly.
   C. The nervous tissue in his stomach is not functioning properly.
   D. The muscle tissue in his stomach is not functioning properly.

8. **Ahmed was eating food, he felt his stomach full. How does Ahmed's brain interpret that his stomach is full?** ***[EOT 2022–23]***

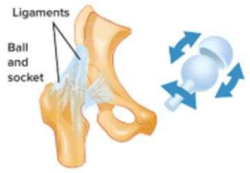
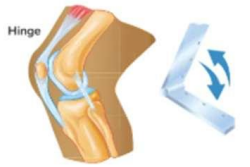
   A. The connective tissue informs the brain that the stomach is full by sending signals.
   B. The muscle tissue informs the brain that the stomach is full by sending signals.
   C. The epithelial tissue informs the brain that the stomach is full by sending signals.
   D. The nervous tissue informs the brain that the stomach is full by sending signals.

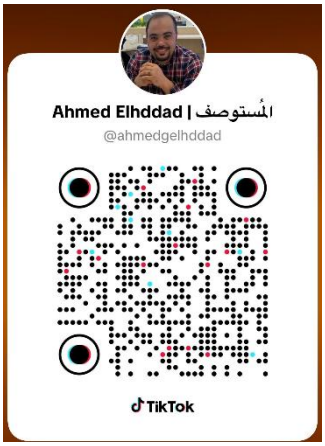
21C LEARNING OUTCOME

Identify and compare ball-and-socket, hinge, and pivot joints.

REFERENCE

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Types of Movable Joints		
Joint	**Description**	**Example**
	allows bones to move and rotate in nearly all directions	hips and shoulder
	allows bones to move back and forth in a single direction	fingers, elbows, knees
	allows bones to turn	neck, lower arm below the elbow



PRACTICE QUESTIONS

1. **What is a ball-and-socket joint? Give one example.**

   .....

2. **Which type of joint allows bones to move back and forth in a single direction?**

   .....

3. **Which type of joint allows bones to turn?**

   .....

4. **Name two places in the body where hinge joints are found.**

   .....

5. **Where is a pivot joint found in the body?**

   .....

6. **How is a ball-and-socket joint different from a hinge joint?**

   .....

7. **Compare hinge joints and pivot joints based on their movements.**

   .....

PAST-PAPER QUESTIONS

8. **A girl was exercising with her friends. She discovered that she could move and rotate her shoulders in nearly all directions, but she could not do the same with her elbows. Why do you think that it is possible to move shoulders in all directions but not elbows?** *[EOT 2021–22]*

   A. Shoulders have hinge joints which allow bones to move back and forth in a single direction, but elbows have ball and socket joints which allows bones to move and rotate in nearly all directions.

   B. Shoulders have ball and socket joints which allow bones to move and rotate in nearly all directions, but elbows have hinge joints which allows bones to move back and forth in a single direction.

   C. Shoulders have pivot joints which allow bones to turn, but elbows have hinge joints which allow bones to move back and forth in a single direction.

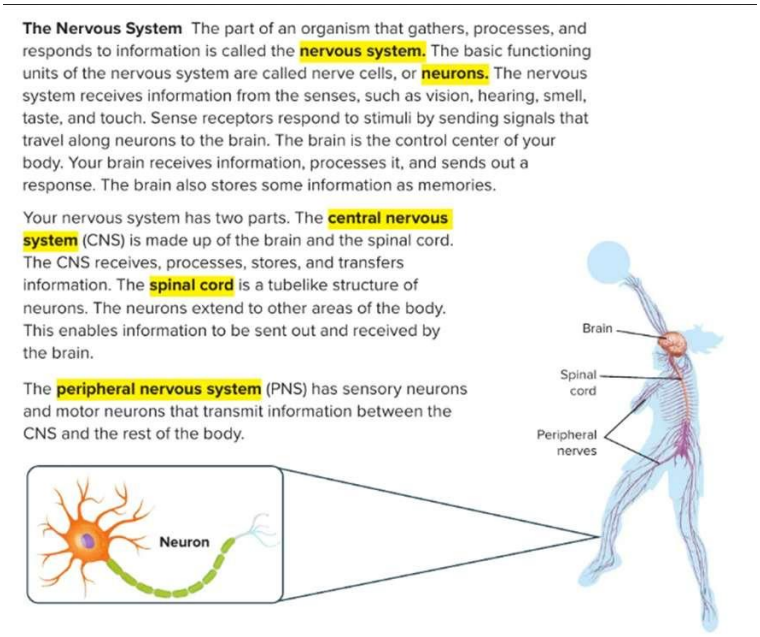
   D. Shoulders have hinge joints which allow bones to move back and forth in a single direction, but elbows have pivot joints which allow bones to turn.

22A

LEARNING OUTCOME

Identify the main parts of the central and peripheral nervous systems and describe the role of neurons in transmitting information through the nervous system.

REFERENCE



The Nervous System The part of an organism that gathers, processes, and responds to information is called the **nervous system.** The basic functioning units of the nervous system are called nerve cells, or **neurons.** The nervous system receives information from the senses, such as vision, hearing, smell, taste, and touch. Sense receptors respond to stimuli by sending signals that travel along neurons to the brain. The brain is the control center of your body. Your brain receives information, processes it, and sends out a response. The brain also stores some information as memories.

Your nervous system has two parts. The **central nervous system** (CNS) is made up of the brain and the spinal cord. The CNS receives, processes, stores, and transfers information. The **spinal cord** is a tubelike structure of neurons. The neurons extend to other areas of the body. This enables information to be sent out and received by the brain.

The **peripheral nervous system** (PNS) has sensory neurons and motor neurons that transmit information between the CNS and the rest of the body.

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PRACTICE QUESTIONS

1. **What are the two main parts of the nervous system?**

   ……

2. **What are the main structures of the central nervous system (CNS)?**

   ……

3. **What is the function of the spinal cord?**

   ……

4. **What is the difference between the central nervous system (CNS) and the peripheral nervous system (PNS)?**

   ……

5. **What are neurons, and why are they important to the nervous system?**

   ……

6. **How do neurons help carry information between the brain and the rest of the body?**

   ……

7. **How does the nervous system receive information and produce a response?**

   ……

PAST-PAPER QUESTIONS

8. **What are the two major parts of the human nervous system and how do you differentiate them?** *[EOT 2021–22]*

   A. The central nervous system receives, processes, stores and transfers information; the peripheral nervous system links the central nervous system to all parts of the body.

   B. The peripheral nervous system receives, processes, stores and transfers information; the central nervous system links the peripheral nervous system to all parts of the body.

   C. The peripheral nervous system transports blood and waste materials; the central nervous system links the peripheral nervous system to all parts of the body.

   D. The central nervous system transports blood and waste materials; the peripheral nervous system links the central nervous system to all parts of the body.

22B

LEARNING OUTCOME

Explain how sense receptors detect stimuli from the environment and identify the receptors associated with different human senses.

PRACTICE QUESTIONS

1. **Which receptors detect light in the eyes?**

   .....

2. **Which receptors detect chemicals in the nose and on the tongue?**

   .....

3. **How do auditory receptors help us hear sounds?**

   .....

4. **How do touch receptors help us detect pressure, temperature, and pain?**

   .....

5. **What happens after sense receptors detect a stimulus?**

   .....

6. **How do the receptors in the nose and tongue help us identify food?**

   .....

7. **How does the retina help us see objects?**

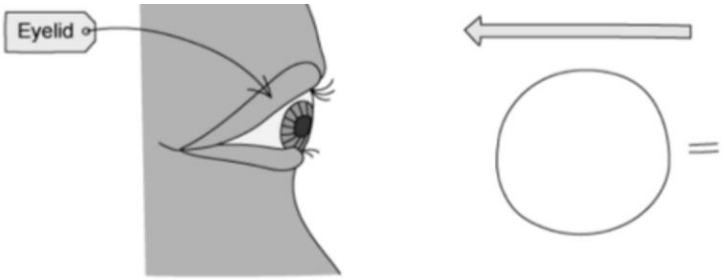
   .....

8. **How do different sense receptors help us receive information from our surroundings?**

   .....

PAST-PAPER QUESTIONS

9. **The figure shows a ball flying towards a girl's eye. She shut her eye before the ball hits it. How could she sense that the ball is going to hit her eye?** *[EOT 2021–22]*





   A. The chemoreceptors in your nose detects the light from the ball, send messages to the brain and the brain processes the information about the vision.
   B. The auditory receptors in your ear detects the light from the ball, send messages to the brain and the brain processes the information about the vision.
   C. The photoreceptors in your eye detects the light from the ball, send messages to the brain and the brain processes the information about the vision.
   D. The receptors in your skin detects the light from the ball, send messages to the brain and the brain processes the information about the vision.

10. **Your mother was baking delicious cookies in the kitchen, and you could sense that from the garden. How could you sense that without seeing it?** *[EOT 2022–23]*

   A. The chemoreceptors in your nose detect the smell of the cookies, send messages to the brain and the brain processes the information about the smell.
   B. The photoreceptors in your tongue detect the smell of the cookies, send messages to the brain and the brain processes the information about the smell.
   C. The chemoreceptors in your ears detect the smell of the cookies, send messages to the brain and the brain processes the information about the smell.
   D. The photoreceptors in your nose detect the smell of the cookies, send messages to the brain and the brain processes the information about the smell.

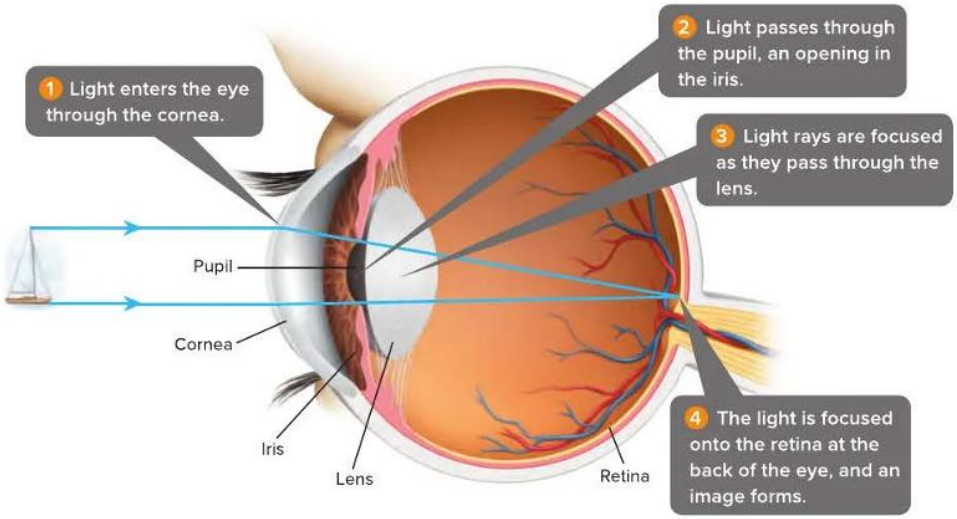
22C

LEARNING OUTCOME

Identify the main structures of the eye and describe their functions in receiving and detecting light.

REFERENCE

Vision The visual system uses photoreceptors in the eye to detect electromagnetic signals—light—and create vision. Light enters the eye through the cornea (KOR nee uh), a thin membrane that protects the eye and changes the direction of light rays. The colored part of your eye is the iris (I rus). After light passes through the cornea, it goes through an opening formed by the iris called the pupil. The iris controls the amount of light that enters the eye by changing the size of the pupil. In bright light, the iris constricts, making the pupil smaller and letting in less light. In dim light, the iris relaxes, making the pupil larger and letting in more light.



Light then travels through a clear structure called the lens. The lens works with the cornea and focuses light. The retina (RET nuh) is an area at the back of the eye that has two types of cells—rod cells and cone cells—with photoreceptors. The retina then sends information as electric signals through the optic nerve to the brain. The brain uses the information and creates a picture of what you are seeing.

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Part of the eye	Function
Cornea	
Iris	
Pupil	
Lens	
Retina	
Optic nerve	
Ciliary muscle	

23A

LEARNING OUTCOME

Describe the structure and function of the digestive system, including how food moves through its organs, how mechanical digestion begins in the mouth, how nutrients are absorbed in the small intestine, and how the large intestine absorbs water and forms waste.

REFERENCE

How Does Digestion Work?

Digestion is the process of breaking down food into small molecules that the body can absorb and use.

Types of Digestion

1. **Mechanical Digestion:** Food is physically broken into smaller pieces by chewing and mixing.
2. **Chemical Digestion:** Chemicals and enzymes break food into small molecules.

Steps of Digestion (In Order)

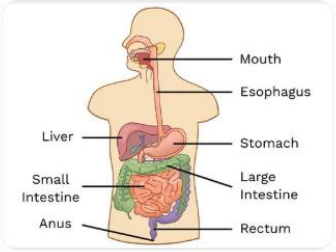
1. **Mouth**
   - Teeth chew food (mechanical digestion).
   - Saliva begins breaking down carbohydrates (chemical digestion).
2. **Esophagus**
   - A muscular tube connecting the mouth to the stomach.
   - **Peristalsis:** Muscle contractions push food toward the stomach.
3. **Stomach**
   - Temporarily stores and mixes food.
   - Gastric juice and acid help break down food.
4. **Small Intestine**
   - Most chemical digestion occurs here.
   - Nutrients are absorbed into the blood through **villi** (tiny fingerlike projections).
5. **Large Intestine**
   - Absorbs additional water from undigested material.
   - Forms solid waste, which is eliminated from the body.

Removing Waste When you modeled digestion, you may have noticed that there was leftover bread, representing food waste. The body produces other waste products as well. For example, some water and vinegar remained in the towel, representing liquid waste. Liquid waste is handled by the urinary system.

Your body excretes, or eliminates, different substances from different body systems. They are processed by the excretory system. The **excretory system** collects and eliminates wastes from the body and regulates the level of fluid in the body. The excretory system is made of different body systems. For example, you just read that liquid waste is handled by the urinary system. The respiratory system, which you will learn about in the next lesson, releases waste as carbon dioxide. Your skin also removes waste in the form of excess salt and water through sweat glands.

Quick Review

Mouth → Esophagus → Stomach → Small Intestine → Large Intestine → Waste Elimination



Remember:

- **Peristalsis** = Moves food.
- **Gastric juice** = Helps digest food.
- **Villi** = Absorb nutrients.
- **Large intestine** = Absorbs remaining water.

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PRACTICE QUESTIONS

1. **What is the main function of the digestive system?**

   .....

2. **How does food move from the mouth to the stomach?**

   .....

3. **What is the difference between mechanical digestion and chemical digestion?**

   .....

4. **How are nutrients absorbed from the small intestine into the blood?**

   .....

5. **What happens to food and water in the large intestine?**

……

6. **How does the digestive system work with other body systems to help the body function properly?**

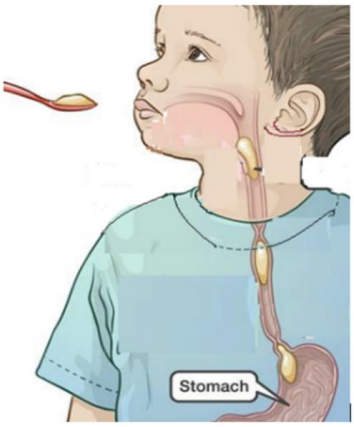
……

7. **What would happen if nutrients could not be absorbed in the small intestine? Explain your answer.**

……

PAST-PAPER QUESTIONS

8. A child was eating food. How does the food in his mouth reach the stomach? *[EOT 2021–22]*



A. A muscular tube called the trachea connects the mouth to stomach and a process called absorption helps the food reach the stomach.
B. A muscular tube called the esophagus connects the mouth to stomach and a process called peristalsis helps the food reach the stomach.
C. A muscular tube called the pharynx connects the mouth to stomach and a process called peristalsis helps the food reach the stomach.
D. A muscular tube called the salivary glands connects the mouth to stomach and a process called absorption helps the food reach the stomach.

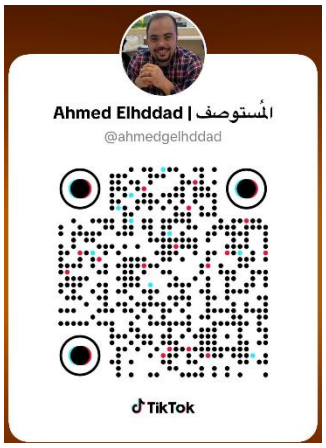
9. What is the name of the process by which food moves through the esophagus and the rest of the digestive tract by waves of muscle contractions? *[EOT 2022–23]*

A. excretion
B. digestion
C. respiration
D. peristalsis

10. Which of the following statements about digestion of food in the large intestines is true? *[EOT 2022–23]*

A. Mechanical digestion occurs by bacteria.
B. Semisolid waste is eliminated from the body.
C. Temporarily stores food.
D. Most nutrients are absorbed.





23B

LEARNING OUTCOME

Explain the function of the kidneys in filtering waste from the blood and why kidney function is important to the whole body.

PRACTICE QUESTIONS

1. **What is the main function of the kidneys in the body?**

   ……

2. **How do the kidneys help remove waste from the blood?**

   ……

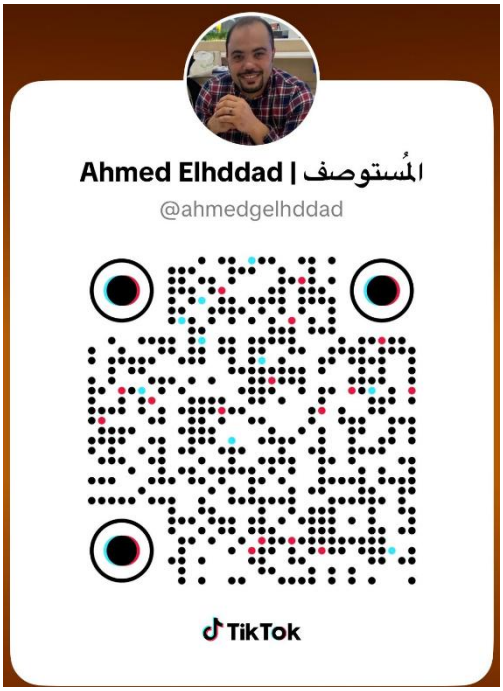
3. **What would happen if waste built up in the blood? Why would this be harmful to the whole body?**

   ……

4. **Why is kidney function important for keeping the body healthy?**

   ……





23C

LEARNING OUTCOME

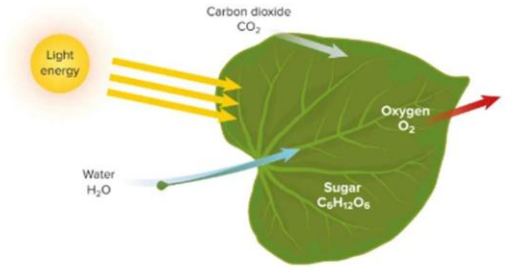
Explain how plants obtain energy through photosynthesis, including how light energy, water, and carbon dioxide are used to produce glucose and oxygen.

REFERENCE

How do plant bodies obtain energy and get rid of waste?

Food, water, and oxygen are three things you need to survive. Some of your organ systems process these materials, and others transport them throughout your body. Like you, plants need food, water, and oxygen to survive. Unlike you, plants do not take in food. Most of them make their own.

Leaves are the major food-producing organs of plants. This means that leaves are the site of photosynthesis (foh toh SIHN thuh sus). **Photosynthesis** is a series of chemical reactions that convert light energy, water, and carbon dioxide into the food-energy molecule glucose and give off oxygen. Glucose moves out of food-making cells, enters a tissue called phloem, and flows to all plant cells. Cells then break down the sugar and release energy.



Like animal bodies, plants also require water to survive. After water enters a plant's roots, it moves into a tissue called xylem. Water then flows inside xylem to all parts of a plant. Like you, plants produce water vapor as a waste product. Carbon dioxide, oxygen, and water vapor pass into and out of a plant through tiny openings in leaves.

THREE-DIMENSIONAL THINKING

In your Science Notebook write an **argument** supported by evidence to support or refute the following claim: I obtain energy in the same way that a plant obtains **energy**.

COLLECT EVIDENCE

How do plants obtain energy? Record your evidence (C) in the chart at the beginning of the lesson.

PRACTICE QUESTIONS

1. **What is photosynthesis, and why is it important for plants?**

   ……

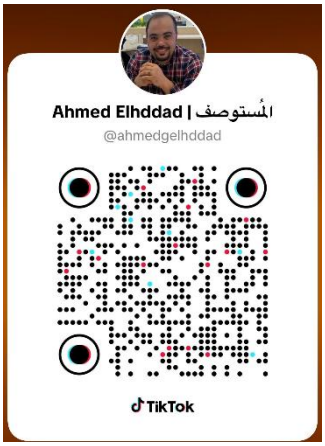
2. **What three things do plants use during photosynthesis to make glucose?**

   ……

3. **What two products are made during photosynthesis?**

   ……

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24A

LEARNING OUTCOME

Use Punnett squares to predict the possible genotypes and phenotypes of offspring, including the probability of inheriting a recessive trait.

REFERENCE

A Similar Relationship From the data of crosses between hybrid plants with purple flowers, Mendel found that the relationship of purple flowers to white flowers was about 3 to 1. This means purple-flowering pea plants grew from this cross three times more often than white-flowering pea plants grew from the cross. He calculated similar relationships for all traits he tested.

Dominant and Recessive Traits Recall that when Mendel cross-pollinated a true-breeding plant with purple flowers and another with white flowers, the hybrid offspring had only purple flowers. Mendel hypothesized that the hybrid offspring had one genetic factor for purple flowers and one genetic factor for white flowers.

Mendel also hypothesized that the purple factor is the only factor seen or expressed because it blocks the white factor. A genetic factor that blocks another genetic factor is called a **dominant** (DAH muh nunt) **trait.** A genetic factor that is blocked by the presence of a dominant factor is called a **recessive** (rih SE sihv) **trait.**



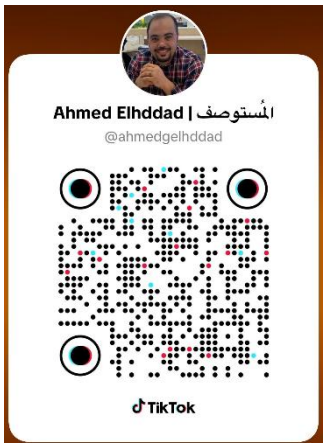
A dominant trait, such as purple pea flowers, is observed when offspring have either one or two dominant factors.



A recessive trait, such as white pea flowers, is observed only when two recessive genetic factors are present in offspring.

COLLECT EVIDENCE

What did Mendel's experiments show about how the traits of offspring, such as those of the kittens, are inherited?



INVESTIGATION



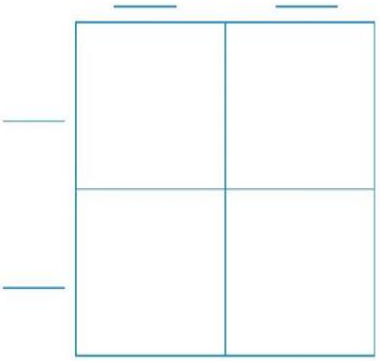
Fruit Fly Traits

1. Use the Punnett square below to complete a cross between a female fruit fly with straight wings (cc) and a male fruit fly with curly wings (CC).

Curly wings (CC)

Straight wings (cc)





2. According to your Punnett square, which genotypes are possible in the offspring?

3. If you switch the locations of the parent genotypes around the Punnett square, does it affect the potential genotypes of their offspring? Explain.

4. Based on the information in your Punnett square, what is the ratio of offspring that will have curly wings to straight wings?

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THREE-DIMENSIONAL THINKING

Design and complete a Punnett square to **model** a cross between two fruit flies that are heterozygous for curly wings (Cc). What is the phenotype ratio of the offspring? **Explain** how you are able to predict the phenotype ratio based on a **cause and effect** relationship.

PAST-PAPER QUESTIONS

1. A and B are the same kind of rabbit. A has a genotype for white fur, and B has a genotype for brown fur. The white fur is the result of a recessive allele (t), and the brown fur is the result of a dominant allele (T). Which of the following genotypes of parent rabbits will produce only offspring having brown fur? *[EOT 2021–22]*





- **A.** Tt and Tt
- **B.** TT and tt
- **C.** Tt and tt
- **D.** tt and Tt

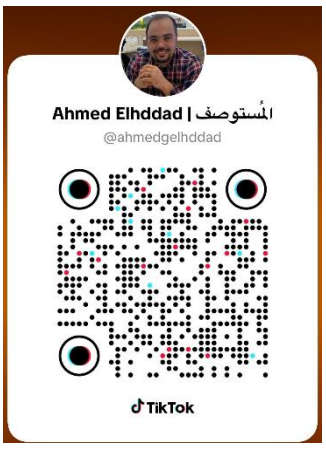
2. A heterozygous, yellow-seeded pea plant is crossed with a homozygous, green-seeded pea plant. If yellow is a dominant allele and green is a recessive allele, predict the phenotypes and genotypes of the offspring at A and B in the Punnett square. *[EOT 2022–23]*

	y	**y**
Y	Yy	**A**
y	yy	**B**

- **A.** A – Yy (yellow); B – yy (green)
- **B.** A – yy (green); B – Yy (yellow)
- **C.** A – YY; B – yY
- **D.** A – yY; B – YY

3. A genetic cross between two organisms may be shown as Gg × Gg. What does 'g' represent? *[EOT 2022–23]*

- **A.** a recessive allele
- **B.** a recessive chromosome
- **C.** a dominant chromosome
- **D.** a dominant allele



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24B

LEARNING OUTCOME

Interpret the results of genetic crosses by calculating and explaining the expected ratios of dominant and recessive phenotypes.

REFERENCE

Look Both Ways Before Crossing the Seed

Mendel counted and recorded the traits of offspring from many experiments in which he cross-pollinated hybrid plants. Data from these experiments are shown below.

Results of Hybrid Crosses

Characteristic of Hybrid Parent	Trait and Number of Offspring	Trait and Number of Offspring	Trait Comparison
Flower Color (purple x purple)	 Purple 705	 White 224	$\frac{705}{224} = \frac{\quad}{1}$
Seed Color (yellow x yellow)	 Yellow 6,022	 Green 2,001	$\frac{6{,}022}{2{,}001} = \frac{\quad}{1}$
Seed Shape (round x round)	 Round 5,474	 Wrinkled 1,850	$\frac{5474}{1{,}850} = \frac{\quad}{1}$
Pod Shape (smooth x smooth)	 Smooth 882	 Bumpy 299	$\frac{882}{299} = \frac{\quad}{1}$

1. **MATH Connection** Calculate the relationship of purple to white flowers, yellow to green seeds, round to wrinkled seeds, and smooth to bumpy pods by dividing the higher number by the lower number. Record the answers in the table above.
2. What patterns do you notice in Mendel's data?

How can you predict what offspring will look like?

Have you ever flipped a coin and guessed heads or tails? Because a coin has two sides, there are only two possible outcomes—heads or tails. You have a 50 percent chance of getting heads and a 50 percent chance of getting tails. The ratio comparing 50 heads to 50 tails can be written 50 to 50 or 50 : 50, or simplified, 1 : 1.

MATH Connection A ratio is a comparison of two numbers or quantities by division. For example, the ratio comparing 6,022 yellow seeds to 2,001 green seeds can be written as follows:

6,022 to 2,001 or

6,022 : 2,001 or

$\frac{6{,}022}{2{,}001}$



To simplify the ratio, divide the first number by the second number.

$\frac{6{,}022}{2{,}001} = \frac{3}{1}$ or 3:1

Given a 3 : 1 ratio, you can expect that an offspring from heterozygous parents has a 3 : 1 chance of having yellow seeds. But you cannot expect that a group of four seeds will have three yellow seeds and one green seed. This is because one offspring does not affect the phenotype of another offspring. In a similar way, the outcome of one coin toss does not affect the outcome of other coin tosses.

THREE-DIMENSIONAL THINKING

A cross between two heterozygous pea plants with yellow seeds produced 1,719 yellow seeds and 573 green seeds. What is the ratio of yellow to green seeds? **Construct an explanation** about what the results show regarding inheritance.

PAST-PAPER QUESTIONS

1. A cross between two heterozygous bell pepper plants with yellow peppers produced 705 yellow peppers and 235 red peppers. Calculate the ratio of yellow to red peppers and explain what it reveals about inheritance. *[EOT 2021–22]*



A. A 3:1 chance of having yellow peppers compared to red peppers and yellow peppers are a dominant trait.

B. A 1:3 chance of having yellow peppers compared to red peppers and yellow peppers are a dominant trait.

C. A 3:1 chance of having yellow peppers compared to red peppers and red peppers are a dominant trait.

D. A 1:3 chance of having yellow peppers compared to red peppers and red peppers are a dominant trait.

@ELHDDAD37

24C

LEARNING OUTCOME

Identify a pedigree as a model used to represent the inheritance of traits across generations.

REFERENCE

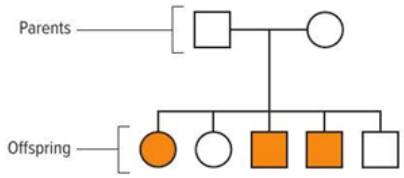
How can you model a family's phenotypes?



Another model that can show inherited traits is a pedigree. A **pedigree** shows phenotypes of genetically related family members. It can also help determine genotypes. In the pedigree below, three offspring have a trait—attached earlobes—that the parents do not have. If these offspring received one allele for this trait from each parent, but neither parent displays the trait, the offspring must have received two recessive alleles.



Attached lobe





Unattached lobe

Recessive phenotype
- Female with attached lobes
- Male with attached lobes

Dominant phenotype
- Female with unattached lobes
- Male with unattached lobes

THREE-DIMENSIONAL THINKING

If the genotype of the offspring with attached lobes is *uu*, what is the genotype of the parents? **Explain** your answer.

6) A florist has one kind of plant that usually has red flowers (the dominant trait), but sometimes has white flowers (the recessive trait). If she crosses plants A and B as shown here, 50% of the offspring will have red flowers.

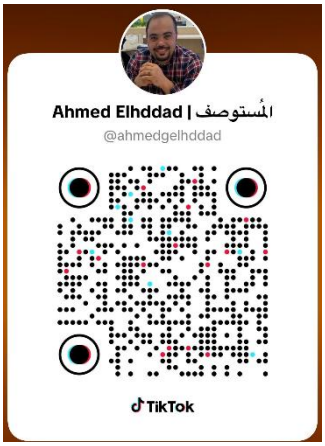
Ova of Plant B (rr) \ Sperm of Plant A (Rr)	R	r
r	Rr	rr
r	Rr	rr

- ○ True
- ○ False

7) A heterozygous orange-flowered plant is crossed with a homozygous purple-flowered plant. If orange is a dominant allele and purple is recessive, what color ratio will the flowers of the offspring plants have?

Purple Flower \ Orange Flower	O	o
o	Oo	oo
o	Oo	oo

- ○ **A)** 1 purple: 3 orange
- ○ **B)** 4 purple: 0 orange
- ○ **C)** 2 purple: 2 orange
- ○ **D)** 0 purple: 4 orange



**********the end