

PONY
2027

SCIENCE المنهج الجديد

Main Book



Primary
First Term
By Ahmed Omara

6

PONY

سلسلة كتب الأستاذ

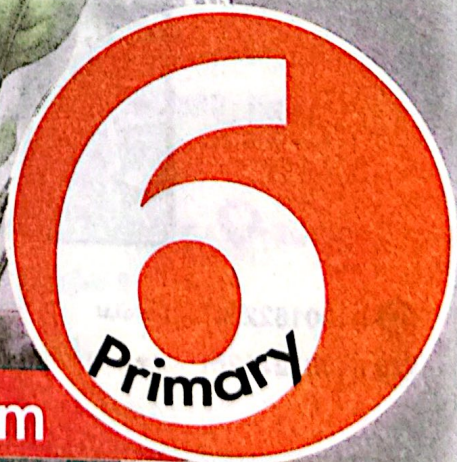
SCIENCE

Main Book

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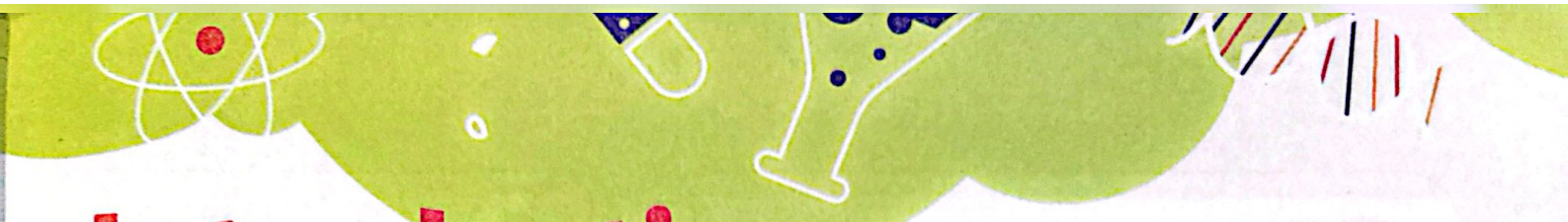


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لا يجوز أبداً إعادة إنتاج أي جزء من هذا العمل ولا حفظه بأي صورة من صور
الحفظ والتخزين ولا نقله بأي شكل أو أي وسيلة سواء أكانت ميكانيكية
أو إلكترونية أو نسخاً أو تسجيلاً دون إذن كتابي سابق من الناشر.

كل الحقوق
محفوظة



Introduction

Dear Student,

Science is much more than a school subject. It is a way of thinking that helps us understand the natural world, solve problems, and make informed decisions. Every scientific discovery begins with curiosity, a question, or an observation. Through science, we learn how to investigate phenomena, analyze evidence, and explain the world around us.

This book has been carefully designed to make science meaningful, engaging, and accessible. It encourages you to become active learners by observing, questioning, exploring, experimenting, and communicating your ideas. Through hands-on activities, investigations, and real-world applications, you will develop your knowledge and skills needed to think critically and act responsibly in an increasingly scientific and technological world.

Dear Teacher,

This book serves as a practical and comprehensive resource that supports inquiry-based learning and scientific literacy. It provides opportunities to foster curiosity, encourage collaboration, promote evidence-based reasoning, and guide students in constructing their own understanding of scientific concepts.

The topics in this book connect important ideas from different fields of science. Students will gain a deeper appreciation of how scientific knowledge contributes to improving lives and addressing global challenges.

Above all, this book aims to inspire a lifelong love of learning and discovery. We hope it encourages students to ask questions with confidence, investigate with curiosity, think with creativity, and pursue knowledge with enthusiasm.

Together, let us explore, discover, and innovate, because today's curious learners are tomorrow's scientists, engineers, inventors, and leaders.

Wishing you a rewarding and inspiring scientific journey.

Authors



Contents



Chapter 1	Conditions for Burning	Pages 5 - 32
Chapter 2	Respiration	Pages 33 - 51
Chapter 3	Digestion	Pages 52 - 72
Chapter 4	Circulation and Excretion	Pages 73 - 95
Chapter 5	Photosynthesis	Pages 96 - 114
Chapter 6	Transportation of Water in Plants	Pages 115 - 132
Chapter 7	Food Chain	Pages 133 - 148
Chapter 8	Food Chains in Egypt	Pages 149 - 160
Chapter 9	Properties of Solutions	Pages 161 - 182
Chapter 10	Reaction Between Solutions and Metals	Pages 183 - 201



The teacher loves teaching science through experiments, listening to students, and inspiring students to think.

Suha is a hardworking student who enjoys science, pays attention to details.

Ali is a smart, curious and energetic student who makes science lesson more fun.

Chapter 1

Conditions for Burning

Lessons of Chapter 1:

- Lesson 1: How Things Burn and Air
- Lesson 2: The Role of Oxygen
- Lesson 3: Air After Burning

Main Vocabulary

Page ⑦

Burn	يحترق	Burning (Combustion)	إحتراق	Candle	شمعه
Lid	غطاء	Surrounding	الوسط المحيط	Replaced	يتم إستبداله

Page ⑧

Clay	صلصال	Bottomless gas jar	وعاء غاز بلا قاع	Flame	لهب
Goes out	تنطفئ	Gaps	فجوات	Continuous	مستمر
Stable	مستقر	Unstable	غير مستقر	Used up (consumed)	يستهلك (يستخدم)
Limited	محدود	Flow	يتدفق (يمر)	Fresh air	هواء نقي

Page ⑩

Mixture	خليط	Gas cylinder	إسطوانة غاز	Percentage	نسبة
---------	------	--------------	-------------	------------	------

Page ⑪

Upside down	رأساً على عقب	Incense stick	عود بخور	Burns brightly	يحترق بتوهج
-------------	---------------	---------------	----------	----------------	-------------

Page ⑬

Safety goggles	نظارات واقية	Limewater	ماء الجير	Colourless	عديم اللون
Clear	شفاف	Turns Milky	يتعكر	Produce	ينتج

Page ⑭

Gas Detector	جهاز كاشف الغازات	Glass tube	أنبوب زجاجي	Single-use	للإستخدام مرة واحدة
--------------	-------------------	------------	-------------	------------	---------------------

Page ⑮

Gas Monitor	جهاز قياس نسبة الغازات	Sensor	مستشعر	Digital numbers	أرقام
-------------	------------------------	--------	--------	-----------------	-------

Page ⑯

Plenty	وفرة	Civilization	حضارة	Animal fats	دهون حيوانية
Plant oils	زيوت نباتية	Temples	معابد	Pyramids	أهرامات
Smoke	دخان	Air circulation	تدوير الهواء	Craftspeople	الحرفيين
Bellow	منفاخ هواء	Melting	إنصهار	Gold	ذهب

Page ⑰

Global warming	الإحتباس الحرارى	Emissions	إنبعاث	Renewable energy	طاقة متجددة
Oil	بتروöl	Coal	فحم	Power plant	محطة الكهرباء

Lesson 1 How Things Burn and Air



Warm up!

Let's explore together! How things burn with Suha and Ali.

I wonder if there is something necessary for things to burn.



Let's explore, if burning need air or not!



When burning candle inside a jar not covered with a lid:

The candle keeps burning.

Because fresh air is supplied from the surroundings.



When burning candle inside a jar covered with a lid:

The flame of candle goes out.

Because the air inside the jar is used up.



- For things to keep burning, fresh air must constantly flow in and out.
- In a place where the air is not replaced, things cannot keep burning.



Experiment

How Air Works When Things Burn

Preparation:



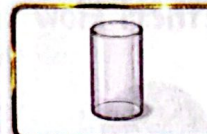
Wooden board



Clay



Candle



Bottomless gas jar



Metal lid



Lighter

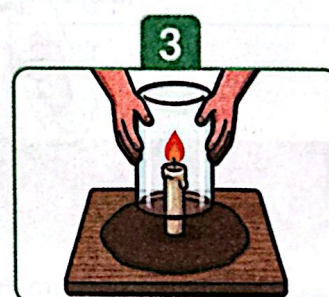
Steps:



Spread the clay flat on the board.



Stand a candle on the clay and then light it.



Cover the candle with the bottomless gas jar.

Observe:

What happens to the flame when:

You put a lid on the jar?



The flame **goes out** after short time.

Because the air inside the jar is used up (consumed).

You cut the clay to create a gap at the bottom?



The flame keeps burning, but it is **unstable**.

Because air enters from the bottom gap, but it is not replaced.

You take off the lid to make gaps at both the top and bottom?



The flame keeps burning, and it is **stable (continuous)**.

Because the used air is replaced as fresh air constantly flows in and out the jar.

Conclusions:

- For things to keep burning, fresh air must constantly flow in and out.
- In a place where the air is not replaced, things cannot keep burning.



Evaluate your Understanding On Lesson (1)

1 Complete the following sentences using the word bank:

gaps

used up

goes out

flow

stable

burning

1. For things to keep, fresh air must constantly in and out.
2. When a jar is covered, the air inside is gradually until the flame
3. The flame becomes when air enters and leaves freely.
4. in the jar allow air movement.

2 Put (✓) or (X), with correction if needed:

1. The air inside a closed jar is limited. ()
2. A flame is stable when air enters but cannot leave. ()
3. If air is not replaced in a space, burning will stop after some time. ()
4. A candle continues burning in a closed jar that doesn't contain gaps. ()

3 Choose the correct answer:

1. If air is not replaced in a space, burning will
(a) increase (b) continue
(c) stop immediately (d) goes out after short time
2. A candle continues burning in an open jar mainly because
(a) the jar is transparent (b) the flame produces smoke
(c) fresh air is replaced (d) the used air is not replaced

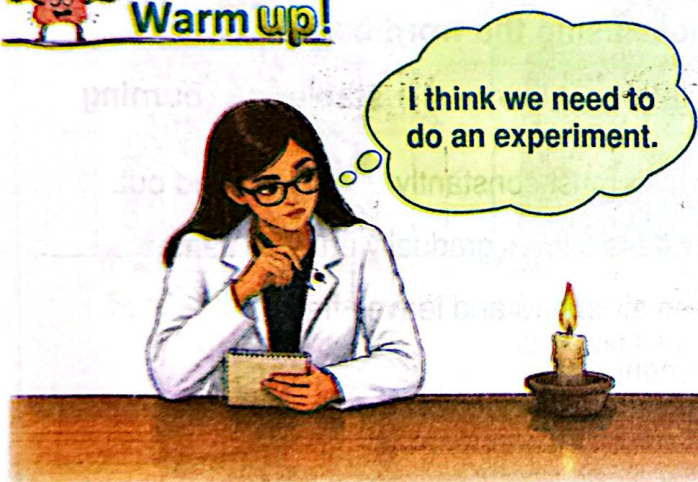
Lesson 2 The Role of Oxygen in Burning

Components of Air:

- Air is a mixture of different gases such as nitrogen, oxygen, carbon dioxide and other gases.
- The following figure shows the composition of the atmospheric air:



Warm up!



Which gas helps things burn?

- ☐ Nitrogen gas
- ☐ Oxygen gas
- ☐ Carbon dioxide gas



Experiment

Which gas has the power to help things burn?

Preparation:

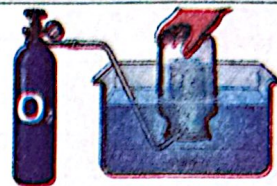


Steps:

- 1 Put nitrogen, oxygen, and carbon dioxide into the 3 jars, respectively.

How to collect the gas:

1. Turn the water-filled jar upside down in the water.
2. Fill 70% of it with the gas, and put the lid on.



- 2 Stand a candle on the combustion spoon, light it, quickly put it into the jar, and put the lid on.



Nitrogen gas (N_2)



Oxygen gas (O_2)



Carbon dioxide gas (CO_2)

- 3 Observe how the candle's flame burns.

Observation:

- The flame burns brightly in the jar containing **oxygen gas**, but it goes out in the two jars containing nitrogen gas and carbon dioxide gas.

Conclusion:

- Oxygen has the power to help things burn, but nitrogen and carbon dioxide do not.

Note:

- When putting the incense stick in a jar containing oxygen gas, it **burns brightly**.
- When putting the incense stick in a jar containing nitrogen gas or a jar containing carbon dioxide gas, the flame **goes out** immediately.



Incense stick

Comparison between oxygen, nitrogen and carbon dioxide gases:

Gas	Its percentage in atmospheric air	Its behavior with burning	Its effect on flame in the closed jar
Nitrogen gas	About 78 %	It doesn't support burning.	The flame goes out immediately.
Oxygen gas	About 21 %	It supports burning.	The flame burns brightly.
Carbon dioxide gas	About 0.04 %	It stops burning.	The flame goes out immediately.



Evaluate your Understanding On Lesson (2)

① Complete the following sentences using the word bank:

gases brighter less mixture
supports prevents goes out greater

- Carbon dioxide makes the flame, because it combustion.
- Oxygen gas combustion, as it makes the flame
- The amount of oxygen gas in the air is than that of nitrogen gas, while it is than that of carbon dioxide gas.
- Air is a of different

② Correct the underlined word:

- Oxygen forms about 0.04% of the atmospheric air. (.....)
- The Incense stick burns brightly in a jar filled with carbon dioxide. (.....)
- Air is mainly composed of oxygen gas. (.....)
- Nitrogen gas supports burning, unlike oxygen gas. (.....)

③ Choose the correct answer:

- What happens to the burning when you put a lit incense stick into a jar of carbon dioxide?
 - It keeps burning as it is.
 - It burns brightly.
 - The flame goes out immediately.
 - The flame goes out after some time.
- What gas is included in the air and has the power to help things burn?
 - Carbon dioxide gas
 - Oxygen gas
 - Hydrogen gas
 - Nitrogen gas

Lesson 3 Air After Burning



Experiment

What happens to the air composition after burning?

Preparation:



Two gas jars



Two lids



Candle



Gas lighter



Combustion spoon

- Limewater is used to check if there is carbon dioxide gas.
- Colorless and clear limewater turns **milky white** when it reacts with carbon dioxide.



Limewater

[Caution!]



Safety goggles

- Wear safety goggles so the limewater doesn't get in your eyes.

Steps:

1



Put clear limewater into each of the two gas jars.

2



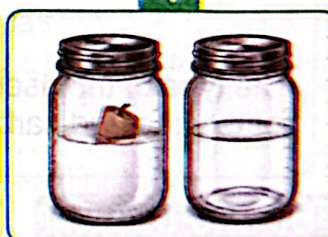
Put a lit candle into one jar, put the lid on, and wait until the flame goes out.

3



Shake the two gas jars.

4



Check the colour of the limewater in the two gas jars.

Observation:

- The colorless and clear limewater turns **milky white** because it reacts with carbon dioxide produced from burning in the jar containing candle.

Conclusion:

- When things burn, oxygen gas is used up (consumed), while carbon dioxide gas is produced (released) in air.

After burning:



The amount of **oxygen** gas **decreases** because it is **used** when things burn.

The amount of **carbon dioxide** gas **increases** because it is **produced** when things burn.



Tools Used to Check Gases

1 Gas Detector Tube:



Reaction:

There is a **chemical** inside the glass tube whose **colour** changes when it reacts with a **specific gas**.

The type of the used tube is different for oxygen and carbon dioxide.

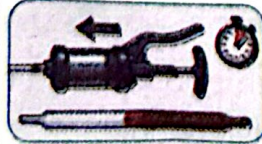
Measuring the amount of gas:

You can measure the amount of the gas by reading the scale where the colour has changed.

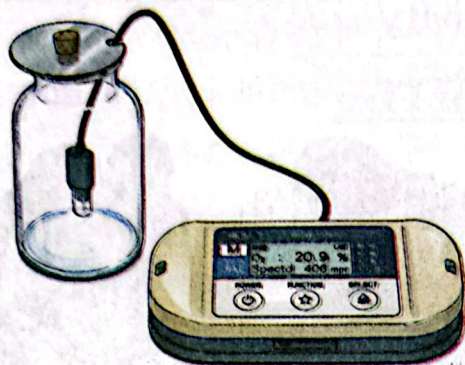
[Caution!]

- The glass tube is single-use only.
- Also, be careful not to get hurt by the broken ends.

How to use it:

Preparations		• Break off both ends of the glass tube carefully. • Insert it firmly into the gas sampling pump. • Pull the handle of the pump fully. • Wait for a certain amount of time.
Reaction		The chemical inside the glass tube reacts with specific gas and changes colour .
Measuring gas		Read the number at the border where the colour changed that represents the percentage of that gas included in the air.

2 Gas Monitor:



It uses a **sensor** to show the **percentage (%)** of the gas on the screen in **digital numbers**.



There are very useful types that can measure **oxygen** and **carbon dioxide** at the same time.



Evaluate your Understanding On Lesson (3)

1 Complete the following sentences using the word bank:

Specific gas

increases

decreases

colour

milky

1. Limewater turns when it reacts with carbon dioxide gas.
2. During burning, the amount of oxygen gas, while the amount of carbon dioxide gas
3. The chemical in the gas detector tube changes when reacting with

2 Correct the underlined word:

1. Carbon dioxide is used during burning. (.....)
2. Limewater is used to check the presence of oxygen gas. (.....)
3. A gas detector tube measures gas by temperature change. (.....)
4. The gas monitor shows results using a flame. (.....)

3 Write the scientific term:

1. It is a device can measure oxygen and carbon dioxide at the same time. (.....)
2. It is a tool that measures gas by a colour change reaction. (.....)

Enrichment Activity

The Discovery of Fire

In Chapter 1, we learned that:

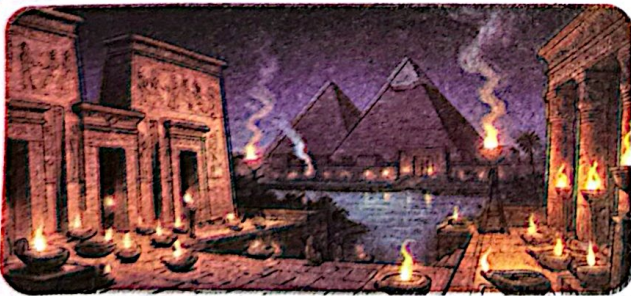
- Things need **oxygen** to burn.
- When there is plenty of oxygen, things **burn intensely**.
- Burning produce **carbon dioxide gas**.



Learning to use fire was a major step for human civilization.

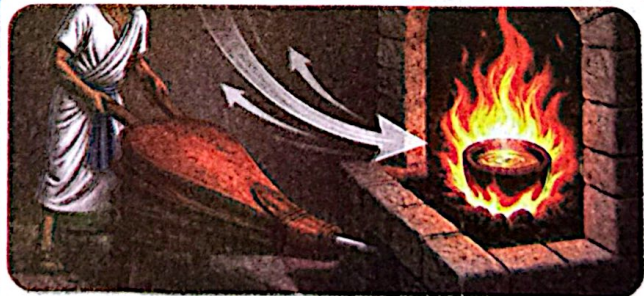
Egyptian Civilization:

Ancient Lights:



- Ancient Egyptians burned **animal fat** and **plant oil** from plants grown along the Nile River to light up the dark insides of temples and pyramids.
- They used clever ideas to reduce **smoke**, which shows their wisdom regarding **air circulation**.

The Role of Oxygen in Combustion:



- Ancient craftspeople used a **bellows** (a tool for blowing air) to pump air into the fire to supply more **oxygen**.
- This helps them in **melting gold** at high temperatures to make **beautiful jewelry**.

Ways to Reduce Carbon Dioxide Emissions

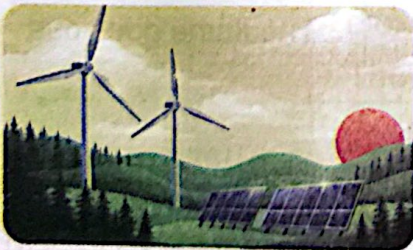
- Burning things produces **carbon dioxide gas**.
- Today, too much of this gas is one of the causes of "**global warming**".



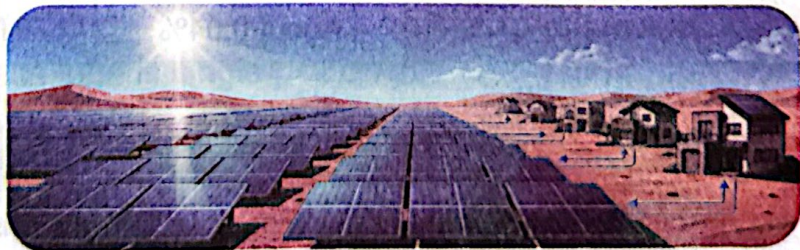
Ways to reduce carbon dioxide emissions in Egypt:

To protect Earth and to generate electricity without burning fuel, Egypt is gaining attention from around the world for:

- Using **renewable energy resources** from the **sun** and **wind** instead of burning **oil** and **coal**.



- Building **Benban Solar Park** that is a giant solar power plant in Aswan brings light to Egyptian homes without producing any carbon dioxide.



Summary on Chapter 1

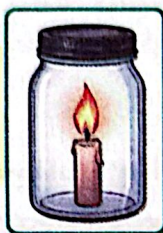
Conditions for Burning



Must Know
Before the
Exam

How things burn:

For things to keep burning, fresh air must constantly flow in and out.



In a place where the air is not replaced, things cannot keep burning.



Conditions of the flame:

Condition	Figure	Flame	Reason
Closed jar		Goes out	Because the air inside the jar is used up (consumed).
Closed jar with Bottom gap only		Keeps burning but it is unstable.	Because air enters from the bottom gap, but it is limited at the top.
Closed jar without lid and with bottom gaps		Stable continuous burning	Because air enters from the bottom gap, but it is limited at the top.

Air components:

- Air is a mixture of different gases such as nitrogen, oxygen, carbon dioxide and other gases.

Gas	Its percentage in atmospheric air	Supports burning	Its effect on flame or on incense stick
Nitrogen gas	About 78%	No	The flame goes out.
Oxygen gas	About 21%	Yes	The flame burns brightly.
Carbon dioxide gas	About 0.04%	No	The flame goes out.

Air after burning:

Gas	Before burning	During burning	After burning
Oxygen gas (O_2)	About 21%	Used up (consumed)	Its percentage decreases.
Carbon dioxide gas (CO_2)	About 0.04%	Produced (released)	Its percentage increases.

How to collect a gas in a closed jar:

Steps	Figure
1. Turn the water-filled jar upside down in the water. 2. Fill 70% of it with the gas, and put the lid on.	

Checking the presence of gases:

First Using chemical substance

Lime water
(Clear and Colourless)

- It is used to check the presence of carbon dioxide gas.
- Its colour turns into milky white when it reacts with carbon dioxide gas.

Second Using tools (devices)

Gas Detector Tube



Importance:

It is used to check the percentage of a specific gas in a place by reading the number at the border where colour of the chemical changes.

Steps:

Preparations		• Break off both ends of the glass tube carefully. • Insert it firmly into the gas sampling pump. • Pull the handle of the pump fully. • Wait for a certain amount of time.
Reaction		The chemical inside the glass tube reacts with specific gas and changes colour .
Measuring gas		Read the number at the border where the colour changed that represents the percentage of that gas included in the air.

Take care:

- The type of tube to use is different for oxygen and carbon dioxide.
- The glass tube is single-use only.

Gas Monitor



Importance:

- It uses a sensor to show the **percentage** of the gas on the screen in **digital numbers**.
- Some types of it can measure oxygen and **carbon dioxide** at the same time.

Burning (Combustion) in Ancient Egypt:

Ancient Lights

Ancient Egyptians burned **animal fat** and **plant oil** from plants grown along the Nile River to light up the dark insides of temples and pyramids.



The Role of Oxygen in Combustion

- Ancient craftspeople used a **bellows** to pump air into the fire to supply more **oxygen gas**.
- This helps them in **melting gold** at high temperatures to make **jewelry**.



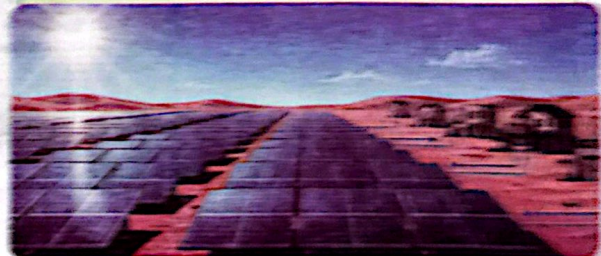
Ways to Reduce Carbon Dioxide Emissions in Modern Egypt:

- Burning things produces **carbon dioxide gas** that causes "global warming".
- To reduce carbon dioxide gas emission, Egypt is gaining attention to:

Use **renewable energy resources** from the **sun** and **wind** instead of burning fuel such as **oil** and **coal**.



Build **Benban Solar Park** that is a giant solar power plant in **Aswan** brings light to Egyptian homes without producing any **carbon dioxide**.



First PONY Questions

Objective Questions

1 Choose the correct answer:

1. What must constantly happen to the candle to keep burning inside a jar?
 - (a) The air must be trapped inside a jar.
 - (b) Fresh air must flow in and out.
 - (c) Smoke must be kept inside the container.
 - (d) The temperature must be decreased.
2. When a burning candle is placed inside a tightly closed jar with no gaps, the flame goes out because
 - (a) fresh air is supplied from the surroundings
 - (b) the air inside the jar is used up
 - (c) air enters from the bottom but cannot leave
 - (d) the jar produces too much smoke
3. When a jar has gaps at the bottom but is covered with a lid, the flame
 - (a) goes out immediately
 - (b) burns brightly and stably
 - (c) keeps burning, but it is unstable
 - (d) changes its color to milky white
4. The role of the gaps at the top and the bottom of the jar is to
 - (a) decrease amount of smoke inside the jar
 - (b) trap the air inside the jar
 - (c) allow air movement
 - (d) decrease temperature inside the jar
5. gas makes up approximately 78% of the atmospheric air.
 - (a) Oxygen gas
 - (b) Carbon dioxide gas
 - (c) Nitrogen gas
 - (d) Hydrogen gas
6. of the atmospheric air is composed of carbon dioxide and other gases.
 - (a) About 78%
 - (b) About 21%
 - (c) About 70%
 - (d) About 0.04%

7. gas has the power to support combustion and make a flame burn brightly.
- (a) Nitrogen
 - (b) Oxygen
 - (c) Carbon dioxide
 - (d) Water vapor
8. Which method correctly describes how a gas is collected in a jar over water?
- (a) Fill the jar 70 % with gas and leave it open.
 - (b) Turn the water-filled jar upside down, fill 70% of it with gas, and put the lid on.
 - (c) Pour the gas directly over the water surface.
 - (d) Fill the jar 30% with gas and place it upright in the water.
9. In a closed space, what happens to the amounts of oxygen and carbon dioxide during burning?
- (a) Oxygen increases and carbon dioxide decreases.
 - (b) Both oxygen and carbon dioxide increase.
 - (c) Oxygen decreases and carbon dioxide increases.
 - (d) Both oxygen and carbon dioxide decrease.
10. Which substance is specifically used to detect the presence of carbon dioxide gas?
- (a) Plant oil
 - (b) Limewater
 - (c) A chemical sensor
 - (d) Animal fat
11. Which device uses a single-use glass tube with a color-changing chemical to measure a gas?
- (a) Gas Monitor
 - (b) Bellows
 - (c) Gas Detector Tube
 - (d) Combustion spoon
12. What tool did ancient craftspeople use to pump air into the fire to supply more oxygen?
- (a) Gas sampling pump
 - (b) Combustion spoon
 - (c) Bellows
 - (d) Gas monitor
13. Which materials did Ancient Egyptians burn to produce light inside temples and pyramids?
- (a) Coal and natural gas
 - (b) Animal fat and plant oil
 - (c) Wood and plant leaves
 - (d) Sand and clay
14. How does a gas monitor show gas percentage?
- (a) By changing liquid colour
 - (b) By reading a scale in glass tube
 - (c) By making a solution milky
 - (d) By displaying numbers on a screen

15. 💡 What was the purpose of pumping more oxygen into the fire using in ancient Egypt?
- (a) To decrease the amount of carbon dioxide.
 - (b) To reduce smoke of the fire.
 - (c) To melt gold to make jewelry.
 - (d) To cook food faster.
16. 💡 Which environmental effect results from increased carbon dioxide released during burning?
- (a) Deforestation
 - (b) Global warming
 - (c) Tsunami
 - (d) Volcanic eruption
17. 💡 is a giant project in Aswan brings light to Egyptian homes without producing any carbon dioxide?
- (a) A coal power plant
 - (b) Benban Solar Park
 - (c) A fossil fuel refinery
 - (d) A new temple

2 Put (✓) for correct statements or (x) for false statements:

1. A candle keeps burning inside a jar not covered with a lid because the used air is replaced. ()
2. A bottom gap in closed jar provides enough air for stable burning of flame of the candle. ()
3. The flame of a candle inside a jar is stable and continues burning when air enters and exits freely. ()
4. Atmospheric air is a mixture consisting only of oxygen and nitrogen gases. ()
5. A flame cannot continue burning in nitrogen gas because nitrogen does not support combustion. ()
6. The amount of oxygen in the air is greater than the amount of nitrogen gas. ()
7. A lit incense stick burns more brightly when placed in a jar containing carbon dioxide gas. ()
8. During burning, oxygen is used up and carbon dioxide is released in the air. ()
9. Safety goggles are unnecessary when using limewater because it is a harmless solution. ()
10. A gas detector tube can be used many times to measure the amount of oxygen in the air. ()
11. One gas detector tube can measure different gases. ()

12. A Gas Monitor can be used in measuring both oxygen and carbon dioxide at the same time. ()
13. 💡 Ancient Egyptians showed wisdom regarding air circulation by using clever ideas to reduce smoke. ()
14. 💡 Ancient craftspeople used a gas sampling pump to melt gold at high temperatures. ()
15. 💡 Using renewable energy resources from the sun and wind increases carbon dioxide emissions compared to burning oil and coal. ()

3 Correct the underlined words:

1. A flame becomes unstable when you take off the lid to make gaps at both the top and bottom of a jar. (.....)
2. Nitrogen gas makes up about 21% of the atmospheric air. (.....)
3. When putting an incense stick in a jar containing oxygen gas, the flame goes out immediately. (.....)
4. The amount of carbon dioxide gas decreases because it is produced when things burn. (.....)
5. Colourless and clear limewater turns blue when it reacts with carbon dioxide. (.....)
6. You must break off both ends of the glass tube and insert it firmly into the gas monitor. (.....)
7. The gas detector tube contains a sensor inside whose color changes when it reacts with a specific gas. (.....)
8. A Gas Monitor uses a chemical to show the percentage of the gas on the screen in digital numbers. (.....)
9. 💡 Ancient Egyptians burned animal fat and plant oil from plants grown along the Amazon River. (.....)
10. 💡 Ancient craftspeople used a combustion spoon to pump air into the fire to supply more oxygen. (.....)
11. 💡 Benban Solar Park is a giant coal power plant in Aswan. (.....)
12. 💡 You must wear gloves so the limewater doesn't get in your eyes during an experiment. (.....)

4 Write the scientific term:

1. It is a mixture of different gases such as nitrogen, oxygen, carbon dioxide, and other gases. (.....)
2. It is the gas that forms about 78% of the atmospheric air and does not support burning. (.....)
3. It is the gas that forms about 21% of the atmospheric air and has the power to help things burn. (.....)
4. It is the gas that is produced when things burn and forms about 0.04% of the air. (.....)
5. It is a clear, colorless liquid used to check the presence of carbon dioxide gas. (.....)
6. It is a single-use glass tube containing a chemical that changes colour when it reacts with a specific gas. (.....)
7. It is the tool into which the glass detector tube is firmly inserted to pull air through it. (.....)
8. It is a device that uses a sensor to show the percentage of a gas on a screen in digital numbers. (.....)
9. 💡 It is a tool for blowing air used by craftspeople in ancient Egypt to pump air into the fire. (.....)
10. 💡 It is a global phenomenon caused today by producing too much carbon dioxide from burning things. (.....)
11. 💡 It is a giant solar power plant in Aswan that generates electricity without producing carbon dioxide. (.....)

5 Complete the following sentences:

1. For things to keep burning, fresh air must constantly flow and
2. When a candle is covered with a bottomless gas jar and a lid on its top with no gaps in the bottom, the air inside the jar is, and the flame
3. Atmospheric air is a of different gases.
4. In an experiment, an incense stick burns brightly in a jar containing gas, but the flame goes out in a jar containing gas.
5. The amount of oxygen gas is than that of nitrogen gas, while it is than that of carbon dioxide gas in the atmospheric air.

6. To collect gas in a water-filled jar, you must turn it _____, fill _____ of it with the gas, and put the lid on.
7. Colourless and clear limewater turns _____ when it reacts with _____ gas produced from burning.
8. To measure gas with a Gas Detector Tube, read the number at the _____ where the colour changed.
9. 💡 Ancient craftspeople pumped air into the fire to supply more _____ gas to help them in melting _____ at high temperatures.
10. 💡 Using renewable energy resources from the _____ and _____ can replace burning oil and coal to reduce emissions of _____ gas.
11. 💡 _____ Solar Park is a giant _____ power plant in Aswan to generate electricity.

Essay Questions

6 What's meant by:

- Atmospheric air?

7 Mention the importance of:

1. Gaps in the closed jar.
2. Oxygen gas.
3. Clear limewater.
4. Wearing safety goggles during the limewater experiment.
5. The gas sampling pump.
6. The sensor in a Gas Monitor.
7. 💡 The bellows for ancient craftspeople.
8. 💡 The Benban Solar Park.

8 Compare between each of the following:

1. A jar covered with a lid (no gaps) and a jar with gaps at both the top and bottom.
(In terms of the state of a burning candle inside)

.....

2. Oxygen gas and Nitrogen gas.
(In terms of their percentage in the air and their behavior with burning)

.....

3. Oxygen gas and Carbon dioxide gas.
(In terms of their effect on a lit incense stick)

.....

4. The Gas Detector Tube and the Gas Monitor.
(In terms of their method of measuring and displaying gas amounts)

.....

9 Give a reason for:

1. A burning candle goes out after a short time when placed in a closed jar covered with a lid and without any gaps.

.....

2. A candle flame keeps burning but is unstable when there is only a gap in the clay at the bottom of the jar.

.....

3. In a place where air is not replaced, things cannot keep burning.

.....

4. The flame of an incense stick burns brightly when put in a jar containing oxygen gas.

.....

5. The amount of oxygen gas decreases while the amount of carbon dioxide gas increases when things burn.

.....

6. Colourless and clear limewater turns milky white when shaken in a jar where a candle recently burned.

.....

7. The glass gas detector tube must be used only once and replaced after using it.

8.  Ancient craftspeople used a bellows to pump air into the fire.

9.  Egypt is gaining attention to build Benban Solar Park.

10 What happens:

1. To a burning candle inside a jar that is not covered with a lid?

2. To a burning candle when air enters from gaps at bottom and top of jar?

3. If you put a lit incense stick into a jar containing nitrogen gas?

4. If you put a lit incense stick into a jar containing oxygen gas?

5. To the amount of oxygen and carbon dioxide gases in a closed space during the burning process?

6. If carbon dioxide reacts with colourless and clear limewater?

7. If you pull the handle of the gas sampling pump fully while a detector tube is inserted?

8. If the chemical inside a gas detector tube reacts with a specific gas?

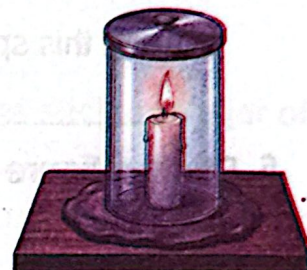
9.  If you pump more air into a fire using a bellows?

11 Study the following figures, then answer the following questions:

1. Study a figure showing a burning candle inside a bottomless gas jar set on clay.

(a) What happens to the air inside the jar and the flame?

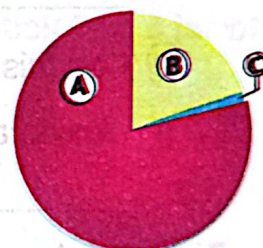
(b) If there are gaps cut into the clay at the bottom and the lid is removed from the top, why does the flame become stable and continuous?



2. Study a figure representing the percentages of gases in the atmospheric air.

(a) Label the letters.

(b) Which letter represents a gas supports combustion?



3. The opposite figure shows a candle being into two different gas jars for some time.

Which gas jar contains oxygen gas?

Give explanation for your answer.



Jar (A)



Jar (B)

4. Study a figure showing clear liquid turning milky white inside a jar after a candle has burned out.

(a) What is the liquid used to check for this gas?

(b) What is the gas that caused this color change?



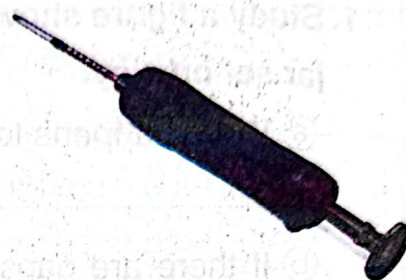
5. Study a figure showing a glass tube connected to a hand pump with a colored scale.

(a) What is the name of this measuring tool?

.....

(b) How do you read the percentage of the gas using this specific tool?

.....



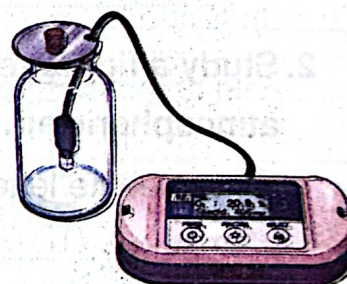
6. Study a figure showing a digital device with a sensor connected to a gas jar.

(a) What is the name of this device?

.....

(b) Can this tool measure both oxygen and carbon dioxide at the same time?

.....



7. Study a figure of an ancient craftsperson pumping a leather tool into a fire.

(a) What is the name of this tool?

.....

(b) What gas is being supplied to the fire to help melt gold at high temperatures?

.....



Choose the correct answer:

Why did the flame go out inside the jar with the lid?

- (a) Because there was no water vapor in the jar.
- (b) Because it got dark inside the jar.
- (c) Because fresh air stopped coming in.

What happens to the burning when you put a lit incense stick into a jar of oxygen gas?

- (a) It becomes weaker.
- (b) It burns brightly.
- (c) The flame goes out.

What happens to the burning when you put a lit incense stick into a jar of carbon dioxide gas?

- (a) It keeps burning as it is.
- (b) It burns brightly.
- (c) The flame goes out.

In the experiment of burning a candle inside a jar, what happens to the flame if you leave gaps at the top and bottom of the jar?

- (a) It keeps burning.
- (b) It goes out immediately.
- (c) The flame is unstable.

Which statement correctly explains oxygen?

- (a) Oxygen makes up about 78% of the air.
- (b) Oxygen helps other things burn.
- (c) When you put a candle in a jar with oxygen, the flame goes out immediately.

What happens when you put limewater in a jar with increased carbon dioxide and shake it?

- (a) It turns blue.
- (b) It turns yellow.
- (c) It turns milky white.

② Fill in the blanks with the correct words:

1. For things to keep burning, fresh must constantly flow in and out.
2. In a place where air is not replaced, things keep burning.

③ Answer the following questions:

1. In the experiment of burning a standing candle inside a jar, what happens to the flame if you put a lid on the jar to stop air from coming in and out?
.....
2. What gas is included in the air and has the power to help things burn?
.....
3. What is the colourless and clear liquid used to check if there is carbon dioxide?
.....
4. How does the amount of oxygen and carbon dioxide gases change after burning?
.....

Chapter 2 Respiration

Best Science Project



Lessons of Chapter 2:

- Lesson 1: How Breathing Works
- Lesson 2: How Lungs Work

Main Vocabulary

Page 35

Breathe in	يحترق	Breathe out	يستنشق	Plastic bags	أكياس بلاستيكية
------------	-------	-------------	--------	--------------	-----------------

Page 36

Room air	مصلصال	Inhaled air (Breathed in air)	هواء الشهيق	Exhaled air (Breathed out air)	هواء الزفير
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Page 37

Breathing (Respiration)	عملية التنفس	Inhalation	عملية الشهيق	Exhalation	عملية الزفير
-------------------------	--------------	------------	--------------	------------	--------------

Page 38

Chest	الصدر				
-------	-------	--	--	--	--

Page 39

Examine	يفحص	Gills	خياشيم	Lungs	الرئتين
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Page 40

Windpipe	هوائية قصبة				
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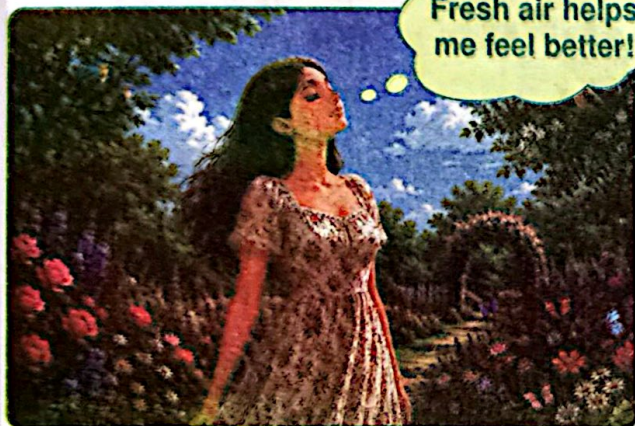
Page 41

Gas exchange	تبادل الغازات	Blood vessels	أوعية دموية	Alveoli	حويصلات هوائية
Heart	القلب	Pump	يضخ		

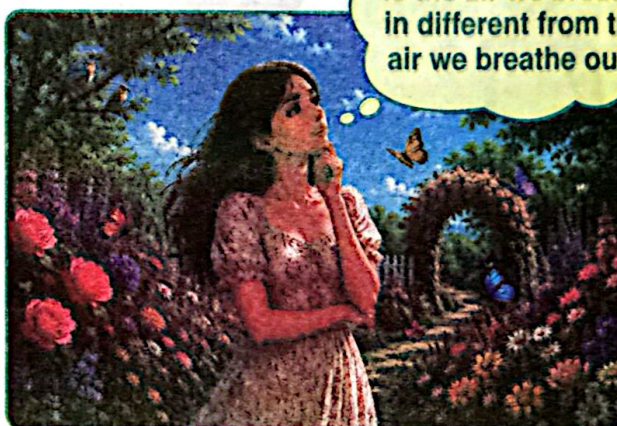
Lesson 1 How Breathing Works



Warm up!



Fresh air helps me feel better!



Is the air we breathe in different from the air we breathe out?



Experiment

How Breathing Works

Preparation:



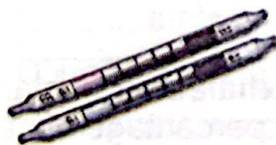
Plastic bags
(Polyethylene bags)



Limewater



Safety goggles



Gas detector tubes



Gas sampling pump



Scissors

First Test with Limewater

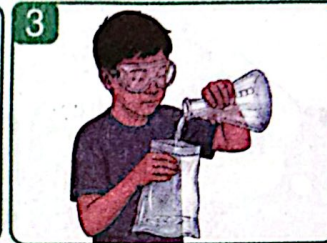
Steps:



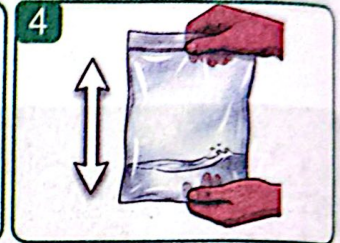
Prepare two plastic bags.



Breathe into one bag, and fill the other bag with room air.



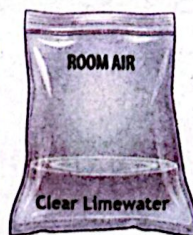
Pour a little limewater into each bag.



Shake the two plastic bags well.

Observations:

The colour of clear limewater **doesn't change** in the plastic bag containing **room air**.



The colour of clear limewater **turns milky** in the plastic bag containing **exhaled air**.

Second Test with Gas Detector Tubes

Steps:

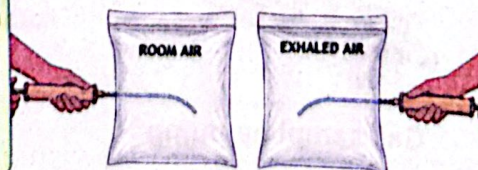
Repeat steps ① and ②.

Make small hole in each bag using scissors.

Use **gas detector tubes** to check the amount of oxygen and carbon dioxide in the air inside the two bags.

Observations:

Room air (Inhaled air) contains about 21% oxygen and about 0.04% carbon dioxide.



Exhaled air contains high percentage of carbon dioxide gas and very low percentage of oxygen gas.

Results:

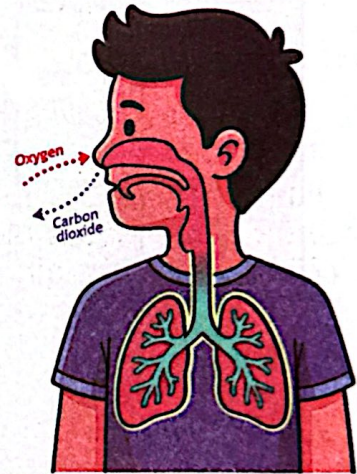
		Inhaled air (Room air)	Exhaled air (Breathed out air)
Test	Limewater	Remains Clear	Turns Milky White
	Gas detector	Oxygen gas is much greater than carbon dioxide gas.	Carbon dioxide gas is much greater than oxygen gas.
Gas	Oxygen	About 21% of air	Lower, but still present
	Carbon dioxide	About 0.04% of air	Much higher

Conclusion:

- People inhale (breathe in) to take in oxygen from the air, and exhale (breathe out) to release carbon dioxide.

Breathing (Respiration)

It is the process of taking in oxygen gas (inhalation) and letting out carbon dioxide gas (exhalation).



Evaluate your Understanding On Lesson (1)

Complete the following sentences using the word bank:

carbon dioxide gas

gas detector

room

limewater

exhaled

Oxygen gas

1. turns milky in a bag containing air.
2. During breathing, the body takes in and releases
3. If limewater remains clear after shaking, the bag most likely contains air.
4. can be used to check the amount of oxygen and carbon dioxide gas.

Lesson 2 How Lungs Work



Warm up!

The teacher asked Ali and Suha some questions about breathing.



When we inhale (breathe in), the chest gets

☒ bigger ☐ smaller ✓ Excellent! ★

When we exhale (breathe out), the chest gets

☐ bigger ☒ smaller ✓ Excellent! ★

The teacher wrote two questions in Suha's notebook and said:

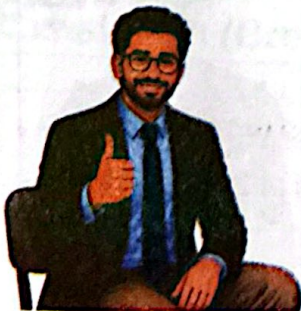


1. Fish breathe in and out using

☐ lungs	☒ gills	✓ <u>Excellent!</u> ☆
--------------------------------	---	-----------------------

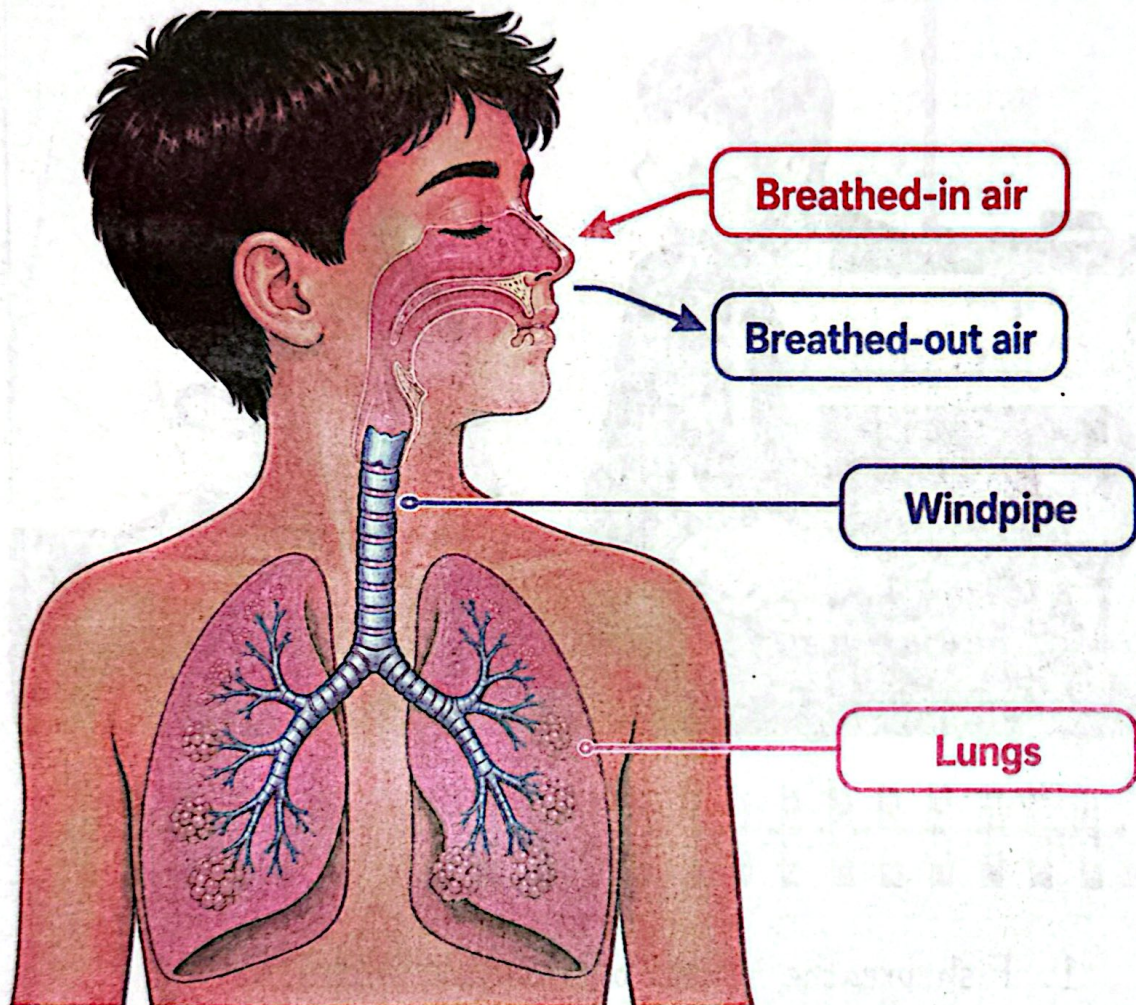
2. Cats breathe using

☒ lungs	☐ gills	✓ <u>Excellent!</u> ☆
---	--------------------------------	-----------------------



Great job! We are now ready to learn how oxygen enters our body and carbon dioxide leaves it.

The Structure of Respiratory System

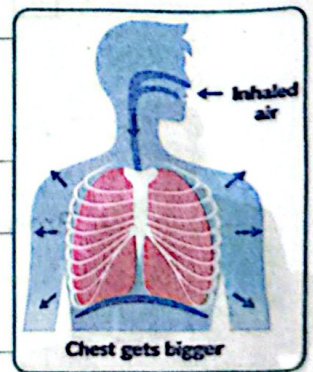


Steps of Respiration (Breathing)

Inhalation (Breathing in):

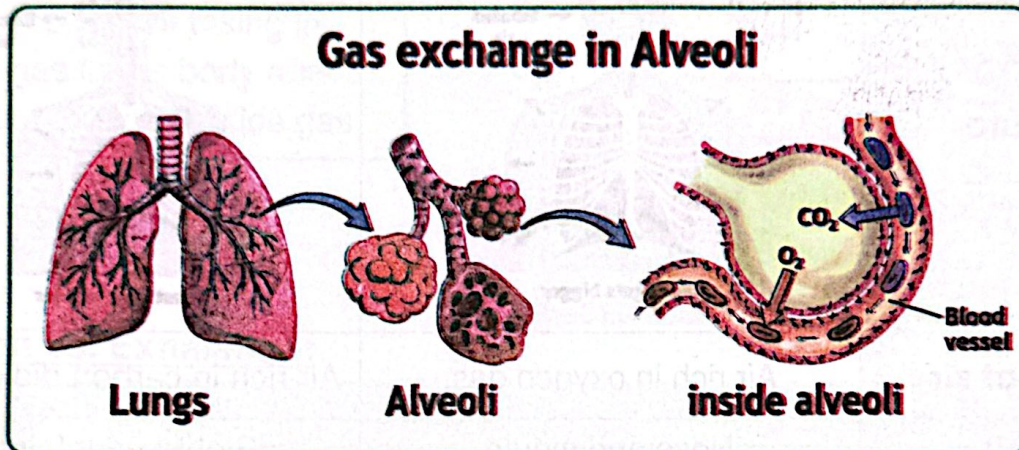
Inhaled air (Breathed-in air) enters the human body through the **nose** or **mouth**.

Inhaled air travels down through the **windpipe (trachea)** to reach the left and right **lungs** in our **chest**.



Gas exchange (Inside lung):

Gas exchange takes place inside tiny air sacs surrounded by blood vessels called **alveoli**.



Through the blood vessels around the alveoli in the lungs:

Oxygen gas is taken into the **blood**.

Carbon dioxide in the blood is let out into the **air**.

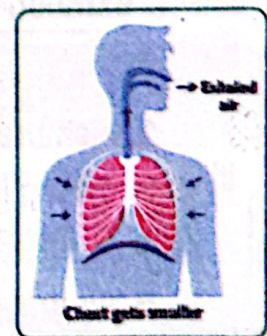
Gas transportation (through blood):

Oxygen gas is carried by the **blood** to the **whole body** by the work of the **heart**.

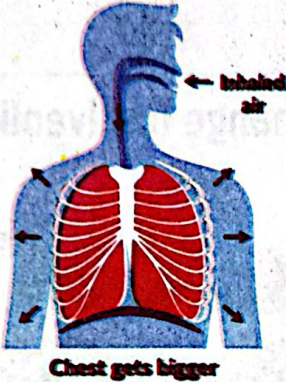
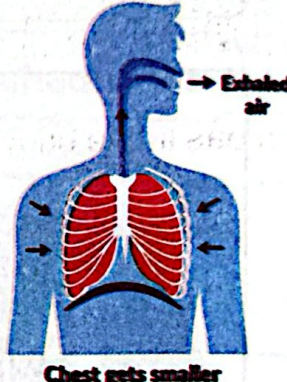
The Heart pumps oxygen-rich blood to the whole body.

Exhalation (Breathing out):

- Exhaled air (Breathed-out air) goes through the windpipe (trachea) and is breathed out from the **nose** and **mouth**.



Comparison between inhaled air and exhaled air:

P.O.C.	Inhaled air (Breathed in air)	Exhaled air (Breathed out air)
Figure		
Type of air	Air rich in oxygen gas.	Air rich in carbon dioxide gas.
Path of air	Nose and mouth ↓ Windpipe (Trachea) ↓ Right and left lungs	Right and left lungs ↓ Windpipe (Trachea) ↓ Nose and mouth
Chest size	It gets bigger.	It gets smaller.



Evaluate your Understanding On Lesson (2)

Complete the following sentences using the word bank:

exhaled

gills

windpipe

nose

mouth

heart

- is a tube that allows inhaled air to enter the lungs.
- Fish breathe using unlike humans.
- During inhalation, air enters the body through the or
- pumps oxygen-rich blood to the whole body.
- Air that contains a higher percentage of carbon dioxide is called air.

Summary on Chapter 2

Respiration

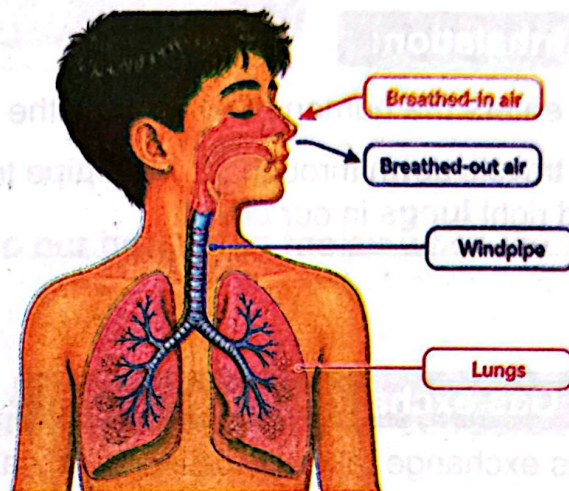


Must Know
Before the
Exam

Respiration (Breathing):

Respiration (Breathing)

It is the process of taking in oxygen gas in the body and letting out carbon dioxide gas.



Inhalation vs. Exhalation:

P.O.F.	Inhalation	Exhalation
Figure	 Chest gets bigger	 Chest gets smaller
Definition	It is the process of taking in oxygen gas in the body.	It is the process of letting out carbon dioxide gas into the air.
Path of air	Nose and mouth → Windpipe → Lung	Lung → Windpipe → Nose and mouth
Chest size	It gets bigger.	It gets smaller.

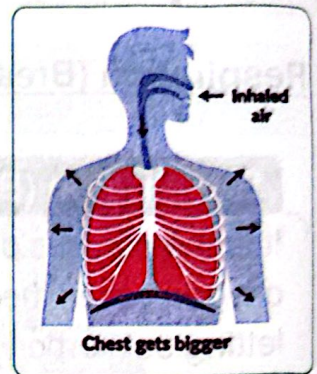
Inhaled air vs. Exhaled air:

P.O.F.	Inhaled air (Breathed out air)	Exhaled air (Breathed out air)
Oxygen gas	About 21% of air	Lower percentage, but still present
Carbon dioxide gas	About 0.04% of air	Much higher percentage

Steps of Respiration:

1. Inhalation:

- Air enters the human body through the **nose** or **mouth**.
- Air travels down through the **windpipe** to reach the left and right **lungs** in our **chest**.

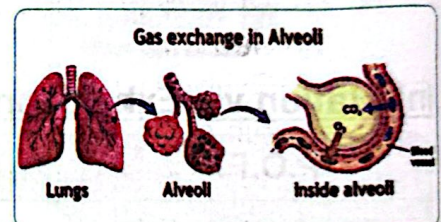


2. Gas exchange (inside lungs):

- Gas exchange takes place inside tiny air sacs surrounded by blood vessels called **alveoli**.
- Through the blood vessels around the alveoli in the lungs.

Oxygen gas is taken into the **blood**.

Carbon dioxide in the blood is let out into the **air**.



Notes:

- Fish breathe using **gills**.
- Cats breathe using **lungs**.

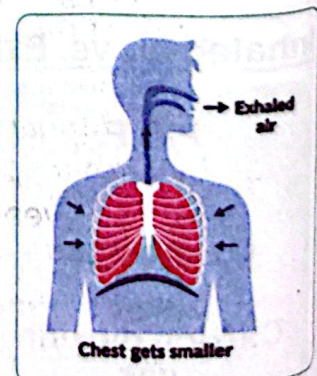
3. Transportation of oxygen gas:

- **Oxygen gas** is carried by the **blood** to the **whole body** by the work of the **heart**.

The heart pumps oxygen-rich blood to the whole body.

4. Exhalation:

Exhaled air (Breathed-out air) goes through the **windpipe** and is **breathed out** from the **nose** and **mouth**.





First PONY Questions

Objective Questions

1 Choose the correct answer:

1. is the gas we take into our body from the air when we breathe in.
(a) Carbon dioxide (b) Oxygen
(c) Nitrogen (d) Water vapor
2. Which gas is found in a higher percentage in exhaled air compared to inhaled air?
(a) Oxygen (b) Carbon dioxide
(c) Nitrogen (d) Helium
3. A clear liquid that turns milky white when exposed to exhaled air is
(a) blood (b) limewater
(c) pure water (d) saliva
4. To check the specific amount of oxygen and carbon dioxide in the air inside a plastic bag, the tool you can use is
(a) scissors (b) safety goggles
(c) gas detector tubes (d) glass beakers
5. The statement that accurately describes the oxygen gas in the exhaled air is:
(a) It contains no oxygen
(b) It has a higher oxygen concentration than inhaled air
(c) It maintains the same oxygen concentration as inhaled air (21%)
(d) It has a lower oxygen concentration than inhaled air
6. The oxygen taken into the blood is carried to the whole body by the work of the
(a) heart (b) windpipe (c) lungs (d) gills
7. In the human body, the air breathed in from the nose and mouth goes through a specific tube called to reach the lungs.
(a) blood vessel (b) windpipe (c) alveoli (d) gill
8. While cats breathe using lungs, the animals that breathe in and out and let out carbon dioxide from their gills are
(a) birds (b) fish (c) humans (d) dogs

9. During the process of exhalation, the chest
 (a) gets bigger (b) gets smaller
 (c) expands outward (d) remains unchanged
10. Gas exchange takes place inside tiny air sacs in the lungs surrounded by blood vessels. These tiny air sacs are called
 (a) gills (b) windpipes (c) alveoli (d) limewater
11. The correct path of exhaled air (breathed-out air) is
 (a) Nose → mouth → Windpipe → Lungs
 (b) Lungs → Alveoli → Heart
 (c) Lungs → Windpipe → Nose and mouth
 (d) Heart → Windpipe → Nose and mouth
12. The organ that is NOT a part of the hollow path that inhaled air travels through is the
 (a) nose (b) windpipe (c) lung (d) heart

2. Put (✓) for correct statements or (X) for false statements:

1. When we inhale air, the chest gets smaller. ()
2. Room air (inhaled air) contains about 21% oxygen and about 0.04% carbon dioxide. ()
3. The colour of clear limewater doesn't change in a plastic bag containing room air. ()
4. Through the blood vessels around the lungs, carbon dioxide in the air is taken into the blood. ()
5. Taking in oxygen and letting out carbon dioxide is called breathing. ()
6. Exhaled air contains a very high percentage of oxygen gas and a low percentage of carbon dioxide gas. ()
7. The oxygen taken in by the lungs travels through the blood and is carried to your fingertips and toes. ()
8. Just like humans let out carbon dioxide from their nose and mouth, fish let out carbon dioxide from their lungs. ()
9. By putting your hand on your chest, you can feel it gets bigger during inhalation and smaller during exhalation. ()
10. Clear limewater will turn blue if you blow breathed-out air into it. ()
11. Gas exchange in the lungs takes place inside tiny air sacs surrounded by blood vessels called gills. ()

3 Correct the underlined words:

1. Oxygen gas turns clear limewater milky in a plastic bag. (.....)
2. When we exhale (breathe out), the chest gets bigger. (.....)
3. Fish breathe in and out using lungs. (.....)
4. Inhaled air travels down through the heart to reach the left and right lungs. (.....)
5. The windpipe is responsible for pumping the oxygen-rich blood to the whole body. (.....)
6. Gas exchange in the lungs takes place through the bones around the lungs. (.....)
7. The oxygen taken in by the lungs is carried to your fingertips and toes through your bones. (.....)

4 Write the scientific term:

1. It is the process of taking in oxygen gas and letting out carbon dioxide gas. (.....)
2. It is a clear liquid that turns milky when you blow breathed-out air into it. (.....)
3. They are the specific organs in our chest where oxygen and carbon dioxide are exchanged. (.....)
4. It is the tube that allows inhaled air to travel from the nose and mouth down to the left and right lungs. (.....)
5. They are the tools used alongside a gas sampling pump to check the amount of oxygen and carbon dioxide in the air inside plastic bags. (.....)
6. They are the tiny structures surrounding the alveoli where oxygen from the air is taken into the blood and carbon dioxide is let out. (.....)

5 Complete the following sentences:

1. Room air (inhaled air) contains about oxygen and about carbon dioxide.
2. Through the around the lungs, oxygen in the air is taken into the blood, and in the blood is let out into the air.
3. The oxygen taken into the blood is carried to the whole body by the work of the
4. During inhalation, air enters the body through the or
5. If limewater remains clear after shaking the plastic bag, the bag most likely contains air.

6. Fish let out carbon dioxide from their, while cats breathe using
7. Exhaled air contains a very high percentage of gas and a very low percentage of gas.
8. If you put your hand on your chest, you can feel that it gets when you breath in and gets when you breath out.

6 Cross out the Odd word, and mention the reason:

1. Nose – Windpipe – Heart – Lungs (.....)
2. Breath in – Oxygen enters lungs – Chest gets bigger – Letting out carbon dioxide (.....)

Essay Questions

7 What's meant by:

1. Breathing (Respiration)?

.....

2. Gas exchange in the lungs?

.....

3. Breathed-in air (Inhaled air)?

.....

4. Breathed-out air (Exhaled air)?

.....

8 Mention the importance of:

1. Limewater in the breathing experiment.

.....

2. Gas detector tubes.

.....

3. The windpipe.

.....

4. The heart during respiration.

.....

5. The blood vessels around the lungs.

.....

6. Alveoli in the human body.

.....

7. Gills for fish.

.....

9 Compare between each of the following:

1. Room air (Inhaled air) and Exhaled air.
(In terms of the percentage of oxygen and carbon dioxide)
.....
2. The chest during inhalation and the chest during exhalation.
(In terms of size of chest)
.....
3. Respiration in cats and respiration in fish. (In terms of the breathing organs used)
.....
4. Limewater mixed with room air and Limewater mixed with exhaled air.
(In terms of colour)
.....
5. Oxygen gas and Carbon dioxide gas during gas exchange in the alveoli.
(In terms of the direction of their movement between the air and the blood)
.....
6. Oxygen and Carbon dioxide in room air.
(In terms of their approximate percentages in air)
.....

10 Give a reason for:

1. The colour of clear limewater turns milky white in a plastic bag containing exhaled air.
.....
2. The colour of clear limewater remains clear and doesn't change in a plastic bag containing room air.
.....
3. Oxygen taken in by the lungs is able to travel to your fingertips and toes.
.....
4. The chest gets bigger when a person inhales (breathes in).
.....
5. The body needs the heart to work alongside the lungs during respiration.
.....

11 What happens if:

1. You breathe into a plastic bag containing clear lime water and shake it well?
.....
2. Blood passes through the blood vessels around the lungs during breathing?
.....

3. You inhale (breathe in) air through your nose or mouth?

(According to the path of air and chest movement)

4. You exhale (breathe out) air?

(According to the chest movement and the gas released)

12 Study the following figures, then answer the following questions:

Figure A:

1. What is the name of the clear liquid inside the plastic bag?

2. What will happen to the color of the liquid after the boy shakes the bag containing his breathed-out air?



Figure B:

1. What is the name of the metal cylinder tool being used to pull the air from the bag?

2. If this tool is measuring carbon dioxide, will it show a very low percentage (like 0.04%) or a high percentage?

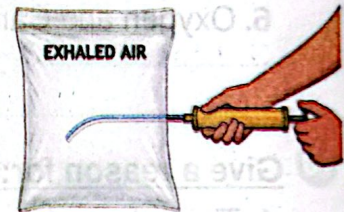


Figure C:

1. What is the scientific name for these tiny air sacs where gas exchange happens?

2. Which specific gas is shown moving from the air inside the sac into the blood?

3. Which specific gas is shown being let out of the blood into the air sac?

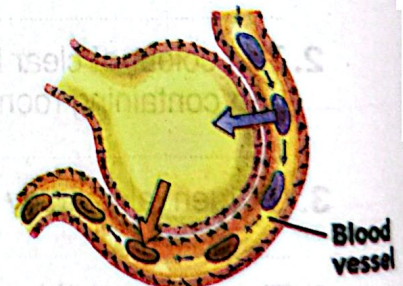


Figure D:

1. Does this figure represent the process of breathing in or breathing out?

2. What is the name of the tube that the air travels up and through to leave the lungs and exit the body?

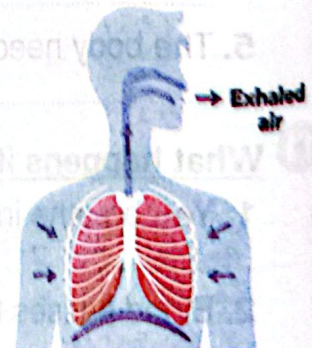


Figure E:

1. What are the respiratory organs inside the cat's body used for respiration?
.....
2. What are the specific respiratory organs the fish uses to let out carbon dioxide into the water?
.....



Second School Book Questions

1 Choose the correct answer:

1. When comparing the air we breathe in and the air we breathe out, which gas increases in the air we breathe out?
(a) Carbon dioxide (b) Oxygen (c) Neither increases
2. What happens to limewater when you blow breathed-out air into it?
(a) It turns milky white. (b) It turns blue. (c) It disappears.
3. Which statements correctly explain breathing?
(a) The air we breathe out has no oxygen at all.
(b) The air we breathe out has more carbon dioxide than the air we breathe in.
(c) The air we breathe out has more oxygen than the air we breathe in.
4. Which statement correctly explains gas exchange in the lungs?
(a) It lets out oxygen from the blood into the air.
(b) It takes in oxygen from the air into the blood.
(c) It takes in carbon dioxide from the air into the blood.
5. What happens to limewater when you blow breathed-out air into it?
(a) It remains clear. (b) It turns into blue. (c) It turns milky white.

2 Answer the following questions:

1. What gas do we take into our body when we breathe in?
.....
2. What is the organ in our chest that exchanges oxygen and carbon dioxide?
.....

3 Fill in the blanks with the correct words to complete the sentence:

- Through the around the lungs, is taken into the blood, and in the blood is let out into the air.

Chapter

3

Digestion



Lessons of Chapter 3:

- Lesson 1: Where Food Goes
- Lesson 2: The Function of Saliva
- Lesson 3: How Absorption Works

Main Vocabulary

Page (54)

Mouth	فم	Teeth	اسنان	Simpler form	صورة بسيطة
Digestion	عملية الهضم	Food pipe (Esophagus)	قناة هضمية (المريء)	Stomach	المعدة
Small intestine	الأمعاء الدقيقة	Large intestine	الأمعاء الغليظة	Anus	فتحة الشرج
Digestive tract	مسار الهضم	Path of food	مسار الطعام		

Page (57)

Digestive juice	عصارة هضمية	Saliva	اللعاب	Starch	نشأ
Iodine solution	محلول اليود	Dropper	قطارة	Dilute	مخفف

Page (58)

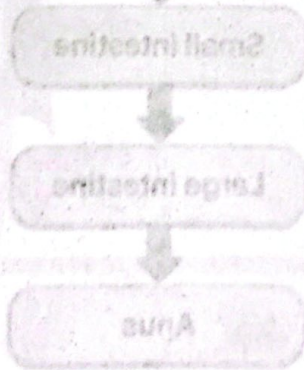
Soaked	منقوع	Test tube	أنبوبة اختبار		
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Page (59)

Absorption	إمتصاص	Nutrients	عناصر غذائية	Digested food	الطعام المهضوم
Undigested food	الطعام الغير مهضوم	Feces (stool)	البراز	Villi	زغابات
Capillaries	شعيرات	Bumps	مطبات	Towel	منشفة

Page (60)

Fats	دهون	Store	يخزن	Urine	بول
------	------	-------	------	-------	-----



Lesson 1 Where Food Goes

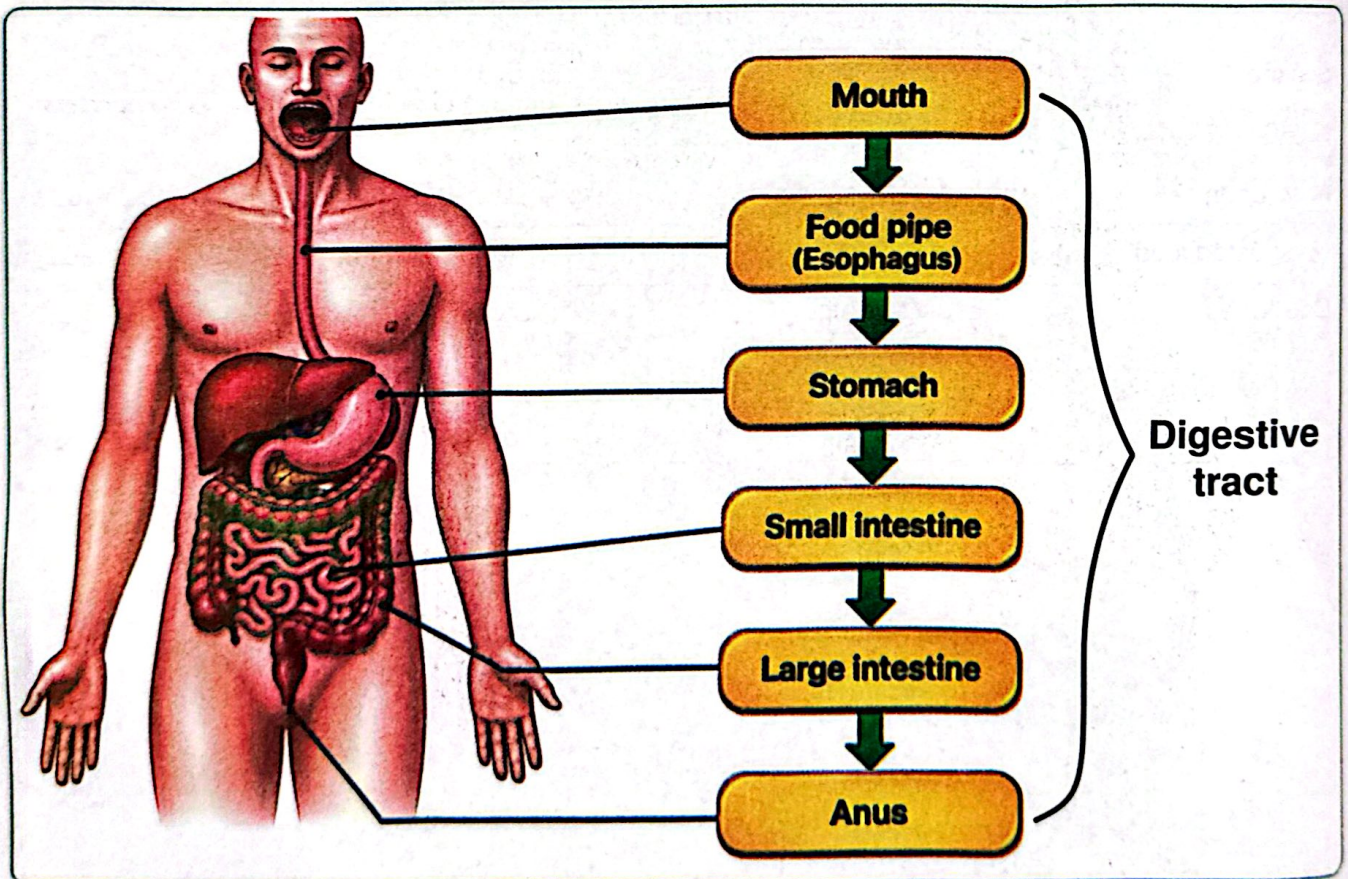
What happens to the food we eat from our mouth, where does it pass through, and how does it change its shape?

- Food is broken down into small pieces by the teeth in mouth and changed into a simpler form that the body can easily absorb.



Digestion

It is the process of breaking down food into small pieces and converting it into a simpler form that can be easily absorbed by the body.



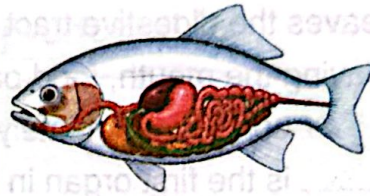
Digestive tract

It is the path of food from the **mouth** to the **anus**.

The first question

Is digestive system similar in all animals?

I think NO, they are different.



Can you arrange the digestive track?

Word Bank:

Large intestine

Stomach

Food pipe

Anus

Small intestine

Mouth

I think yes, I can do it.

Now try to arrange the word bank to get the correct digestive tract:





Evaluate your Understanding On Lesson (1)

1 Complete the following sentences using the word bank:

food pipe

mouth

anus

stomach

1. Food leaves the digestive tract through the
2. After leaving the mouth, food passes through the
3. The comes immediately before the small intestine.
4. The is the first organ in the digestive tract.

2 Put (✓) for correct statements or (X) for false statements:

1. All animals have exactly the same digestive system. ()
2. The stomach is located between the food pipe and the small intestine. ()
3. Digestion only means making food smaller in size. ()

3 Choose the correct answer:

1. Which statement best explains why food is broken into smaller pieces during digestion?

- (a) To keep food inside the stomach.
- (b) To increase the amount of food.
- (c) To help the body absorb it more easily.
- (d) To get rid of wastes quickly.

2. Which statement MUST be true about the large intestine?

- (a) It comes directly before the stomach.
- (b) It is the last organ in digestive tract.
- (c) It breaks down food into small pieces.
- (d) It comes after the small intestine.

3. The digestive tract is written by a student as:

Mouth → Food pipe → Anus → Small intestine → Large intestine → Stomach

Which change can we do to make the sequence correct?

- (a) Add the Anus at the last of digestive tract.
- (b) Remove the stomach from the digestive tract.
- (c) Exchange the stomach and the anus.
- (d) Exchange the food pipe and the stomach.

Lesson 2 The Function of Saliva

Digestive juice

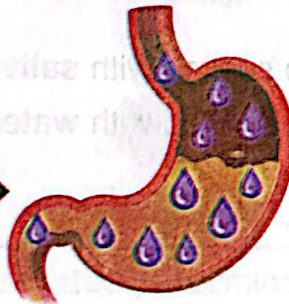
It is a liquid that has the function of digesting of food.

Digestive juices are produced in:

The mouth



The stomach



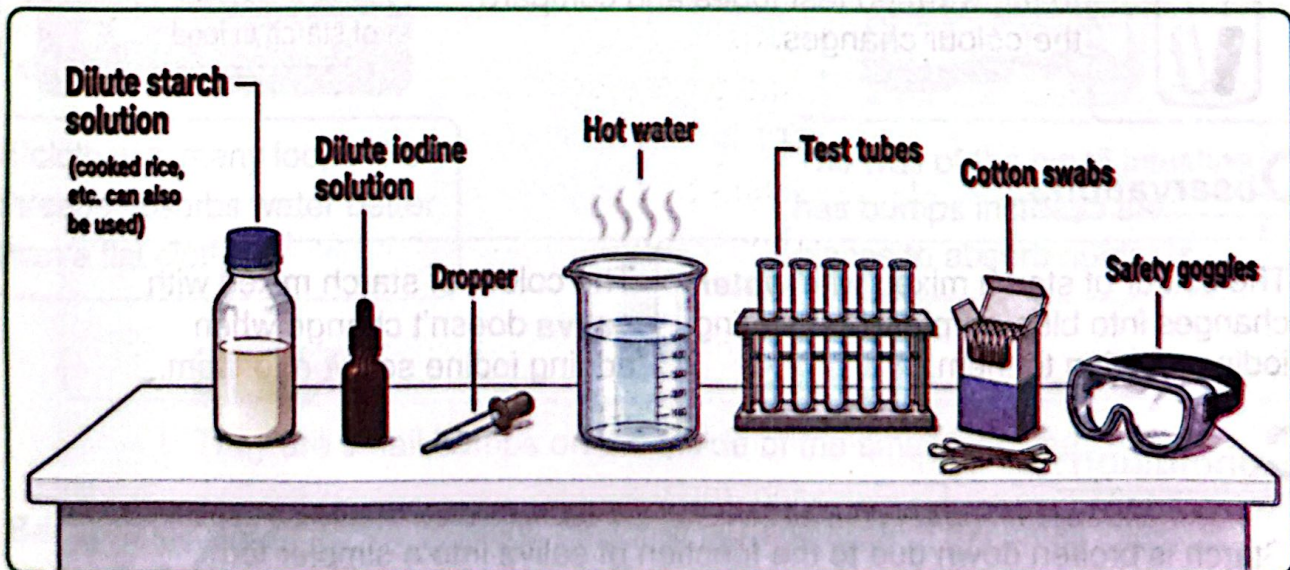
Intestines



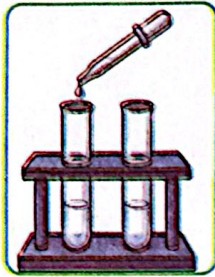
Saliva

It is a digestive juice in the mouth has the function of breaking down starch contained in food into something else (simpler form).

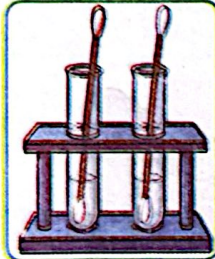
Preparation:



Steps:



Put the **dilute starch solution** into two test tubes with a dropper.



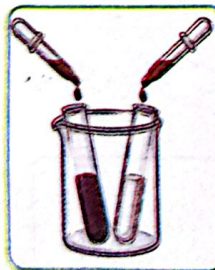
- Put a cotton swab soaked with **saliva** into one test tube.
- Put a cotton swab soaked with **water** into the other test tube.



Put the two test tubes in beaker containing hot water of about **40°C** for a few minutes.

Reason

To make the same environment such as temperature inside the body.



Add drops of **dilute iodine solution** to the warmed test tubes and compare the colour changes.

Dilute iodine solution is used to detect the presence of starch in food.

Observations:

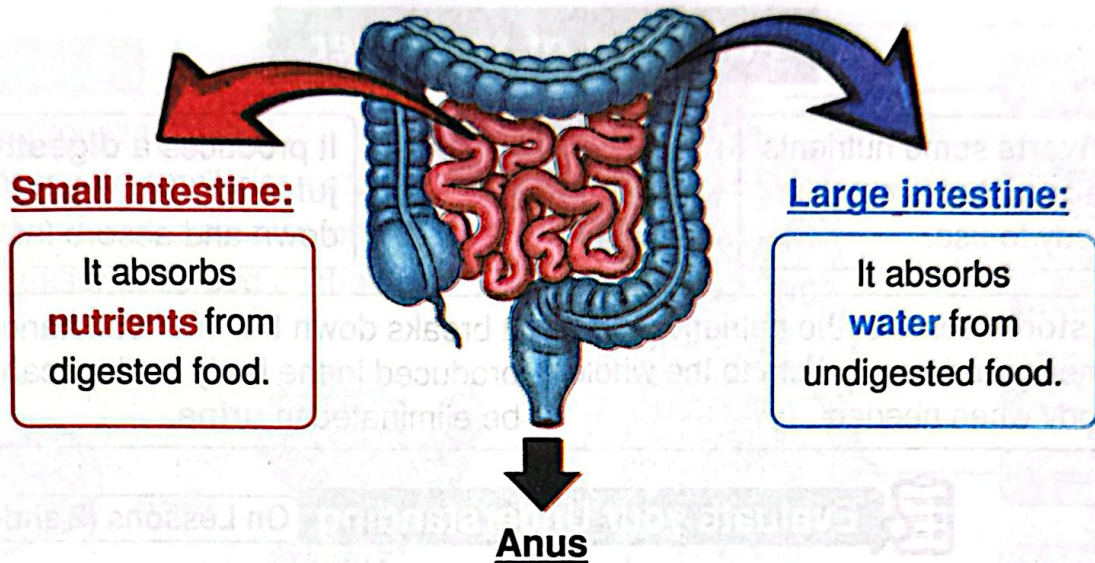
The colour of starch mixed with **water** changes into blue-purple when adding iodine solution to them.

The colour of starch mixed with **saliva** doesn't change when adding iodine solution to them.

Conclusion:

Starch is broken down due to the function of saliva into a simpler form.

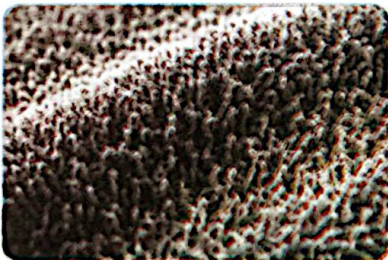
Lesson 3 How Absorption Works



It is an opening where **feces (stool)** is eliminated out the body through it.

Structure of the small intestine:

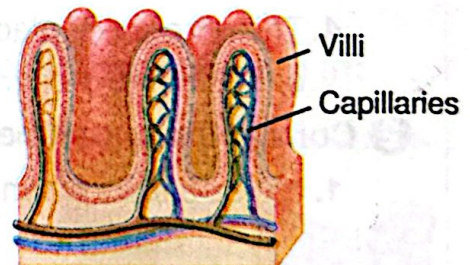
Surface of a towel



A cloth with many loops like threads absorbs water better than a flat cloth.

Walls of small intestine

Just like a towel



The wall of the small intestine has bumps increase the places to absorb nutrients.

Villi

They are small bumps on the inside of the small intestine.

- Because villi are **lined up closely**, the inner surface area of the small intestine becomes **larger**, and it can absorb nutrients **efficiently**.

- The nutrients absorbed in the small intestine are carried to the whole body by the **blood**, passing through the **liver**.

Function of the Liver

It **converts** some nutrients into a form that is easy for the body to use.



It produces a **digestive juice** that helps break down and absorb fat.

It **stores** some of the nutrients as energy and sends them to the whole body when needed.

It breaks down **harmful** substances produced in the body so they can be eliminated in **urine**.



Evaluate your Understanding On Lessons (2 and 3)

1 Complete the following sentences using the word bank:

1. When iodine solution is added to starch, the colour changes to
2. The liver produces that helps in the digestion of fats.
3. After absorption, nutrients are transported by the to all parts of the body.
4. The purpose of placing test tubes in warm water is to simulate the of the human body.

2 Correct the underlined word:

1. Saliva breaks down proteins in the mouth into simpler substances.

(.....)

2. The large intestine absorbs nutrients from digested food. (.....)

3 Write the scientific term:

1. They are small bumps on the inside of the small intestine to improve absorption. (.....)

2. It is a liquid that has the function of digesting of food. (.....)

4 Cross out the Odd word, and mention the reason:

- Mouth – Stomach – Small intestine – Anus

Odd word: Reason:

Summary on Chapter 3

Digestion

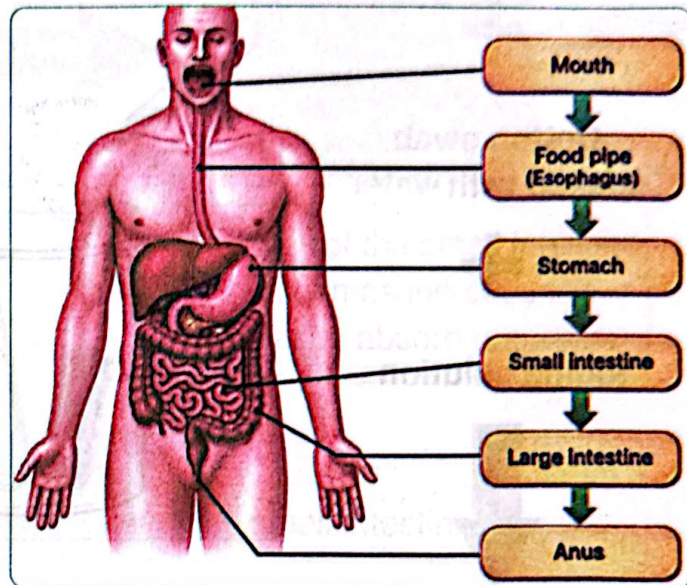
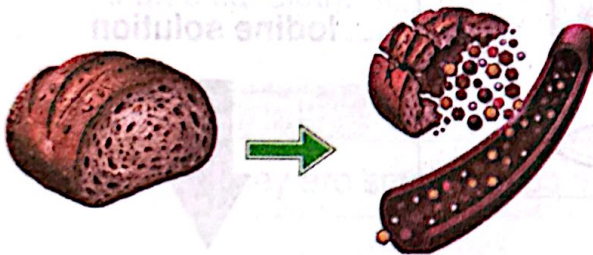


Must Know
Before the
Exam

Process:

Digestion

It is the process of breaking down food into small pieces and converting it into a simpler form that can be easily absorbed by the body.



Digestive tract:

Digestive tract

It is the path of food from the **mouth** to the **anus**.

Digestion of food:

Digestive juice

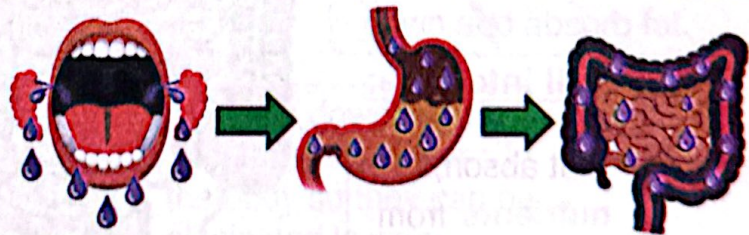
It is a liquid that has the function of digesting of food.

Digestive juices are produced in:

The mouth

The stomach

Intestines



Saliva in the Mouth:

Saliva

It is a digestive juice in the mouth has the function of breaking down starch contained in food into simpler form.



Test of saliva:

Dilute starch solution



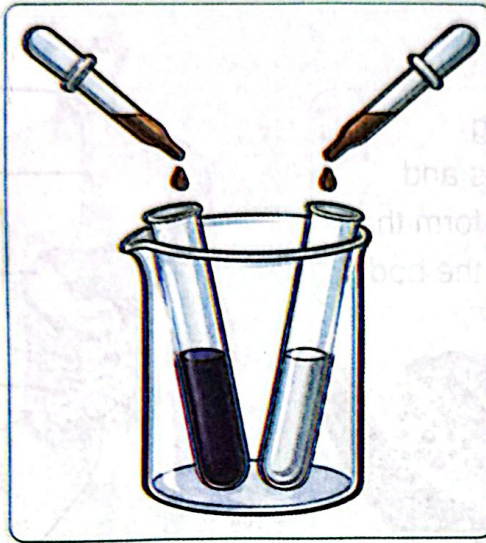
Cotton swab soaked with **water**



Iodine solution



The colour of iodine solution changes to blue-black.



Dilute starch solution



Cotton swab soaked with **saliva**



Iodine solution

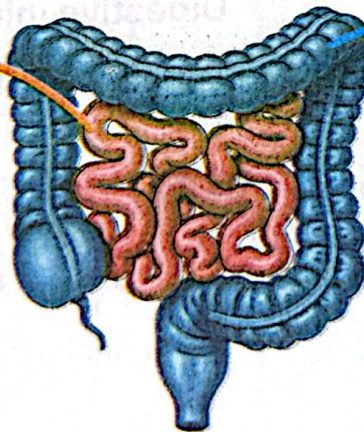


The colour of iodine solution doesn't change.

How absorption works:

Small intestine:

It absorbs **nutrients** from digested food.



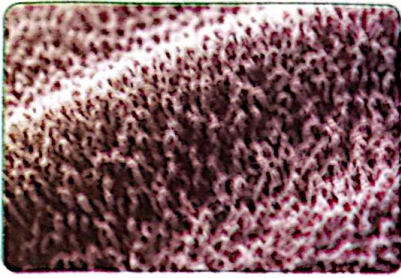
Large intestine:

It absorbs **water** from undigested food.

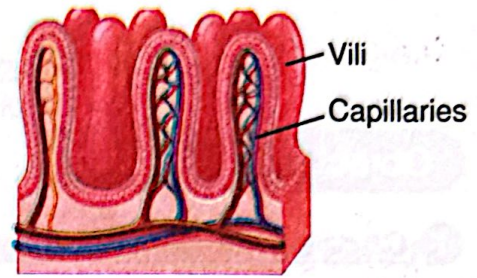
↓
Anus

It is an opening where feces (stool) is eliminated out the body through it.

Structure of the small intestine:



Just like a towel,



A cloth with many loops like threads absorbs water better than a flat cloth.

The wall of the small intestine has bumps increase the places to absorb nutrients.

Villi

They are small bumps on the inside of the small intestine.

- Villi are **lined up closely**, so the inner surface area of the small intestine becomes **larger**, and it can absorb nutrients **efficiently**.
- The nutrients absorbed in the small intestine are carried to the whole body by the blood, passing through the liver.

It converts some nutrients into a form that is easy for the body to use.



It produces a **digestive juice** that helps break down and absorb fat.

It stores some of the nutrients as energy and sends them to the whole body when needed.

It breaks down **harmful** substances produced in the body so they can be eliminated in **urine**.

Exercises on Chapter 3

Digestion

First

PONY Questions

Objective Questions

1 Choose the correct answer:

- 1. Select the correct order of the digestive tract that food passes through.**
 - (a) Mouth → Stomach → Food pipe → Small intestine → Large intestine → Anus
 - (b) Mouth → Food pipe → Stomach → Large intestine → Small intestine → Anus
 - (c) Mouth → Food pipe → Stomach → Small intestine → Large intestine → Anus
 - (d) Mouth → Food pipe → Large intestine → Small intestine → Stomach → Anus
- 2. The purpose of warming the test tubes in hot water of about 40°C during the saliva experiment is to**
 - (a) disinfect the test tubes and the water
 - (b) change the colour of the iodine solution before adding it
 - (c) evaporate the water from the starch solution
 - (d) create an environment with a temperature similar to the inside of the human body
- 3. All of the following are functions of the liver except**
 - (a) absorbing water from undigested food
 - (b) storing some nutrients as energy and sending them to the whole body
 - (c) breaking down harmful substances produced in the body so they can be eliminated in urine
 - (d) producing a digestive juice that helps break down and absorb fat
- 4. The liquid produced in the mouth that has the function of breaking down starch into something else is called**
 - (a) Iodine solution
 - (b) Dilute starch solution
 - (c) Saliva
 - (d) Urine
- 5. Which statement best explains why food is broken into smaller pieces during digestion?**
 - (a) To keep food inside the stomach for a longer time.
 - (b) To increase the amount of food the body holds.
 - (c) To get rid of wastes as quickly as possible.
 - (d) To convert it into a simpler form that the body can easily absorb.

- 6. The wall of the small intestine has small bumps called villi, whose main role is to**
- (a) break down food mechanically
 - (b) increase the places to absorb nutrients efficiently
 - (c) transport food directly to the stomach
 - (d) eliminate feces out of the body
- 7. Where are the digested nutrients mainly absorbed to enter the blood?**
- (a) Food pipe
 - (b) Stomach
 - (c) Large intestine
 - (d) Small intestine
- 8. A liquid that specifically functions is to digest food within the human body, such as the fluid produced in the mouth or stomach, is formally referred to as a**
- (a) dilute starch solution
 - (b) digestive tract
 - (c) digestive juice
 - (d) dilute iodine solution
- 9. After the liver breaks these substances down, they are eliminated from the body in the form of**
- (a) feces
 - (b) sweat
 - (c) digestive juices
 - (d) urine
- 10. The specific component responsible for carrying the nutrients after absorbing by the villi in the small intestine is the**
- (a) blood
 - (b) nerves
 - (c) muscles
 - (d) saliva

2 Put (✓) for correct statements or (X) for false statements:

1. Digestion means making food smaller in size without changing its form. ()
2. Digestive juices are produced not only in the mouth, but also in the stomach and intestines. ()
3. The colour of starch mixed with saliva changes to blue-purple when iodine solution is added. ()
4. The large intestine mainly absorbs nutrients from digested food. ()
5. The inner surface area of the small intestine is larger because villi are lined up closely. ()
6. The liver produces a digestive juice that helps break down and absorb fat. ()
7. If you add iodine solution to a mixture of starch and saliva, it turns blue-purple because the starch is not broken down. ()
8. Undigested food that remains after passing through the large intestine is eliminated from the body through the anus as feces. ()
9. Food that enters the mouth is carried directly to the stomach before passing through the food pipe. ()

3 Correct the underlined words:

1. The path of food from the mouth to the anus is called the respiratory tract. (.....)
2. The color of starch mixed with water changes into red when adding iodine solution to it. (.....)
3. Harmful substances that are broken down by the liver are eliminated from the body in the form of feces. (.....)
4. The stomach absorbs more water from undigested food before it is eliminated. (.....)
5. The nutrients absorbed in the small intestine are carried to the whole body by the nerves, passing through the liver. (.....)
6. Food that enters from the mouth is carried to the stomach through the windpipe. (.....)
7. The wall of the small intestine is structurally similar to a flat cloth because it has many bumps to absorb nutrients better. (.....)
8. The liver breaks down harmful substances produced in the body so they can be eliminated in sweat. (.....)
9. Digestive juices are produced not only in the mouth, but also in the stomach and lungs. (.....)

4 Write the scientific term:

1. It is the process of breaking down food into small pieces and converting it into a simpler form that can be easily absorbed. (.....)
2. It is the path of food from the mouth to the anus. (.....)
3. It is a liquid that has the function of digesting food, such as saliva. (.....)
4. They are small bumps on the inside of the small intestine that make its inner surface area larger for efficient nutrient absorption. (.....)
5. It is an opening where feces (stool) is eliminated out of the body. (.....)
6. It is the organ in the digestive tract where nutrients from digested food, along with water, are mainly absorbed. (.....)
7. It is an organ that converts some absorbed nutrients into an easy-to-use form and stores them as energy. (.....)
8. It is the organ that receives undigested food from the small intestine and absorbs more water from it. (.....)
9. It is a specific digestive juice produced in the mouth that has the function of breaking down starch into something else. (.....)

5 Complete the following sentences:

1. Food that enters from the mouth is carried in the order of mouth, food pipe, _____, small intestine, _____, and comes out from the anus.
2. The nutrients absorbed in the small intestine are carried to the whole body by the blood, passing through the _____.
3. When conducting the digestion experiment, a cotton swab soaked with _____ is placed in one test tube, and a cotton swab soaked with _____ is placed in the other.
4. The liver converts some nutrients into a form that is easy to use and stores them as _____.
5. A cloth with many loops like a _____ absorbs water better than a flat cloth, which is similar to the inner wall of the small intestine.
6. _____ produces a digestive juice that helps break down and absorb fat.
7. The inner surface area of the small intestine becomes larger because it is lined with small bumps called _____.
8. Breaking down food with teeth and changing it into a form that is easy to absorb is called _____.
9. Digestive juices are produced not only in the mouth, but also in the _____ and intestines.

6 Cross out the Odd word, and mention the reason:

1. Mouth – Lungs – Stomach – Small intestine (_____)
2. Saliva – Blood – Digestive juice of the stomach – Digestive juice of the intestines (_____)
3. Stomach – Small intestine – Large intestine – Saliva (_____)
4. Storing nutrients as energy – Breaking down harmful substances – Absorbing water from undigested food – Producing a digestive juice to break down fat (_____)

Essay Questions

7 What's meant by:

1. Digestion?

2. Digestive tract?

3. Saliva?

4. Villi?

5. Digestive juice?

8 Mention the importance of:

1. Saliva.

2. Villi in the small intestine.

3. Liver. (Mention two functions only)

4. Large Intestine.

9 Compare between each of the following:

1. The Small intestine and the Large intestine. (In terms of what they absorb)

2. Starch mixed with water and Starch mixed with saliva.

(In terms of the color change when dilute iodine solution is added)

3. Saliva and The digestive juice produced by the Liver.

(In terms of specific substance they help break down)

10 Give a reason for:

1. The colour of starch mixed with saliva doesn't change when adding iodine solution to it.

2. The inner surface area of the small intestine becomes larger.

3. Food must be broken down by the teeth in the mouth.

4. The test tubes are placed in a beaker containing hot water of about 40°C for a few minutes.

5. The liver breaks down harmful substances produced in the body.

6. Undigested food must pass through the large intestine before being eliminated from the body.

11 What happens:

1. When dilute iodine solution is added to a warmed test tube containing a mixture of starch and water?

2. When dilute iodine solution is added to a warmed test tube containing a mixture of starch and saliva?

3. To the nutrients after they are absorbed in the small intestine?

4. To the undigested food after it passes through the large intestine?

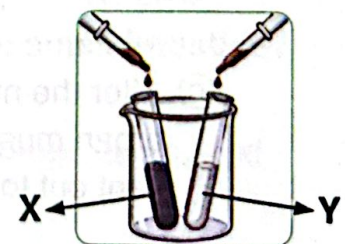
5. To the absorbed nutrients after they reach the liver?

12 Study the following figures, then answer the following questions:

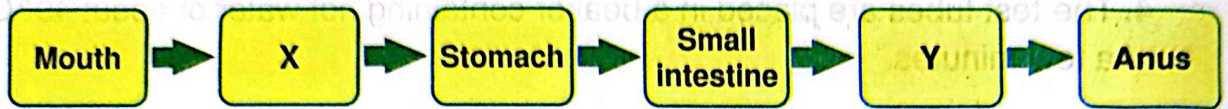
1. Study a diagram showing two test tubes taken out of a 40°C water bath. Iodine solution is added to both. Test Tube [X] turns blue-purple. Test Tube [Y] shows no color change.

(a) Which test tube contains saliva, [X] or [Y]?

(b) Why did Test Tube [X] turn blue-purple?



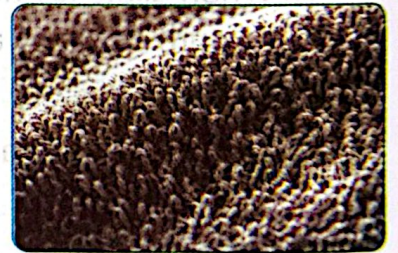
2. Study the following incomplete diagram representing the human digestive tract path:



- (a) Identify the specific organs that correspond to the missing labels [X] and [Y].
.....
- (b) After food passes through the organ labeled [Y], what is the name of the waste material that is eliminated from the body through the anus?
.....
- (c) What specific substance does the organ labeled [Y] mainly absorb from the undigested food?
.....

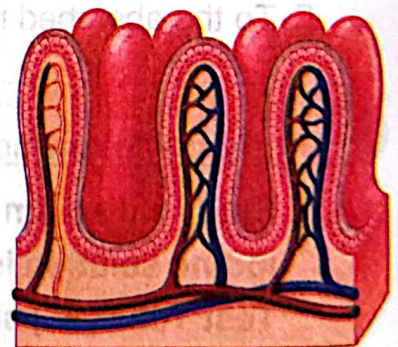
3. Study the concept of a towel absorbing water compared to human organs.

- (a) Which organ in the human body has a surface structured like the loops of a towel?
.....
- (b) What are these specific structures on the inside of this organ called?
.....



4. Study the opposite diagram showing the inside of the small intestine.

- (a) What is the primary function of these small bumps and the capillaries inside them?
.....
- (b) What is the name of the fluid inside these capillaries that carries the absorbed nutrients to the whole body?
.....
- (c) After the nutrients enter this transport fluid, which organ must they pass through first before being sent out to the whole body when needed?
.....



1 Choose the correct answer:

1. Which statements correctly explain the results of the saliva experiment?

- (a) The one mixed with water and starch changed to blue purple with the iodine solution.
- (b) The one mixed with water and starch had no change even when the iodine solution was dropped.
- (c) The one mixed with saliva and starch changed to blue purple with the iodine solution.
- (d) The one mixed with saliva and starch had no change even when the iodine solution was dropped.

2. What is the correct order that food passes through? Choose the correct answer from below.

- (a) Mouth → Stomach → Food pipe → Small intestine → Large intestine → Anus
- (b) Mouth → Food pipe → Stomach → Large intestine → Small intestine → Anus
- (c) Mouth → Food pipe → Stomach → Small intestine → Large intestine → Anus
- (d) Mouth → Food pipe → Large intestine → Small intestine → Stomach → Anus

3. In the experiment: To check the function of saliva, why do you warm the test tubes in hot water of about 40 degrees Celsius?

- (a) To disinfect.
- (b) To evaporate the water.
- (c) To make it about the same temperature as inside the body.

4. What carries the absorbed nutrients to the body? Choose the correct answer from below.

- (a) Blood vessels
- (b) Nerves
- (c) Muscles

5. Where do the nutrients absorbed in the small intestine pass through first to be carried to the whole body?

- (a) Stomach
- (b) Large intestine
- (c) Liver

6. What is the advantage of having villi on the wall of the small intestine?

- (a) It makes it easier to swallow food.
- (b) The surface area of the wall of the small intestine becomes larger, and nutrients can be absorbed efficiently.
- (c) It makes it easier for nutrients to pass through.

2 Answer the following questions:

1. What do we call the process of changing food into a form that is easy to absorb into the body?

.....

2. Choose the correct words from below to fill in the blanks.

Food that enters from the mouth is carried in the order of:

Mouth → ① → ② → ③ → ④ → Anus.

(Large intestine – - Stomach – Food pipe – Lungs – Small intestine)

.....

3. What is the path of food from the mouth to the anus called?

.....

4. After mixing saliva and starch and warming it, did the color change when you added the iodine solution? Choose the correct answer from below.

(It turned blue purple. / It did not change.)

.....

5. What do we call the small bumps on the inner wall of the small intestine that absorb nutrients?

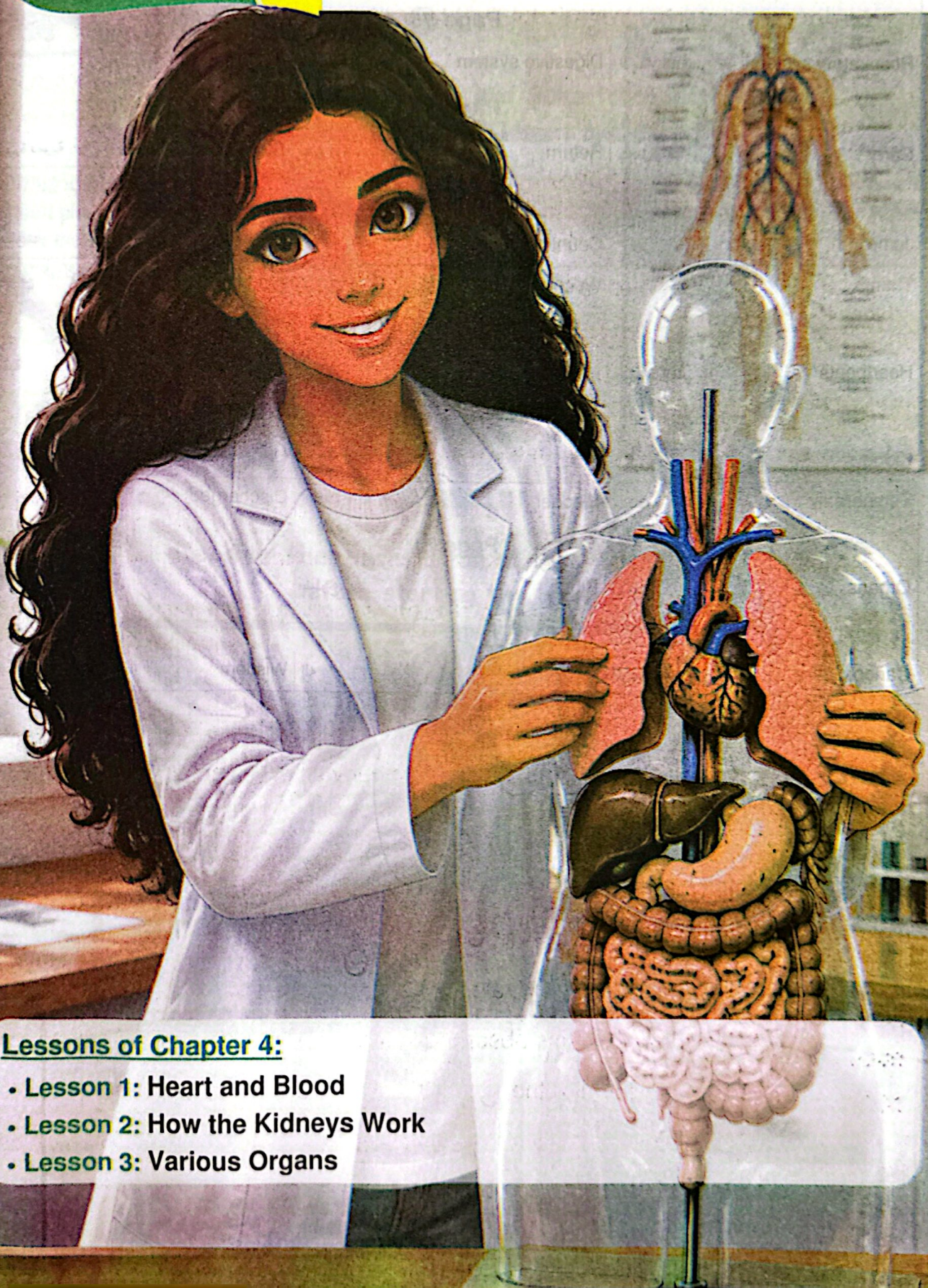
.....

6. Fill in the blanks with the correct words:

The nutrients of digested food, along with water, are mainly absorbed in the (1), the nutrients absorbed in the small intestine are carried by the (2) through the (3) to the whole body.

.....

Chapter 4 Circulation and Excretion



Lessons of Chapter 4:

- Lesson 1: Heart and Blood
- Lesson 2: How the Kidneys Work
- Lesson 3: Various Organs

Main Vocabulary

Page 75					
Respiratory system	الجهاز التنفسي	Digestive system	الجهاز الهضمي		
Page 76					
Carry	يحمل	Return	يعود	Blood Circulation	دورة دموية
Page 77					
Jump	يقفز	Count	يعد	Muscles	عضلات
Thumb	إبهام	Wrist	معصم	Fingers	أصابع
Page 78					
Heartbeats	ضربات القلب	Pulses	نبضات	Neck	رقبة
Page 80					
Kidneys	الكلى	Filter	يفلتر	Urine	البول
Temporarily	مؤقتاً	Bladder	المثانة	Discharged	يطرد
Page 81					
Organs	أعضاء	Ribs	ضلوع		
Page 82					
Canopic Jars	أواني كتانوية	God	إله	Wisdom	حكمة

Lesson 1 Heart and Blood

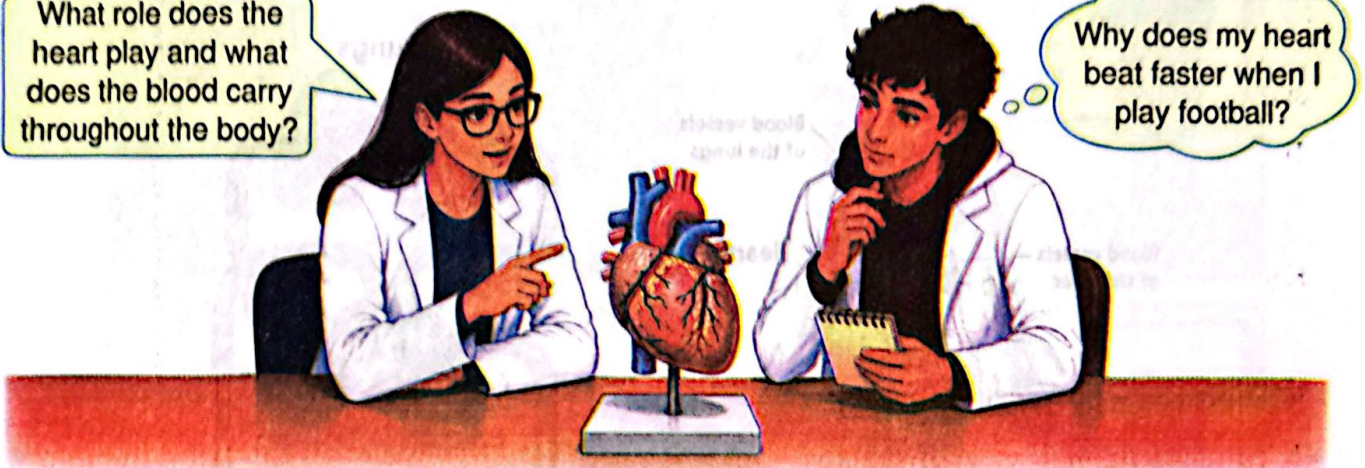


Warm up!

The teacher asks Ali and Suha to collect some information about "Heart and Blood".

What role does the heart play and what does the blood carry throughout the body?

Why does my heart beat faster when I play football?

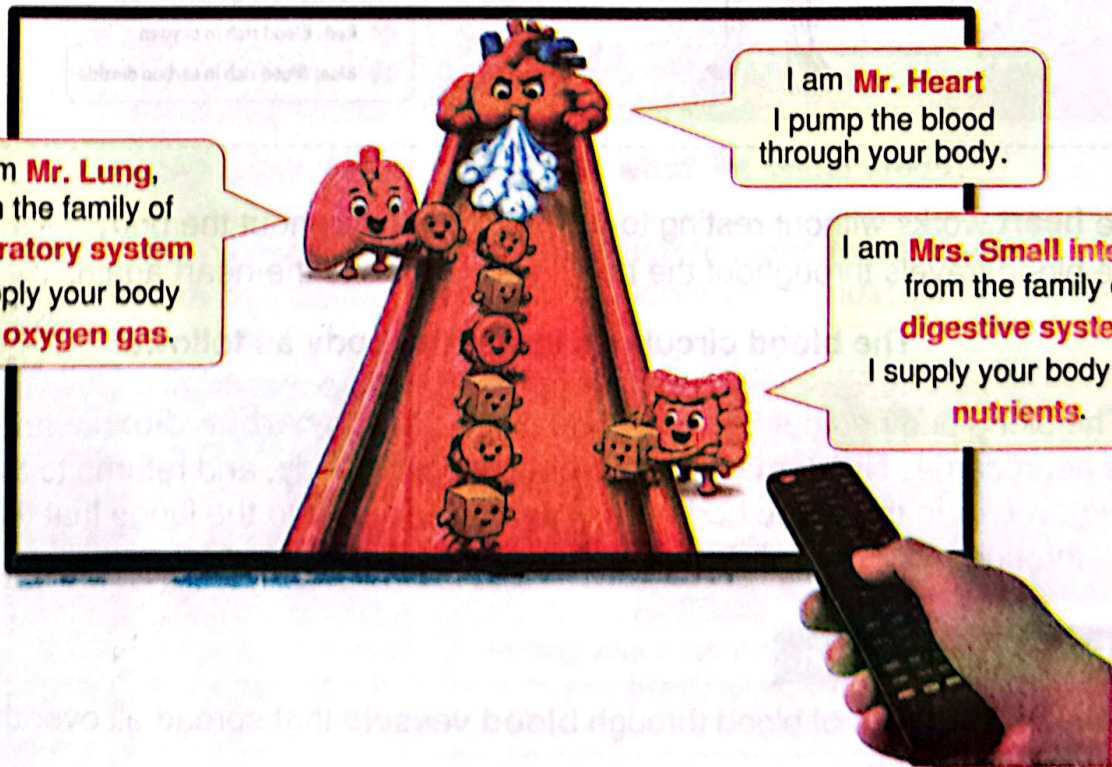


Teacher then turns a fun science video on TV before starting the lesson.

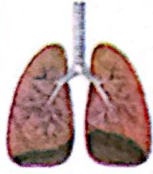
I am **Mr. Lung**,
from the family of
respiratory system
I supply your body
with **oxygen gas**.

I am **Mr. Heart**
I pump the blood
through your body.

I am **Mrs. Small intestine**,
from the family of
digestive system
I supply your body with
nutrients.



We have learned before that:

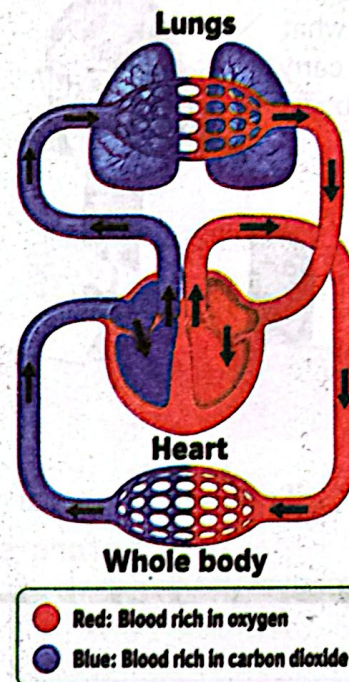
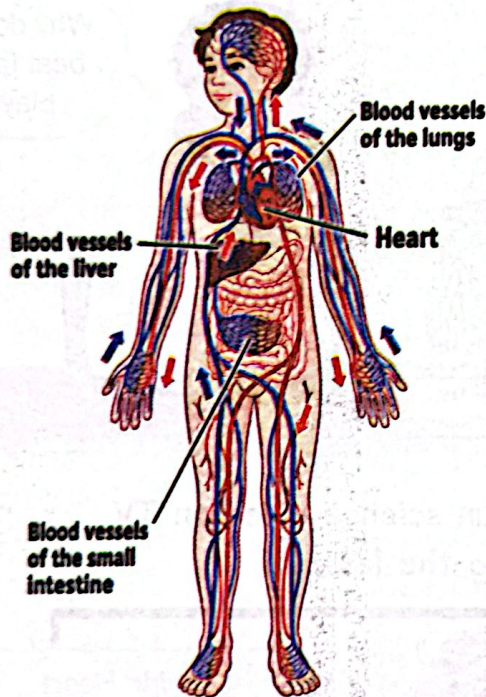


- **Oxygen gas** is taken in by the **lungs** from inhaled air.

- **Nutrients** are absorbed by the **small intestine** from digested food.



In this chapter, we will know how nutrients and oxygen reach the whole body:



- The **heart** works without resting to **pump** blood throughout the body.
- The blood travels throughout the body, and returns to the heart again.

The blood circulates inside the body as follows:

The blood pumped out from the heart carries **Nutrients** and **oxygen gas** to the whole body through blood vessels.

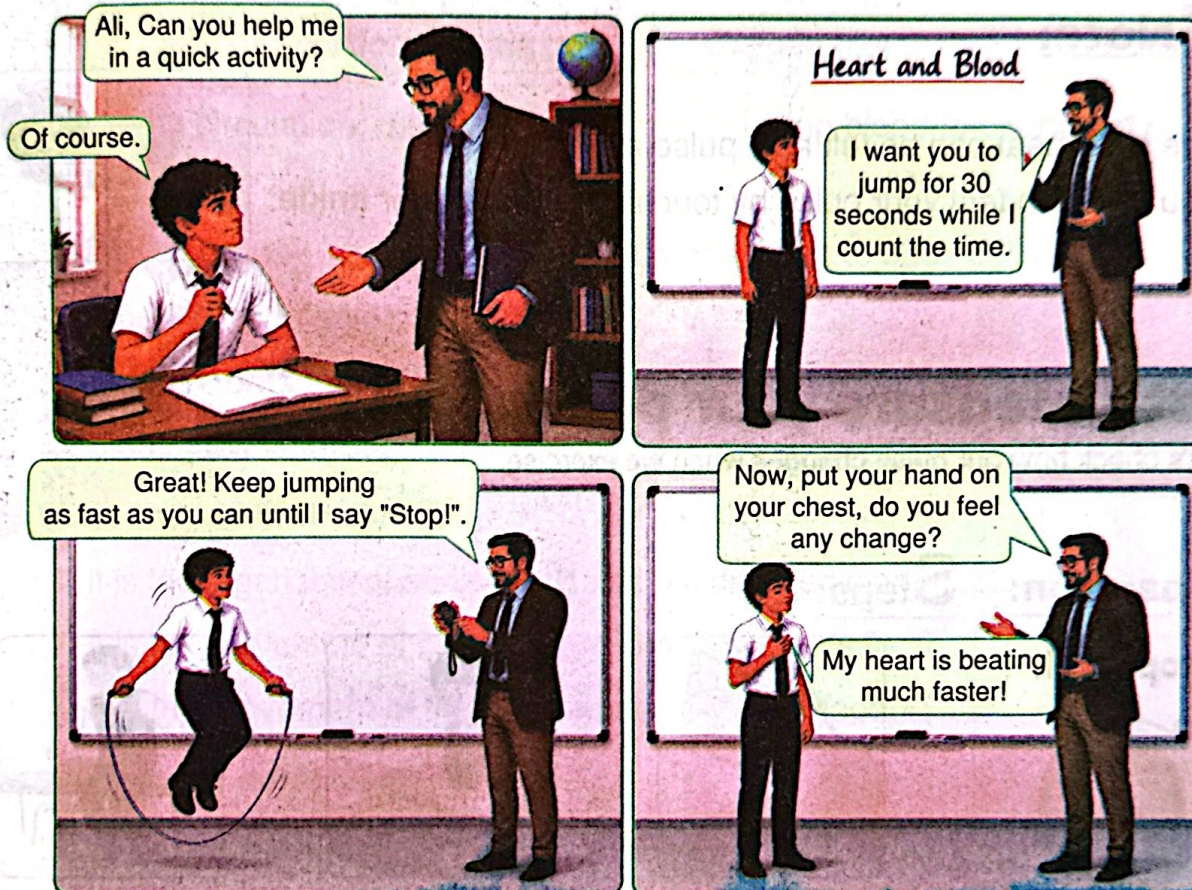
The blood collects **carbon dioxide** and **waste** produced in the body, and returns to the heart again to be sent to the lungs that let out carbon dioxide and take in oxygen.

Blood Circulation

They are the flows of blood through **blood vessels** that spread all over the body.

Warm up!

Ali was sitting in class, starting to write in his notebook, the teacher came in and said:



Ali, Can you help me in a quick activity?

Of course.

Heart and Blood

I want you to jump for 30 seconds while I count the time.

Great! Keep jumping as fast as you can until I say "Stop!".

Now, put your hand on your chest, do you feel any change?

My heart is beating much faster!

Teacher asks Ali to talk about what he understood.



Exercise makes my **heart** beat faster to pump more **blood** that carries **oxygen gas** and **nutrients** to my muscles.

You can repeat this activity by yourself or with your friends and then you can check your heartbeats by many ways such as:



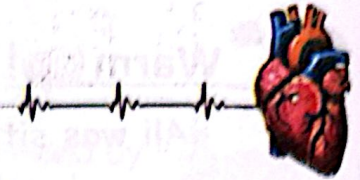
Putting your hand on your chest.



Putting your fingers near the base of your thumb on your wrist.

Heartbeat

It is the movement of the heart when pumping out the blood.



Note:

- The Heartbeat can be felt as a pulse at the **wrist**.
- You can also feel your pulse by touching your **neck** or **ankle**.



Let's measure your pulse!

Let's check how our pulse changes when we exercise.

Preparation:

Stopwatch



Steps:



Put your finger near the base of your thumb on your wrist and find the place where it is beating.



While sitting, count how many times your pulse beats in 1 minute.



After jumping lightly, measure it again.

Observation:

The number of pulses after exercising is greater than that during sitting.

Conclusion:

The number of pulses **increases** after exercising to send more **oxygen** and **nutrients** to the whole body quickly.



Evaluate your Understanding On Lesson (1)

1 Complete the following sentences using the word bank:

blood vessels

nutrients

heart

carbon dioxide gas

Oxygen gas

1. During circulation, the pump blood to every part of the body.
2. Blood carries from the lungs to body cells.
3. Digested food enters the blood as
4. Blood returns to the lungs carrying
5. Blood travels through a network called

2 Write the scientific term:

1. It is the organ that absorbs nutrients from digested food. (.....)
2. It is the movement of blood through the blood vessels. (.....)
3. It is the movement of the heart while pumping blood. (.....)

3 Choose the correct answer:

1. Which statement is TRUE about the blood?

- (a) Blood moves in only one direction and never returns.
- (b) Blood leaves the heart and returns to it again.
- (c) Blood stops moving while sleeping.
- (d) Blood carries only oxygen gas.

2. Which sequence correctly shows how oxygen reaches the muscles?

- (a) Lungs → Blood → Heart → Whole body → Muscles
- (b) Heart → Lungs → Small intestine → Muscles
- (c) Lungs → Heart → Small intestine → Blood
- (d) Small intestine → Heart → Blood → Muscles

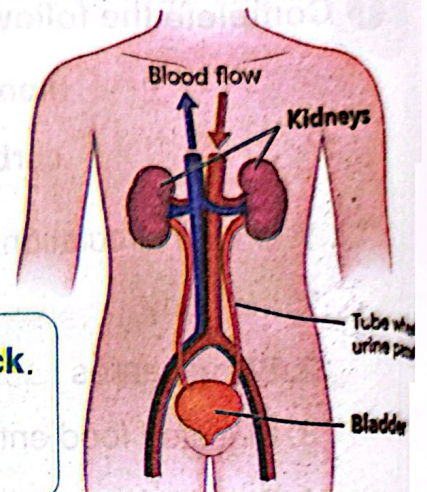
Lesson 2 How the Kidneys Work

- Waste products (produced in the body) and unnecessary things (extra water) are carried to the kidneys by the blood.

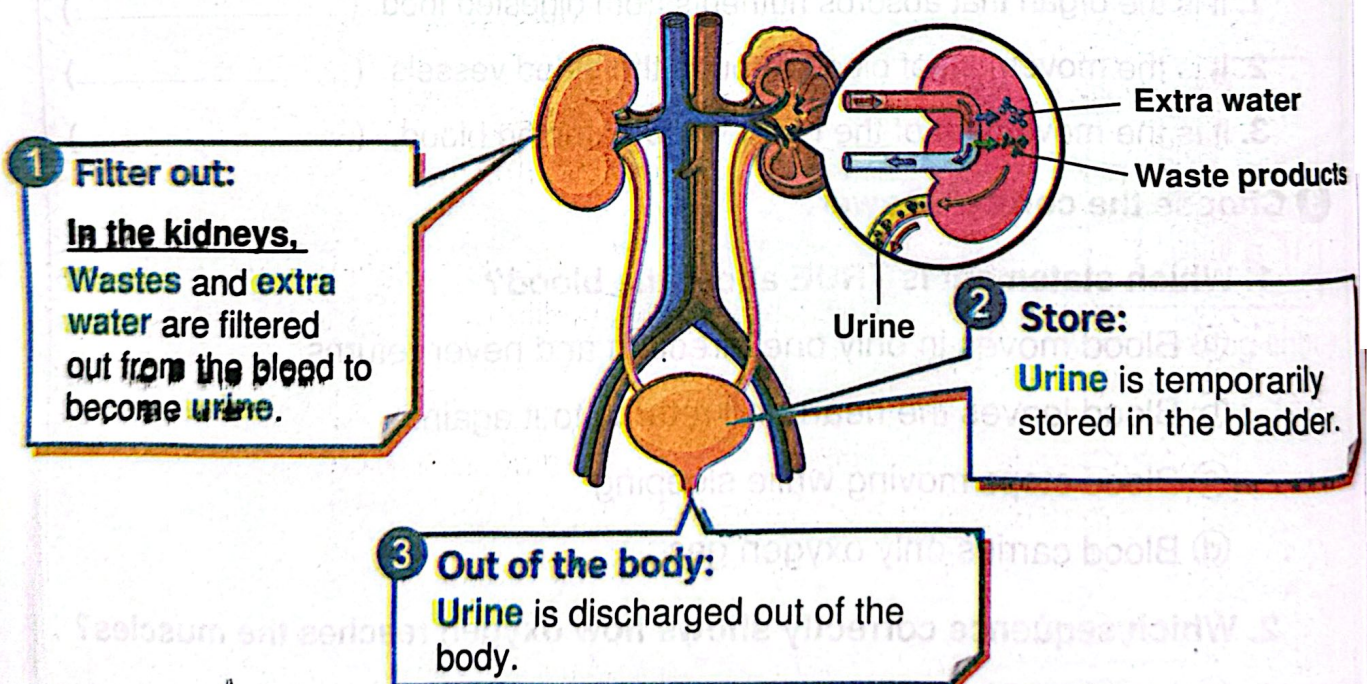
Kidneys:

Location: The **two** kidneys are located on the **lower back**.

Function: They **filter** the blood from waste products and unnecessary things.



Steps of Discharging Waste Products

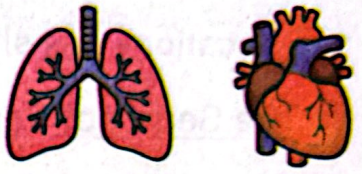
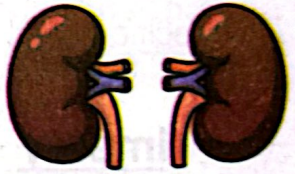


Urine

It is the liquid containing waste products that is produced by kidneys and temporarily stored in bladder until it is discharged out of the body.

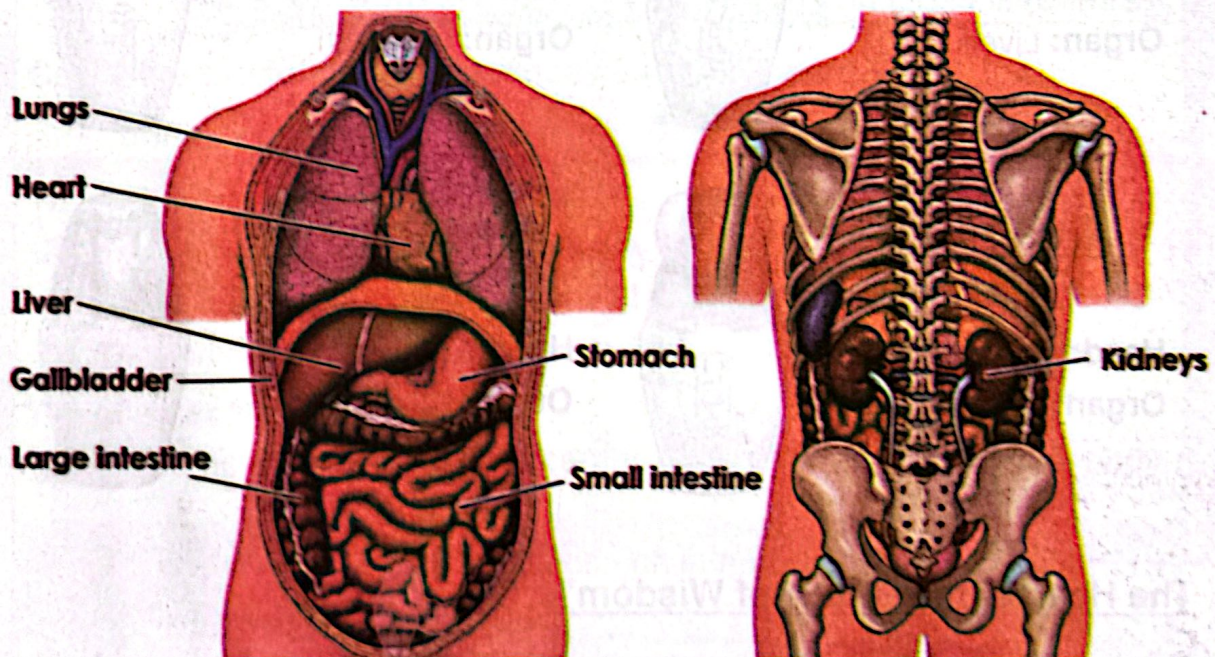
Lesson 3 Various Organs

- In our body, many organs are lined up closely without gaps.
- Our organs do not work separately, but they work together with each other and they are all connected together by the circulation of blood.

Organs in the chest	• There are left and right lungs, and the heart sandwiched between them. • They are protected by the ribs.	
Organs in the abdomen	There is the stomach at the top, the long small intestine below it, and the large intestine around it.	
Organs in the lower back on the back side	There is one kidney on each side.	

Front of the body

Back of the body



All organs are connected by **blood vessels**, and **blood** moves throughout the body, carrying **nutrients** and **oxygen** and collecting **waste products**.

Enrichment Activity

What Mummies Taught Us about the Locations of Our organs?

Ancient Egyptians were the first people in the world to know the exact **locations** and **shapes** of organs due to their mummy-making skills.

The Secret of Canopic Jars:

- When ancient Egyptians made mummies, they kept four very important organs which are the **lungs**, **stomach**, **liver**, and **intestines** safe in special jars.
- They knew that these were important "**engines**" that supported human life.
- Each Canopic jar has a shape that was believed to be the god who protected a specific organ.

Imsety

Head: Human
Organ: Liver



Hapi

Head: Jackal (Wild dog)
Organ: Stomach



Duamutef

Head: Baboon
Organ: Lungs



Qebehsenuef

Head: Falcon
Organ: Intestines

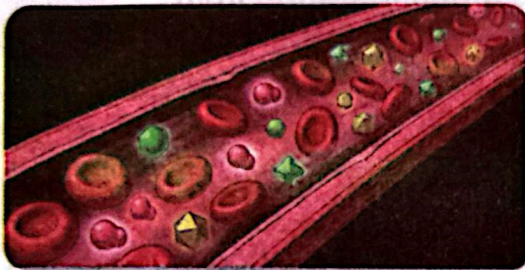


The Heart is the "Place of Wisdom":

- Ancient people believed the heart was where the "mind" (or soul) resided, so they left it inside the body.

- Taking care of our daily meals helps in keeping our body's organs healthy.

The Transporters of Oxygen and Nutrients:



The oxygen and the nutrients are carried to **cells** all over our body by the **blood**, using the pumping power of the **heart**.

Egyptian Food for Good Health:



A traditional Egyptian food called "**Molokhia**" is full of nutrients that help keep our blood flowing smoothly and help us digest our food.



Evaluate your Understanding On Lessons (2 and 3)

1 Complete the following sentences using the word bank:

urine

ribs

water

liver

bladder

waste

1. Urine is stored temporarily in the _____ before it leaves the body.
2. Organs in the chest are protected by _____.
3. 💡 The canopic jar with the human head was believed to protect the _____.
4. _____ products and extra _____ are filtered from the blood to become _____.

2 Write the scientific term:

1. It is the network of tubes that carries blood to every organ in the body. (_____)
2. 💡 It is a traditional Egyptian food rich in nutrients that helps keep blood flowing smoothly. (_____)

3 Cross out the Odd word:

1. 💡 Imsety – Duamutef – Qebehsenuf – Bladder (_____)
2. Lungs – Heart – Ribs – Stomach (_____)



The role of lung and small intestine:



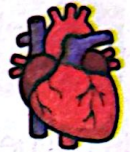
- **Oxygen gas** is taken in by the **lungs** from inhaled air.

- **Nutrients** are absorbed by the **small intestine** from digested food.



The role of heart and blood:

The **heart** works without resting to **pump** blood throughout the body.



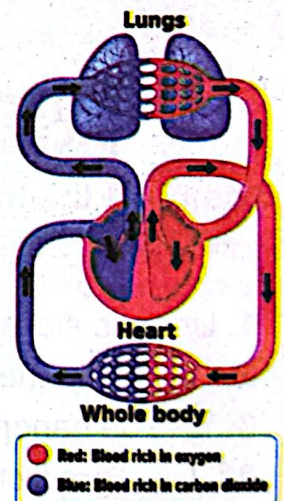
- Blood carries **oxygen** and **nutrients** to all body cells.
- Blood collects **carbon dioxide** and **waste products** and returns to the heart again.

Blood Circulation:

Blood Circulation

They are the flows of blood through **blood vessels** that spread all over the body.

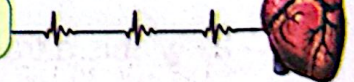
- Blood circulation connects all body organs.
- Blood moves through blood vessels that spread throughout the body.



Heartbeats:

Heartbeat

It is the movement of the heart when pumping out the blood.



- Pulse is the heartbeat felt in blood vessels.
- Pulse can be felt by touching the **wrist**, **neck**, and **ankle**.
- Exercise increases heart rate because muscles need more oxygen and nutrients.

Kidneys and Excretion:

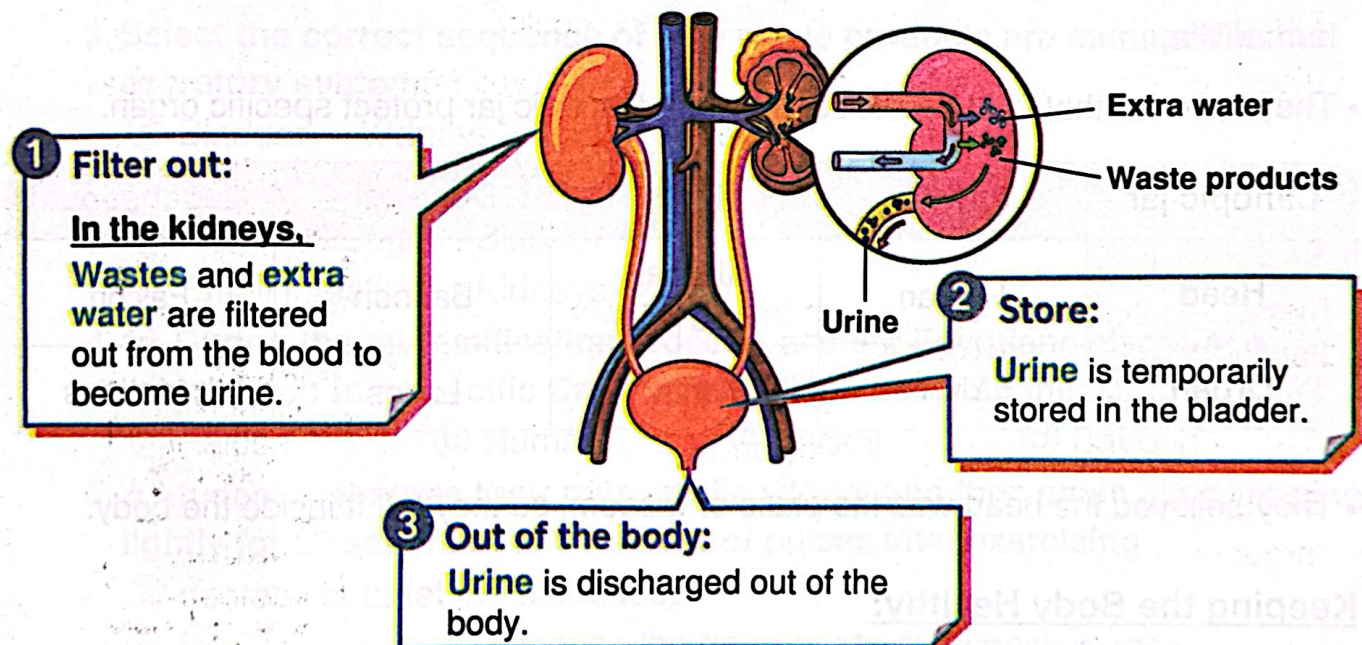
- Waste products produced in the body and unnecessary things (extra water) are carried to the kidneys by the blood.

Kidneys:

Location: The two kidneys are located on the **lower back**.

Function: They **filter** the blood from waste products and unnecessary things.

Steps of Discharging Waste Products



Urine

It is the liquid containing waste products that is produced by kidneys and temporarily stored in bladder until it is discharged out of the body.

Organs and their locations:

Organs in the chest (protected by ribs)	Organs in the abdomen	Organs in the lower back on the back side
• Right and left lungs • Heart (sandwiched between two lungs)	• Stomach • Small intestine • Large intestine	• Right and left kidneys

Ancient Egyptians and organs:

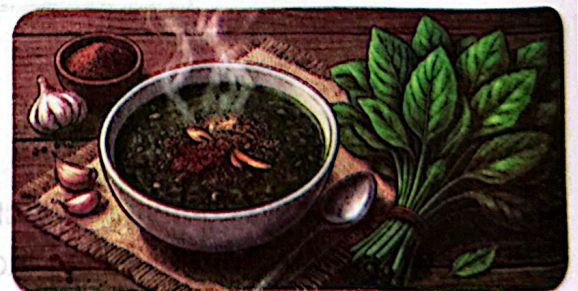
- Ancient Egyptians knew the locations of body organs.
- They preserved four organs in **Canopic jars** as they are “**engines**” that supported human life.
- They believed that the head of each god on Canopic jar protect specific organ.

Canopic jar	Imsety	Hapi	Duamutef	Qebehsenuef
Head	Human	Jackal (wild dog)	Baboon	Falcon
Organ	Liver	Stomach	Lungs	Intestines

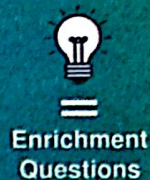
- They believed the heart was the place of wisdom, so they left it inside the body.

Keeping the Body Healthy:

- Taking care of our daily meals helps in keeping our body's organs healthy.
- **Molokhia** is a traditional Egyptian food full of nutrients that help keep our blood flowing **smoothly** and help us digest our food.



Exercises on Chapter 4 **Circulation and Excretion**



First PONY Questions

Objective Questions

1 Choose the correct answer:

1. The organ that act as a pump to send blood throughout the human body is the
(a) lung (b) heart (c) kidney (d) stomach
2. Blood rich in carbon dioxide is represented in scientific diagrams by the colour.
(a) red (b) green (c) yellow (d) blue
3. Select the correct sequence of how waste products are managed in the excretory system:
(a) Bladder → Kidneys → Out of the body
(b) Kidneys → Bladder → Out of the body
(c) Heart → Lungs → Bladder
(d) Small intestine → Kidneys → Heart
4.  During the mummification process, ancient Egyptians placed the stomach in a specific Canopic jar. Which head did this jar have?
(a) Falcon (b) Human (c) Jackal (d) Baboon
5. A student measures their pulse while sitting, and then again after jumping lightly for 30 seconds. The number of pulses after exercising
(a) decreases to let the blood rest
(b) remains the same because the heart beats at a constant rate
(c) increases to send more oxygen and nutrients to the whole body quickly
(d) stops temporarily while the muscles work
6. Which of the following statements is true regarding how the body's organs are arranged?
(a) Organs work completely separately with large gaps between them.
(b) The kidneys are located in the front of the abdomen.
(c) The heart is sandwiched between the left and right lungs and protected by the ribs.
(d) The large intestine is located in the chest.

7. Choose the correct sequence of blood circulation starting from the lungs.
 - (a) Lungs → Whole body → Heart → Lungs
 - (b) Lungs → Heart → Lungs → Whole body
 - (c) Lungs → Heart → Whole body → Heart
 - (d) Lungs → Kidneys → Heart → Whole body
8. The process of filtering waste products and extra water from the blood results in the formation of
 - (a) nutrients
 - (b) sweat
 - (c) red blood cells
 - (d) urine
9. What specific substance does the small intestine supply to the blood so it can be carried to the whole body?
 - (a) Carbon dioxide
 - (b) Nutrients
 - (c) Extra water
 - (d) Oxygen gas
10.  Which vital organ was protected by the Canopic jar, known as Imsety?
 - (a) Liver
 - (b) Lungs
 - (c) Intestines
 - (d) Stomach
11. How do all the various organs in the human body stay connected so they can work together?
 - (a) Through the bones of the rib cage.
 - (b) Through a network of tubes where urine passes.
 - (c) By the continuous circulation of blood through blood vessels.
 - (d) By being lined up completely separately with large gaps.
12. The exact location of the two kidneys within the human body is
 - (a) inside the chest, protected by the ribs
 - (b) in the lower back on the back side of the body
 - (c) surrounding the large intestine in the abdomen
 - (d) at the base of the neck

② Put (✓) for correct statements or (X) for false statements:

1. Blood pumped out from the heart travels throughout the body and never returns to the heart again. ()
2. The kidneys are two bean-shaped organs located in the lower back on the back side of the body. ()
3. Urine is temporarily stored in the bladder before it is discharged out of the body. ()
4.  Ancient Egyptians believed the brain was the "Place of Wisdom," so they left it inside the mummy. ()

5. The small intestine is an organ located in the abdomen that absorbs nutrients from digested food. ()
6.  The Canopic jar with the human head, named Imsety, was believed to protect the brain. ()
7. The heart is sandwiched between the left and right lungs and is protected by the ribs. ()
8. Blood travels from the heart to the whole body and does not return to the heart again. ()
9. The kidneys are located in the lower back on the front side of the body. ()
10. Urine is formed when the kidneys filter waste products and extra water out of the blood. ()
11. You can feel your heartbeat as a pulse exclusively by touching your wrist only. ()
12. Blood returning to the heart from the rest of the body is sent to the lungs specifically to let out carbon dioxide and take in fresh oxygen. ()

③ Correct the underlined words:

1. The respiratory system organ that supplies your body with oxygen gas is the stomach. ()
2. Blood rich in oxygen is represented in scientific diagrams by the color blue. ()
3. The liquid containing waste products that is produced by the kidneys is called blood. ()
4. The traditional Egyptian food that is full of nutrients and helps keep blood flowing smoothly is pizza. ()
5. You can feel your heartbeat as a pulse at your wrist, neck, or elbow. ()
6. The two bean-shaped organs located in the lower back that filter waste products are the intestines. ()
7. The blood that has collected waste and returned to the heart is then sent directly to the stomach to exchange carbon dioxide with oxygen. ()
8. Digested food is absorbed and enters the blood as urine so it can be carried to cells all over the body. ()
9. In the human excretory system, the liquid produced by the kidneys is temporarily stored in the liver before it is discharged out of the body. ()

4 Write the scientific term:

1. It is the movement of the heart when pumping out the blood. (.....)
2. It is the network of tubes that spread all over the body through which blood flows. (.....)
3. It is the flow of blood through blood vessels that spread all over the body. (.....)
4. It is the liquid containing waste products and extra water that is produced by the kidneys. (.....)
5. It is the balloon-like sac organ where urine is temporarily stored until it is discharged. (.....)
6. It is the heartbeat that travels through the blood vessels, which can be felt at the wrist, neck, or ankle. (.....)
7.  They are special containers used by ancient Egyptians to keep important organs like the lungs, stomach, liver, and intestines safe when making mummies. (.....)
8. They are the bones that protect the vital organs located in the chest, such as the left and right lungs and the heart. (.....)

5 Complete the following sentences:

1. The blood pumped out from the heart carries and nutrients to the whole body.
2. In the kidneys, waste products and extra are filtered out from the blood to become urine.
3. Organs in the chest, such as the left and right lungs and the heart, are protected by the
4.  Ancient Egyptians safely kept four very important organs such as the lungs, stomach, liver, and in special jars.
5. The heart is sandwiched between the left and right in the chest.
6.  The Canopic jar with a human head, called Imsety, was believed to protect the
7.  Molokhia is full of that help keep our blood flowing and help us digest our food.
8. Blood that has returned to the heart from the rest of the body is then sent to the lungs to let out and take in oxygen.
9. After urine is produced by the kidneys, the temporarily stores it until it is discharged out of the body.

6 Cross out the Odd word, and mention the reason:

1. Lungs – Heart – Ribs – Kidneys (.....)

Reason:

2.  Human head jar – Jackal head jar – Falcon head jar – Heart (.....)

Reason:

3. Extra water – Oxygen – Waste products – Urine (.....)

Reason:

4. Kidneys – Bladder – Urine – Pulse (.....)

Reason:

5. Heart – Blood vessels – Blood – Bladder (.....)

Reason:

Essay Questions

7 What's meant by:

1. Heartbeat?

.....

2. Blood Circulation?

.....

3. Urine?

.....

8 Mention the importance of:

1. The heart.

.....

2. The kidneys.

.....

3. Ribs.

.....

4.  Canopic jars in Ancient Egypt.

.....

5.  The traditional Egyptian food "Molokhia".

.....

6. Blood vessels.

.....

7. The small intestine.

.....

8. Discharging urine out of the body.

.....

9 Compare between each of the following:

1. Blood represented by the red color and blood represented by the blue color in diagrams.

.....

2. Organs in the chest vs. Organs in the abdomen.

(In terms of an example of each)

.....

3.  The Canopic jar with a Baboon head vs. the Canopic jar with a Falcon head.

(In terms of the organ they protect)

.....

4. The lungs and the small intestine.

(In terms of the specific supplies they provide to the blood)

.....

5. The heart and the kidneys.

(In terms of the function of each)

.....

10 Give a reason for:

1. The number of heart pulses (heartbeats) increases after exercising.

.....

2. Inside our bodies, the heart works without resting.

.....

3. Blood returning from the whole body is sent back to the lungs before going back to the rest of the body.

.....

4.  Ancient Egyptians left the heart inside the mummy's body instead of placing it in a jar.

.....

5.  Eating the traditional Egyptian food "Molokhia" is highly beneficial for the human body.

.....

11 What happens:

1. If blood carrying waste products and extra water passes through the kidneys?
.....
2. If you place your fingers near the base of your thumb on your wrist?
.....
3. To the blood that has collected waste and carbon dioxide from the body returns to the heart?
.....
4. To the nutrients absorbed from the small intestine and the oxygen taken in by the lungs?
.....

12 Study the following figures, then answer the following questions:

Figure (A):

- a What does the blue color represent in these blood vessels?
.....
- b Why must the blood returning from the whole body be sent to the lungs?
.....

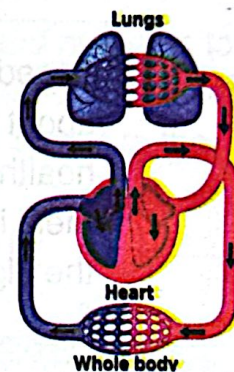


Figure (B):

- a Identify the two bean-shaped organs and mention what they filter out of the blood.
.....
- b Identify the sac-like organ at the bottom and state its function.
.....

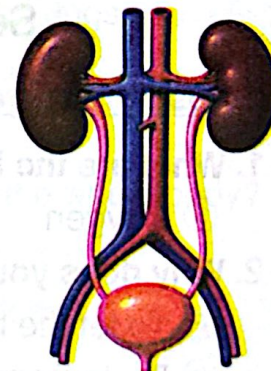


Figure (C):

- a What are these special jars called?
.....
- b Which specific organ was protected by the jar with the Baboon head?
.....



Figure (D):

- ① Identify the two bean-shaped organs in the lower back and state their primary function.

- ② Trace the path of extra water and waste products from the moment they enter these bean-shaped organs until they are temporarily stored.

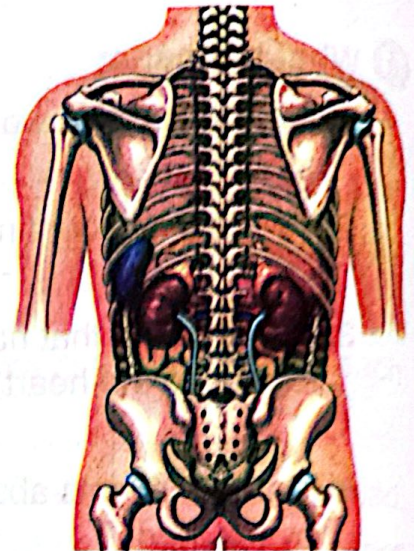


Figure (E):

- ① Identify this traditional Egyptian food.

- ② Based on what you have learned about keeping the body's organs healthy, why is eating this specific meal important for the blood and the digestive system?



Second School Book Questions

1. Choose the correct answer:

- What are the important things that blood carries to the whole body?
① Oxygen ② Carbon dioxide ③ Muscles
- Why does your pulse become faster after exercising?
① To let the blood rest slowly.
② To carry more oxygen and nutrients to the whole body quickly.
③ Because there are not enough nutrients.
- Which statement correctly explains the heart?
① The heart plays a role in digesting the food we eat.
② The heart is constantly beating to pump out blood.
③ The heart plays a role in storing nutrients.

4. Which statement correctly explains how the kidneys work?

- (a) It absorbs oxygen from the blood.
- (b) It pumps blood to the whole body.
- (c) It takes out waste products from the blood.

5. Among the following organs, which one has one on each side of the body, for a total of two?

- (a) Lungs
- (b) Stomach
- (c) Heart

6. Which statement correctly describes where the organs are located?

- (a) The small intestine is outside the large intestine and surrounds the large intestine.
- (b) The stomach is connected to the food pipe.
- (c) There are two kidneys on the abdomen side.

2. Fill in the blanks with the correct words to complete the sentence:

1. The blood pumped out from the heart carries and nutrients to the whole body, collects and waste produced in the body, and returns to the heart again. The blood that has returned to the heart is sent to the to exchange with
2. Each organ is not moving separately, but all are connected by and work together.

3. Choose 2 organs that are inside the chest of the human body.

A: Stomach

B: Heart

C: Lungs

D: Large intestine

E: Small intestine

4. Answer the following questions:

1. What is the organ that works like a pump to send blood to the whole body?

.....

2. What do we call the movement of the heart pumping out blood?

.....

3. What is the organ called that filters the blood and filters out waste products?

.....

4. Where is the urine produced in the kidneys temporarily stored until it is discharged out of the body?

.....

Chapter 5 Photosynthesis

Lessons of Chapter 5:

- Lesson 1: Sunlight and Starch
- Lesson 2: Gas Exchange

Main Vocabulary

Page 98

Leaf	ورقة النبات	Factory	مصنع	Energy	طاقة
Photosynthesis	عملية البناء الضوئي	Overlapping	متداخل	Starch	نشأ

Page 99

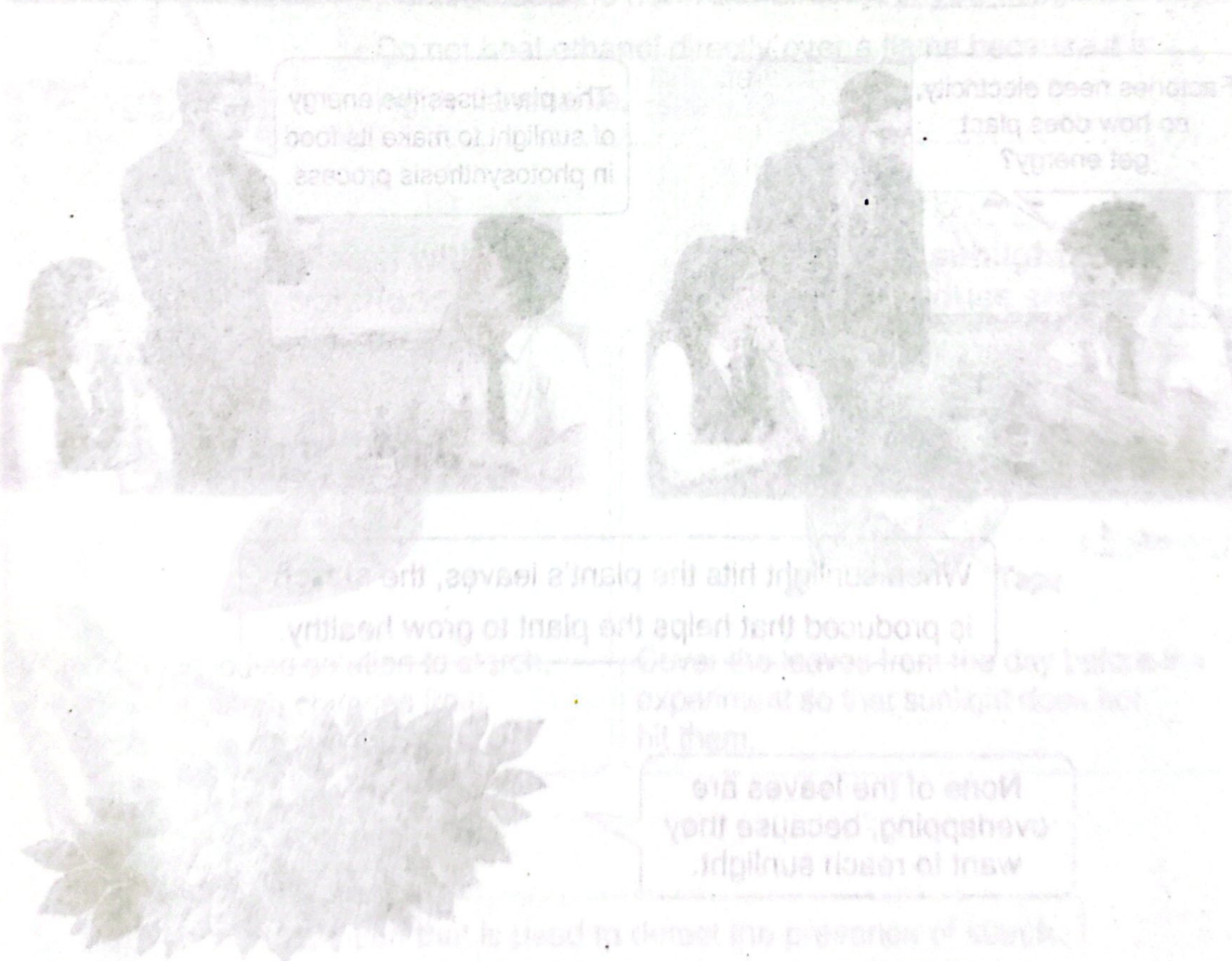
Ethanol	كحول إيثيلي	Flammable	قابل للإشتعال		
---------	-------------	-----------	---------------	--	--

Page 100

Aluminum foil	ورق الألمونيوم				
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Page 103

Sunny day	يوم مشمس				
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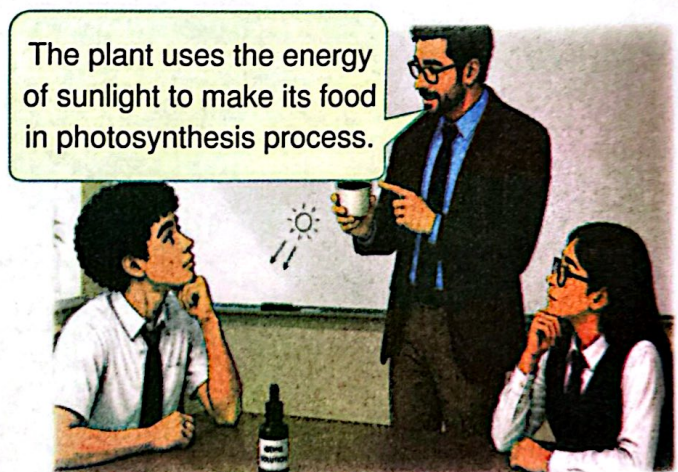
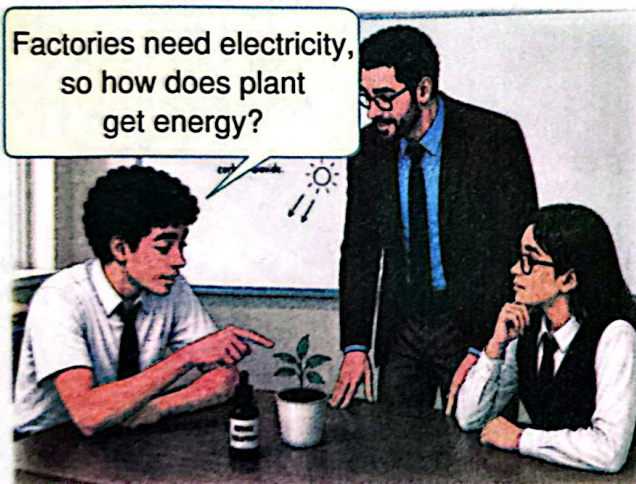
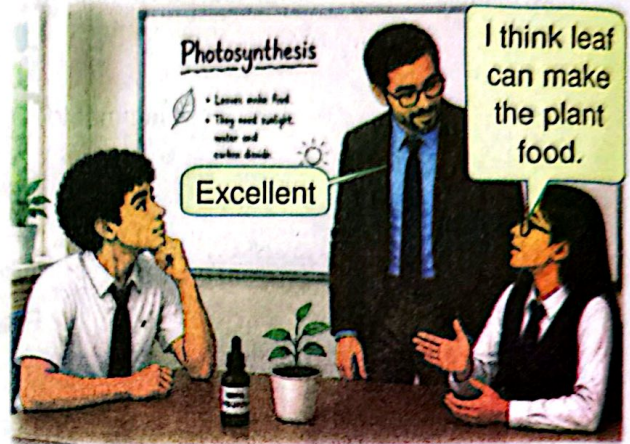
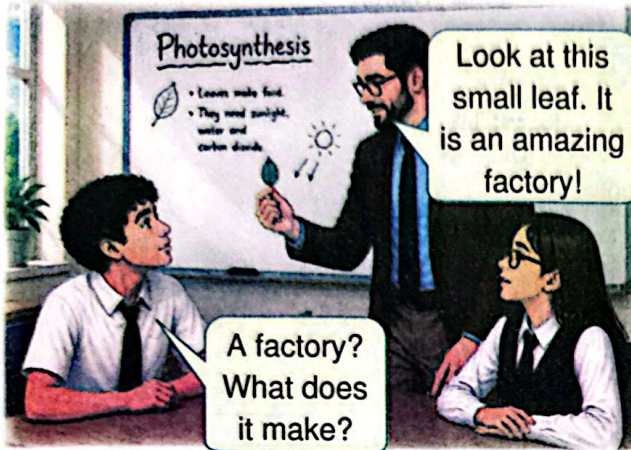


Lesson 1 Sunlight and Starch



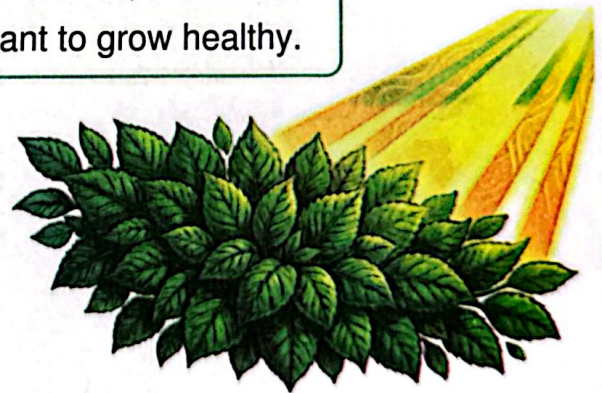
Warm up!

The teacher comes close to the students, holding a small green leaf and says:

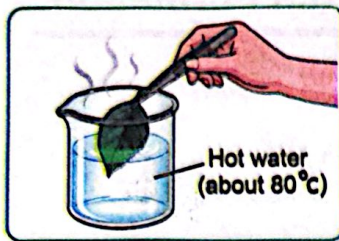


When sunlight hits the plant's leaves, the **starch** is produced that helps the plant to grow healthy.

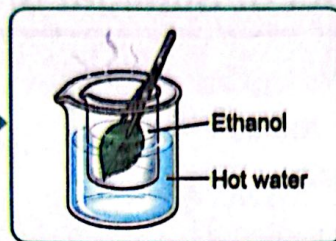
None of the leaves are overlapping, because they want to reach sunlight.



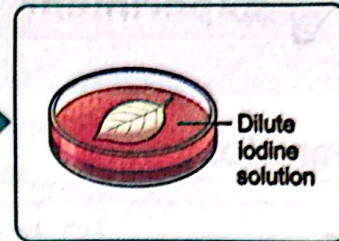
How to Check for Starch in Leaves:



Put the leaf in hot water to make it soft.



Put the leaf into Ethanol warmed in hot water to remove the green colour of leaf.



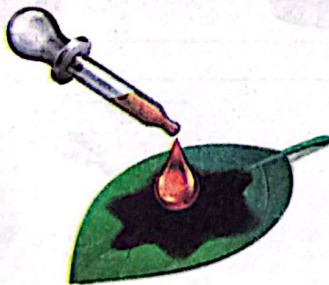
Wash the leaf with hot water, and soak it in dilute iodine solution.



[Caution!]

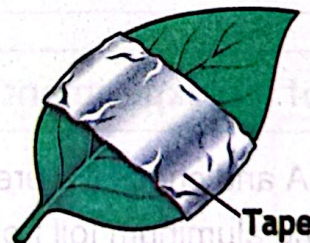
- Do not touch the hot water directly, or you will get burned.
- Do not heat ethanol directly over a flame because it is highly flammable.

Reaction starch with iodine solution:



When adding iodine solution to starch, the colour of starch changes from yellowish brown into **blue-black**.

To check if sunlight is needed to produce starch:



Cover the leaves from the day before the experiment so that sunlight does not hit them.

Iodine solution

It is the solution that is used to detect the presence of starch.



Experiment

Effect of Sunlight on Starch Formation

Preparation:



Plant



Aluminum foil



Dilute iodine solution



Ethanol



Beaker



Petri dish

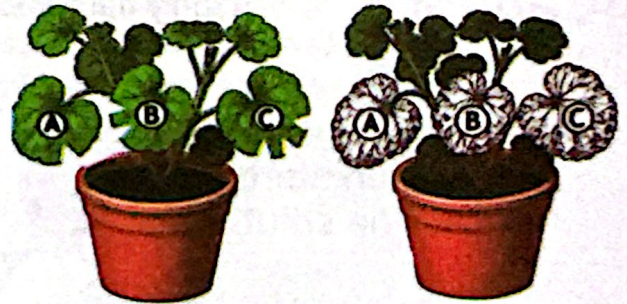


Hot water
about 80 degrees Celsius

Steps:

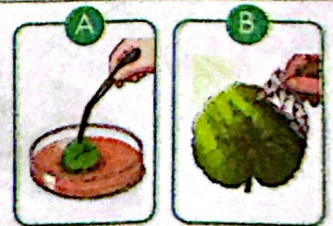
The day before the experiment:

- Make small cuts in each leaf so you can tell A, B, and C apart.
- Cover the plant's leaves with aluminum foil so they do not receive sunlight.



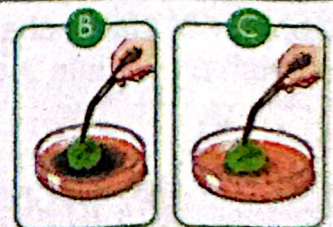
Morning of the experiment day:

- Take leaf A and check if there is any starch.
- Remove the aluminum foil from B.



5 hours later:

- Take leaves B and C and check if there is any starch.



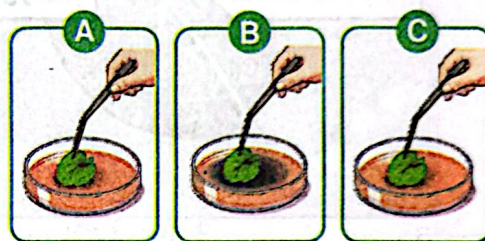
Results:

Leaf	Condition before test	Iodine solution test	Presence of starch
A	No sunlight	Its colour remains yellowish-brown.	No starch present
B	Exposed to sunlight for 5 hours	Its colour turns to blue-black.	Starch is present
C	No sunlight	Its colour remains yellowish-brown.	No starch present

Observations:

When iodine solution was added to the leaves:

- Only the leaf (B) turned **blue-black**.
- The leaves (A and C), remained **yellowish-brown**.



Conclusion:

- Sunlight is necessary for the production of plant's food (starch) through photosynthesis process.

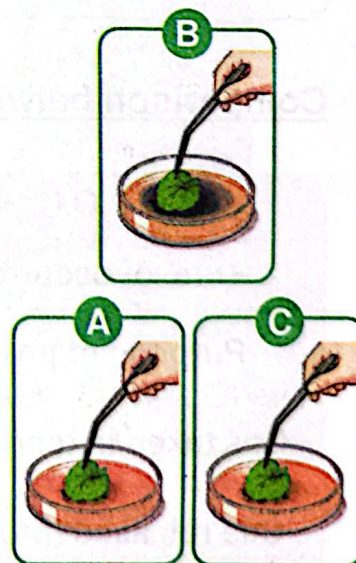
Give reason for:

① Leaf B turns **blue-black** with iodine solution.

- Because leaf B was exposed to sunlight, so it produced starch, which turns blue-black with iodine.

② Leaves A and C do not change colour with iodine solution.

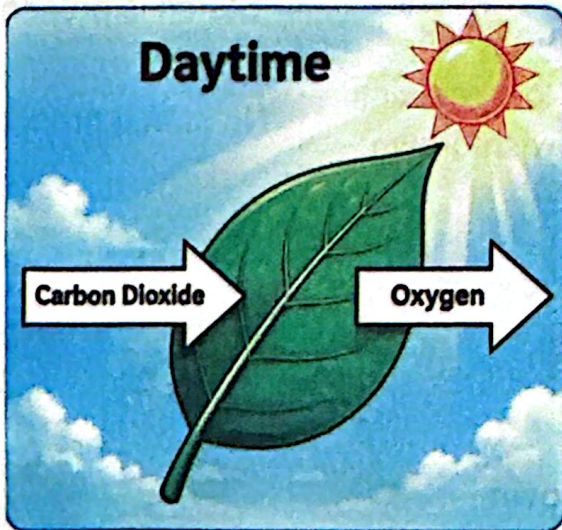
- Because they were covered with aluminum foil and did not receive sunlight, so no starch was formed.



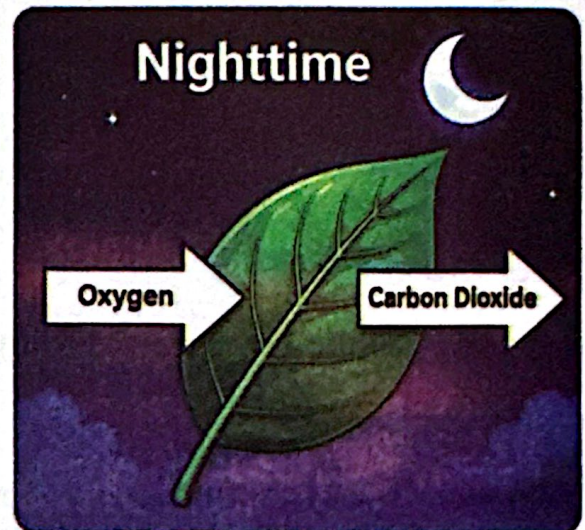
Lesson 2 Gas Exchange

- Plants perform many vital processes to survive and grow healthy.

The relationship between day and night, and air:



- Plants take in carbon dioxide gas and release oxygen gas because photosynthesis is very active.
- Breathing is also happening, but overall, they take in more carbon dioxide.



- Plants only breathe, taking in oxygen and releasing carbon dioxide because there is no light.

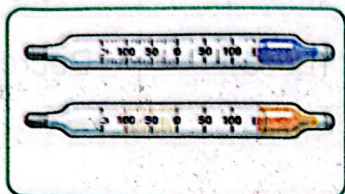
Comparison between photosynthesis and respiration in plants:

P.O.C	Photosynthesis	Respiration
Time of occurrence	Only in daytime	Occurs in day and night
Purpose of process	Production of starch	Releasing energy
Gas taken in (consumed)	Carbon dioxide	Oxygen
Gas released (produced)	Oxygen	Carbon dioxide



Experiment The Relationship Between Plants and Air

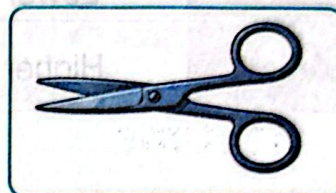
Preparation:



Gas detector tubes
for oxygen and
carbon dioxide



Gas sampling pump



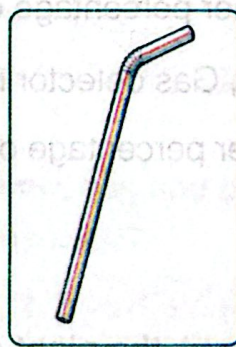
Scissors



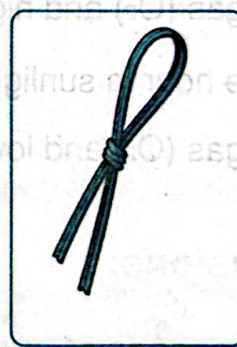
Plant



Polyethylene bag

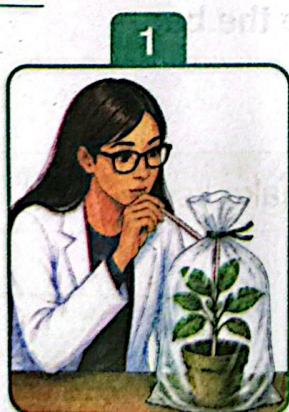


Straw



Twist tie

Steps:



On a sunny day, put a bag over the plant and breathe into it.



Use the gas detector tube to check the percentage of oxygen and carbon dioxide inside the bag.



Leave plant in a sunny place for about 1 hour and then repeat step ②.

Results:

Gas inside the bag	After breathing into the bag	After 1 hour in sunlight	Change
Oxygen	Lower (Less)	Higher (more)	Increase ↑
Carbon dioxide	Higher (more)	Lower (Less)	Decrease ↓

Observations:

- After breathing inside the bag, Gas detector readings showed lower percentage of oxygen gas (O_2) and higher percentage of carbon dioxide gas (CO_2).
- After one hour in sunlight, Gas detector readings showed higher percentage of oxygen gas (O_2) and lower percentage of carbon dioxide gas (CO_2).

Conclusions:

- In the presence of **sunlight**, the plant carries out **photosynthesis**.
- During photosynthesis, the plant uses **carbon dioxide gas** and releases **oxygen gas**, changing the composition of the air inside the bag.

Photosynthesis

It is the process by which the plant use **sunlight** to make its own food.



Note:

- Water droplets that appear inside of the bag are formed due to **transpiration process** and we will study this process in **chapter 6**.





Evaluate your Understanding

On Lessons (1 and 2)

1 Complete the following sentences:

- The leaf that receives can produce starch.
- The colour of iodine solution changes to when starch is present.
- Leaves covered with cannot produce starch.

2 Write the scientific term:

- It is the process by which plants use sunlight to make food. (.....)
- It is the gas taken in by plants during photosynthesis. (.....)

3 Correct the underlined word:

- Plants make food using the energy of the moon. (.....)
- Respiration process in plants occurs during night only. (.....)

4 Choose the correct answer:

- A plant is sealed inside a transparent bag and placed in sunlight.
Which change is expected after one hour?

Choice	Oxygen gas	Carbon dioxide gas
(a)	decreases	increases
(b)	increases	increases
(c)	decreases	decreases
(d)	increases	decreases



- A student forgets to remove the aluminum foil from Leaf B before placing it in sunlight. What is the expected iodine test result?

- (a) Blue-black (b) Yellowish-brown
(c) Green (d) Purple

5 Cross out the Odd word, and mention the relation between the rest:

- Using sunlight – Starch production – Taking in Oxygen – Consuming carbon dioxide

The odd word is:

The relation between the rest words:



Must Know
Before the
Exam

Summary on Chapter 5

Photosynthesis

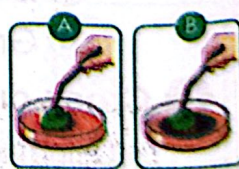
Photosynthesis:

Photosynthesis

It is the process by which the plant use **sunlight** to make its own food.

Site of occurrence	Leaves
Time of occurrence	Only in daytime
Needed materials	• Sunlight (source of energy) • Carbon dioxide gas (Gas taken in or consumed) • Water (From soil)
Products	• Starch (Plant food) • Oxygen gas (Gas released or produced)

Starch test:

Steps and reasons	<table><tr><th>Step</th><th>Reason</th></tr><tr><td>① Put the leaf in hot water.</td><td>To make the leaf soft.</td></tr><tr><td>② Put the leaf in ethanol (warmed in hot water).</td><td>To remove green colour.</td></tr><tr><td>③ Add iodine solution.</td><td>To detect starch.</td></tr></table>	Step	Reason	① Put the leaf in hot water .	To make the leaf soft.	② Put the leaf in ethanol (warmed in hot water).	To remove green colour.	③ Add iodine solution .	To detect starch.
	Step	Reason							
	① Put the leaf in hot water .	To make the leaf soft.							
	② Put the leaf in ethanol (warmed in hot water).	To remove green colour.							
③ Add iodine solution .	To detect starch.								
To check if sunlight is needed to produce starch	Cover the leaves from the day before the experiment with aluminum foil so that sunlight does not hit them. 								
Results	<u>Leaf (A) doesn't contain starch:</u> Yellowish-brown → The colour doesn't change. (Because leaf didn't exposed to sunlight.) <u>Leaf (B) contains starch:</u> Yellowish-brown → Blue-black (Because leaf was exposed to sunlight.) 								
	Safety Rules	• Never touch hot water directly to avoid getting burned. • Never heat ethanol over a flame because it is highly flammable.							

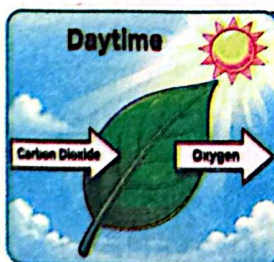
Photosynthesis vs. Respiration in plants:

P.O.C	Photosynthesis	Respiration
Time of occurrence	Only in daytime	Occurs in day and night
Purpose of process	Production of starch	Releasing energy
Gas taken in (consumed)	Carbon dioxide	Oxygen
Gas released (produced)	Oxygen	Carbon dioxide

Experiment to compare Photosynthesis and Respiration:

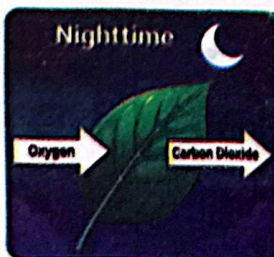
P.O.C	After breathing into the bag	After 1 hour in sunlight
Figure		
Process	Respiration	Photosynthesis
Using gas detector tubes	Oxygen	Lower (Less)
	Carbon dioxide	Higher (more)
	Higher (more)	Lower (Less)

The relationship between day and night, and air:



During daytime:

- Photosynthesis is very active than respiration that is also happening.
- Plants take in more **carbon dioxide** gas and release **oxygen gas**.



During nighttime:

- Plants only make respiration because there is no light.
- Plants take in **oxygen gas** and releasing **carbon dioxide gas**.

First

PONY Questions

Objective Questions

1 Choose the correct answer:

1. The biological process where a plant takes in carbon dioxide and releases oxygen to produce its food is known as
☐ (a) respiration ☐ (b) transpiration ☐ (c) photosynthesis ☐ (d) digestion
2. The iodine solution changes its colour from yellowish-brown to blue-black indicating the presence of
☐ (a) oxygen gas ☐ (b) carbon dioxide gas
☐ (c) starch ☐ (d) ethanol
3. The expected color of the iodine solution when dropped on a leaf that has been covered with aluminum foil for a full day is
☐ (a) blue-black ☐ (b) yellowish-brown
☐ (c) green ☐ (d) red
4. An increase in the oxygen level and a decrease in the carbon dioxide level inside a sealed transparent bag containing a plant placed in sunlight is an evidence of
☐ (a) active respiration taking place ☐ (b) active photosynthesis taking place
☐ (c) the plant dying from lack of air ☐ (d) the formation of water droplets
5. Heating ethanol directly over a flame during the starch test procedure is considered dangerous because
☐ (a) it will instantly dissolve the starch in the leaf
☐ (b) it is highly flammable
☐ (c) it will turn the leaf blue-black prematurely
☐ (d) it will fail to soften the leaf
6. The leaves of a healthy plant are arranged in a way that they do not overlap because
☐ (a) they need space to release oxygen
☐ (b) they want to reach sunlight
☐ (c) they must absorb water from the air
☐ (d) they are trying to hide from the sun

7. Regarding the time of occurrence, the respiration process in plants happens

- (a) only during the daytime (b) only during the nighttime
(c) in both day and night (d) only when photosynthesis stops

8. During the photosynthesis process, the specific gas that a plant consumes to help produce its food is

- (a) oxygen (b) nitrogen (c) carbon dioxide (d) hydrogen

9. Before reacting with starch on a leaf, the original color of the dilute iodine solution is

- (a) blue-black (b) green (c) yellowish-brown (d) clear

2 Put (✓) for correct statements or (X) for false statements:

1. Plants perform respiration during the night only because there is no sunlight. ()
2. The leaves of a healthy plant do not overlap because they all want to reach the sunlight. ()
3. Placing a plant leaf in hot water is the step responsible for removing its green color. ()
4. During photosynthesis, the plant produces starch which provides the energy it needs to grow healthy. ()
5. After leaving a plant enclosed in a bag in sunlight for one hour, the percentage of carbon dioxide inside the bag increases. ()
6. Plants stop breathing during the day to focus entirely on the photosynthesis process. ()
7. During the starch test, it is safe to heat the beaker containing ethanol directly over a flame. ()
8. If a leaf is completely hidden from sunlight using aluminum foil, it will still produce enough starch to turn blue-black when tested with iodine. ()
9. During daytime, a plant takes in more carbon dioxide than the carbon dioxide it releases by breathing. ()

3 Correct the underlined words:

1. The solution used to detect the presence of starch in a leaf is called ethanol solution. (.....)
2. Respiration in plants produces starch to help the plant survive. (.....)

3. During daytime, plants take in more oxygen than they release through the breathing process. (.....)
4. Leaves covered with aluminum foil during the experiment change to a blue-black color when tested with iodine. (.....)
5. A plant's leaves are arranged so they do not overlap to allow them to reach the water. (.....)
6. Plants perform the photosynthesis process during both day and night. (.....)
7. When a student breathes into the plastic bag covering a plant, the percentage of oxygen gas initially becomes higher inside the bag. (.....)

4 Write the scientific term:

1. It is the process by which plants use the energy of sunlight to make their own food. (.....)
2. It is the substance produced by leaves during photosynthesis that turns blue-black when reacted with iodine. (.....)
3. It is the solution used to test for the presence of starch in plant leaves. (.....)
4. It is the gas taken in by the plant from the air during the respiration process. (.....)
5. It is the biological process occurring day and night where a plant takes in oxygen and releases carbon dioxide to release energy. (.....)
6. It is the material used to cover a plant's leaf from the day before the experiment to completely block sunlight. (.....)

5 Complete the following sentences:

1. Plants use the energy of to make their food in the photosynthesis process.
2. During the starch test, the leaf is placed in hot water first to make it
3. Ethanol is warmed in a hot water bath to remove the color from the plant leaf.
4. In the breathing process, plants take in gas and release gas.
5. While the photosynthesis process produces starch, the respiration process in plants is responsible for releasing

6 Cross out the Odd word, and mention the reason:

1. Taking in Oxygen / Releasing energy / Occurs day and night / Production of starch
(.....)

The reason:

2. Hot water / Dilute iodine solution / Aluminum foil / Gas detector tube
(.....)

The reason:

3. Carbon dioxide consumed / Oxygen released / Occurs only in daytime /
Releasing energy (.....)

The reason:

4. Taking in oxygen / Releasing carbon dioxide / Breathing / Active photosynthesis
(.....)

The reason:

Essay Questions

7 What's meant by:

1. Photosynthesis process?

.....

2. Iodine solution?

.....

3. Plant respiration?

.....

8 Mention the importance of:

1. Sunlight for plants.

.....

2. Warming the leaf in ethanol during the starch experiment.

.....

3. The gas detector tube in the gas exchange experiment.

.....

4. The plant's respiration process.

.....

5. Plant's leaves being arranged without overlapping.

.....

Compare between each of the following:

1. Photosynthesis and Respiration in plants.
(Regarding the purpose of the process and the gas consumed)
2. Leaf (A) which was covered with aluminum foil and Leaf (B) which was exposed to sunlight. (Regarding their color after the iodine test and the starch presence)
3. The plant's gas exchange during the daytime and during the nighttime.
(Regarding the overall gas taken in and the overall gas released)

Give a reason for:

1. None of the plant's leaves are overlapping.
2. Ethanol should not be heated directly over a flame during the starch experiment.
3. During the nighttime, plants only take in oxygen and release carbon dioxide.
4. The plant leaf is placed into ethanol warmed in a hot water bath during the experiment.
5. During the daytime, plants overall take in more carbon dioxide despite the breathing process also taking place.

What happens:

1. If dilute iodine solution is added to a leaf that was completely hidden from sunlight using aluminum foil for a day?
2. To the percentages of carbon dioxide and oxygen inside a transparent bag covering a plant after being left in a sunny place for one hour?
3. If a leaf is put directly into hot water (about 80°C) at the very beginning of the starch test?
4. If sunlight hits the leaves of a healthy plant?
5. To the green color of a plant leaf when it is put into ethanol warmed in a hot water bath?

12 Study the following figures, then answer the following questions:

Figure A:

- a) If leaf B is soaked in iodine solution after exposed to sunlight for 5 hours, what color will it turn, and what does this indicate?
-

- b) If leaf C is tested with iodine solution, what will its color remain, and why?
-



Figure B:

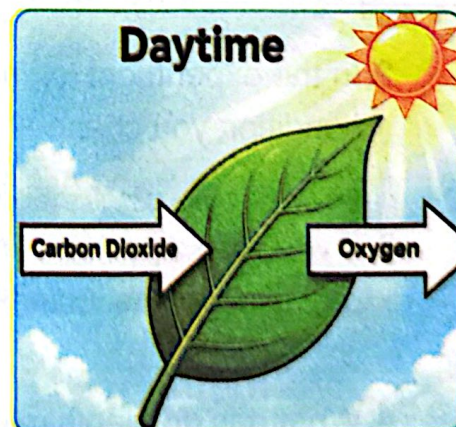
A student breathes into a sealed bag containing a potted plant. The bag is placed in sunlight for one hour.

- a) Right after the student breathes into the bag, which gas increases?
-
- b) After one hour in sunlight, how do the oxygen and carbon dioxide levels change?
-



Figure C:

- a) While the figure shows the overall gas exchange during the daytime, does the plant completely stop taking in oxygen for respiration? Explain your answer.
-
- b) If the sun sets and the environment becomes completely dark (Nighttime), how will the direction of the gas exchange arrows change?
-



Choose the correct answer:

1. What color does a leaf that was in the sunlight turn when soaked in iodine solution?

- (a) Does not change (b) Blue-black (c) Yellow

2. Which of the following explanations is correct?

- (a) Plants produce starch by receiving sunlight.
(b) Plants produce starch by blocking sunlight.

3. What gas do plants take in from the air when they breathe?

- (a) Oxygen (b) Carbon dioxide (c) Nitrogen

4. During the night, when there is no light, what kind of gas exchange do plants do?

- (a) Take in oxygen and release carbon dioxide (breathing).
(b) Take in carbon dioxide and release oxygen.

5. Which statement correctly explains plants and air?

- (a) Plants keep releasing only oxygen all day long.
(b) During the daytime, they take in more carbon dioxide than the carbon dioxide they release by breathing.
(c) While the sunlight is hitting them, plants do not breathe.

Answer the following questions:

1. What nutrient is produced when sunlight hits the leaves of plants?

.....

2. In the experiment to check if sunlight is needed to produce starch, what is the condition you change?

.....

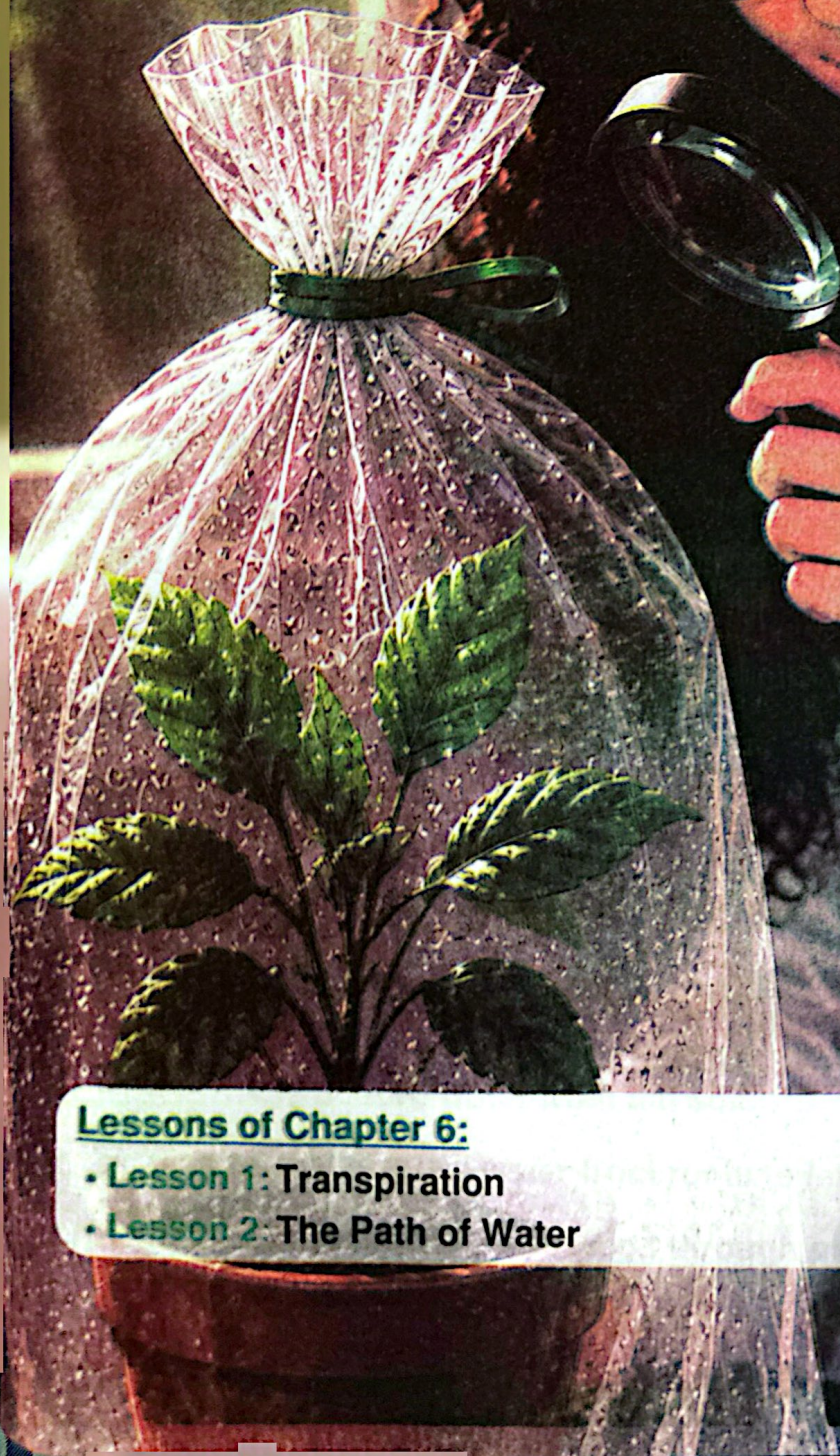
3. If you hide a part of a leaf with aluminum foil to block the sunlight, how will that part react to the iodine solution reaction?

.....

4. What gas do plants release into the air when they are in the sunlight?

.....

Chapter 6 Transportation of Water in Plants



Lessons of Chapter 6:

- Lesson 1: Transpiration
- Lesson 2: The Path of Water

Main Vocabulary

Page (117)

Wilted plant	نبات ذابل	Healthy plant	نبات صحي	Roots	جذور
Stem	ساق	Absorb	يمتص	Transport	ينقل

Page (118)

Flask	قارورة	Magnifying glass	مرآة مكبرة		
-------	--------	------------------	------------	--	--

Page (119)

Transpiration	عملية النتح	Stomata	ثغور	Gets rid	يتخلص من
Excess water	الماء الزائد	Exit	يخرج	Water vapour	بخار الماء

Page (121)

Lotus (water lily)	اللوتس (زنبق الماء)	Flat	مسطحة	Efficiently	بكفاءة
Natural air purifier	منقى هواء طبيعي	Papyrus Straws	قش البردي	Sprinkling water	رش الماء

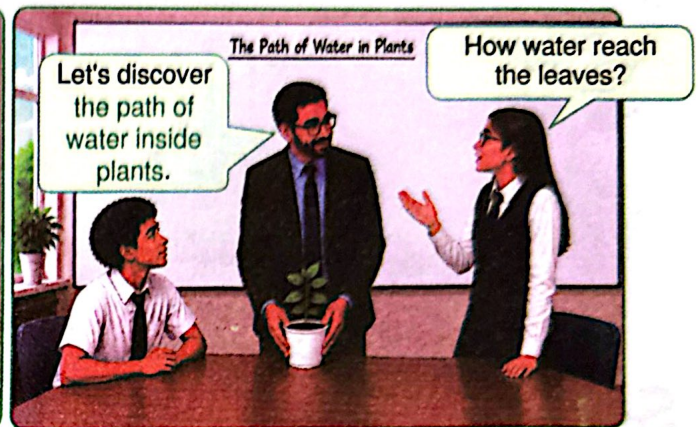
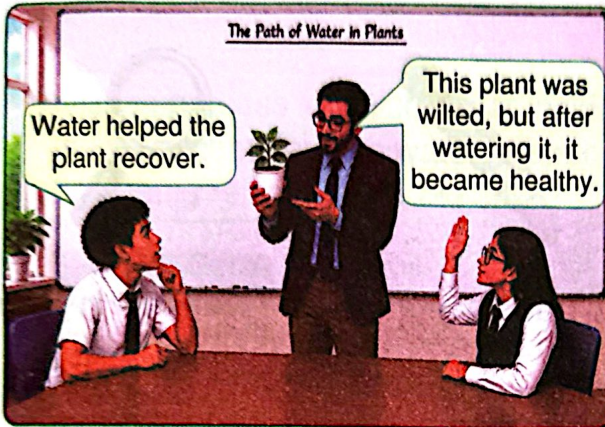
Lesson 1

The Path of Water Inside Plants



Warm up!

The teacher shows the students a healthy plant after watering it and says:



The Relationship Between Plants and Water:

- Water is essential for plant, because it helps plants make their own food (starch) through photosynthesis process.
- If you water the base of a wilted plant, the plant recovers after a while.



The Path of Water Inside the Plant:

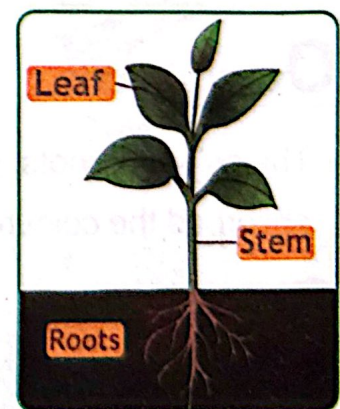
- Water spreads to the whole body of the plant, as there are paths in the roots, stems, and leaves that carry water.
- Water is transported inside the plant in the order of:



First: Roots absorb water from the soil.

Then: Stem transports water from roots to leaves.

Finally: Leaves make the plant food through photosynthesis process.





Experiment Observing the Path of Water Inside Plants

Preparation:



Plant



Flask contains
Colored water



Cutter knife

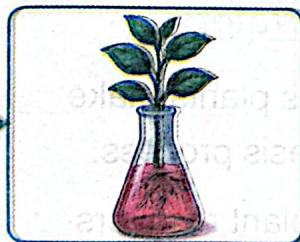


Magnifying glass

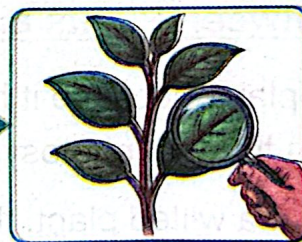
Steps:



Wash the roots with water to remove any soil.



Soak the roots in the flask contains colored water.



After few hours, observe the change in the colour of the plant.



Cut the roots, stems and leaves, and observe the cut surfaces.

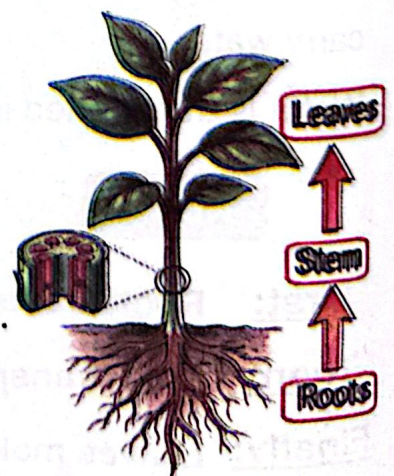
Observation:

- The colour of roots, stem and leaf turned red after the plant absorbed the coloured water.

Conclusions:

- The parts that turned red are the paths for the colored water.
- Water is transported inside the plant in the order of:

Roots → stem → leaves



Lesson 2 Transpiration

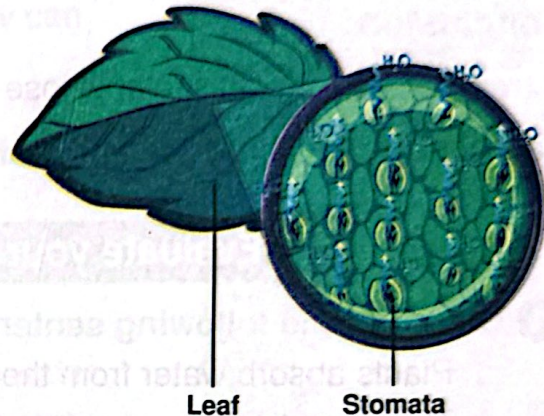
- Plant gets rid of some of the excess water absorbed from the roots.
- The excess water goes out into the air in the form of water vapour through small pores on **leaves** called **stomata** in **transpiration** process.

Transpiration

It is the process in which water inside the plant changes into water vapour and being released into the air.

Stomata

These are small pores mostly found on the underside of the leaves and they act as exits for water vapour.



Experiment Observing Transpiration in Plants

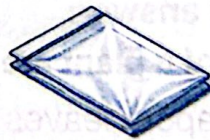
Preparation:



Plant (A)
with leaves



Plant (B)
without leaves



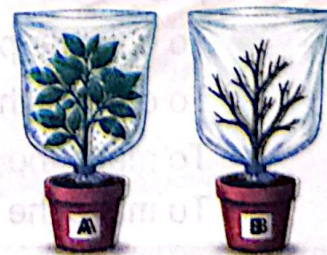
Plastic bags



Twist ties
or strings

Steps:

- 1 On a sunny day, put bags over Plant A and Plant B.
- 2 Place the two plants in sunny place.
- 3 Check if water droplets form inside the bags.



Observations:

In Plant A (with leaves):

Water droplets are formed inside the plastic bag.

In Plant B (without leaves):

No water droplets formed inside the plastic bag.

Conclusion:

- In **transpiration** process, plants lose the **excess water** in the form of **water vapour** that goes out into the air through **stomata** on the **plant leaves**.



Evaluate your Understanding On Lessons (1 and 2)

1 Complete the following sentences:

1. Plants absorb water from the through their
2. There are tiny called allow water vapour to leave the leaf.
3. The carries water from the roots to the leaves.

2 Correct the underlined word:

1. Water first reached the leaves before the stem. (.....)
2. Water changes into oxygen gas during transpiration. (.....)
3. Wilted plant dies after watering. (.....)

3 Choose the correct answer:

1. If most stomata of a plant are blocked, which change is most likely?
 - (a) More water vapour leaves the plant.
 - (b) Water transport becomes faster.
 - (c) Very little transpiration occurs.
 - (d) Roots stop absorbing water.
2. Why coloured water is used in the experiment?
 - (a) To help the plant grow faster.
 - (b) To change the color of the leaves.
 - (c) To make the path of water visible inside the plant.
 - (d) To make the stem stronger.

Enrichment Activity

Solar Panels on the Lotus (Water Lily):

- The lotus (water lily) has a **large** and **flat** leaves floating on the Nile River to catch as much of Egypt's strong **sunlight** as possible so they can produce **nutrients (starch)** efficiently.



Papyrus Straws:

- Papyrus is used to make **paper** in ancient times.
- It grows many meters tall near the water.
- Inside its stem, there are **strong, straight** water paths that carry the water absorbed by the roots all the way to the top at **once**.



Exchanging Gases:

- The beautiful green plants along the Nile River act as a "**natural air purifier**" to keep the air in Egypt clean.
- When plants do photosynthesis, they take in carbon dioxide that humans breathe out and release oxygen.



Sprinkling Water in Desert Plants:

- Transpiration works to **lower** the temperature around the plant.
- In the desert of Egypt, the reason it feels cool when you get close to plants is because they act like a **natural sprinkler** to cool the air for us.



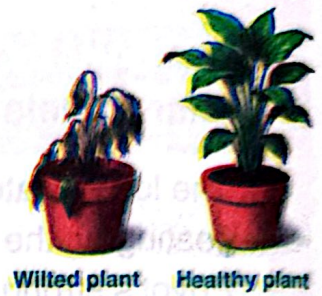
Summary on Chapter 6

Transportation of Water in Plants



Importance of water for plant:

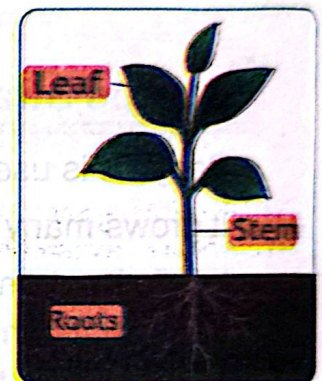
- Water helps the plant make food.
- Water keeps the plant healthy.
- Water makes a wilted plant recover after watering.



Path of water in plant:

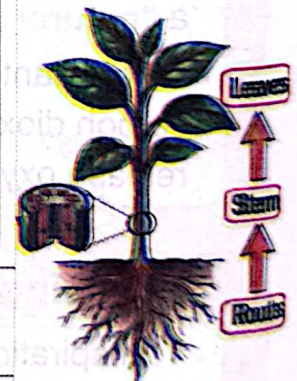
Water moves in this order: Roots → Stem → Leaves

Plant Part	Function
Roots	They absorb water from the soil.
Stem	It transports water from roots to leaves.
Leaves	They make the plant food through photosynthesis process.



Experiment to observe path of water in plant:

Steps and reasons	Step	Reason
	① Wash the roots with water.	To remove soil from roots.
	② Put roots in colored water and wait.	To make path of water visible.
	③ Cut the roots, stem and leaves.	To observe path of red-colored water.
Observation	The colour of roots, stem and leaf turn to red.	
Conclusion	Water moves in this order: Roots → Stem → Leaves	



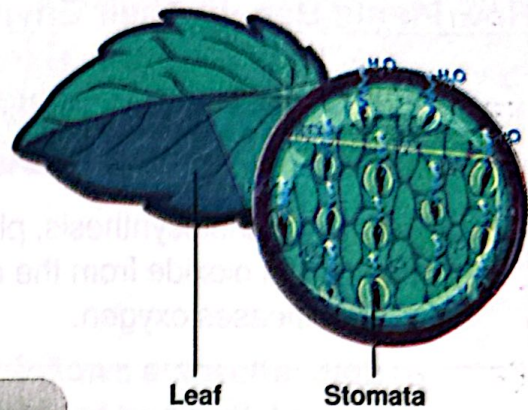
Transpiration:

- Plant gets rid of the **excess water** absorbed from the roots through small pores in **leaves** called **stomata** in **transpiration** process in the form of **water vapour**.

Transpiration

It is the process in which water inside the plant changes into water vapor and being released into the air.

Stomata



Function	Location
Release water vapor	Tiny pores on the underside of leaves

Transpiration Experiment:

In Plant A (with leaves):

Water droplets are formed inside the plastic bag.



In Plant B (without leaves):

No water droplets formed inside the plastic bag.

Plants get rid of **excess water** in the form of **water vapor** through the **stomata** on the **leaves**.

Photosynthesis vs. Transpiration:

P.O.C	Photosynthesis	Transpiration
Main function	Producing Starch (plant food)	Getting rid of excess water in the form of water vapour.
Location (site)	Green leaves	Stomata on underside of green leaves
Time of occurrence	At daytime only	Observed better at daytime because water evaporate faster.
Gas released	Oxygen gas	Water vapour
Similarities	- Both are important for keeping the plant healthy. - Both processes occur in the leaves of plants.	

How Plants Benefit Their Environment:

Plant is Natural Air Purifier during photosynthesis	Plant is Natural Sprinkler during transpiration
Because during photosynthesis, plant absorbs carbon dioxide from the air and releases oxygen.	Because during transpiration, plant releases water vapour that cools the surrounding air as we feel areas near plants cooler, especially in hot deserts.

Simply: Photosynthesis = Cleans the Air Transpiration = Cools the Air

Plants in Egypt:

Plant	Figure	Transpiration
Lotus (Water Lily)		<u>It has a large and flat leaves floating on the Nile River:</u> • To catch as much of sunlight as possible. • To produce nutrients (starch) efficiently.
Papyrus		• It was used to make paper in ancient times. • It grows many meters tall near the water. • There are strong, straight water paths in stem that carry the water absorbed by the roots to the top at once.

Exercises on **Transportation of Water**

Chapter 6 **in Plants**



Enrichment
Questions

First PONY Questions

Objective Questions

1 Choose the correct answer:

- The transportation of water inside a plant follows a specific path to ensure the plant's survival. The correct order of this path is
(a) Stem → Roots → Leaves (b) Leaves → Stem → Roots
(c) Roots → Stem → Leaves (d) Roots → Leaves → Stem
- During the transpiration process, the plant releases excess water into the surrounding air. This water is released in the form of
(a) liquid water (b) ice crystals (c) oxygen gas (d) water vapor
- Blocking all the stomata on a plant's leaves will most likely result in
(a) faster water transport through the plant
(b) very little transpiration occurring
(c) more water vapor leaving the plant
(d) the roots absorbing more water
- The colored water in the flask experiment serves a specific scientific purpose, which is
(a) Make the plant grow faster
(b) Make the path of water visible inside the plant
(c) Change the natural color of the leaves permanently
(d) Make the stem stronger
- The leaves of the lotus (water lily) floating on the Nile River have a flat and large shape. This specific adaptation helps the plant to
(a) absorb water directly from the air
(b) prevent the transpiration process completely
(c) release excess carbon dioxide
(d) catch strong sunlight to produce starch efficiently
- Standing near a green plant in the desert environment feels remarkably cool. Which process is directly responsible for this effect?
(a) Absorption of colored water (b) Photosynthesis
(c) Transpiration (d) Starch production

7. Through the process of photosynthesis, plants use strong sunlight to produce their own nutrients. The specific nutrient mentioned in the text that plants produce efficiently is

- (a) oxygen (b) starch (c) water vapor (d) colored water

8.  The ancient Egyptians used a specific plant that grows many meters tall near the water to make paper. This plant is known as

- (a) lotus (b) palm tree (c) papyrus (d) water lily

9.  The internal structure of the papyrus stem is unique because it carries absorbed water all the way to the top at once using

- (a) large and flat leaves (b) small pores called stomata
(c) a natural sprinkler system (d) strong, straight water paths

10.  In the desert country of Egypt, getting close to plants feels remarkably cool because the transpiration process makes them act like a

- (a) natural air purifier (b) solar panel
(c) natural sprinkler (d) green factory

2 Put (✓) for correct statements or (X) for false statements:

1. Roots absorb water from the soil primarily to help the plant make its own food. ()

2. Water first reaches the leaves before it passes through the stem. ()

3. In the transpiration experiment, water droplets formed inside the plastic bag covering the plant without leaves. ()

4. The green plants along the Nile River act as a natural air purifier by taking in carbon dioxide and releasing oxygen. ()

5. Transpiration acts like a natural sprinkler because the water vapor coming out of the leaves lowers the temperature around the plant. ()

6. The flat and large shape of the lotus leaves on the Nile River helps the plant catch strong sunlight to efficiently produce starch. ()

7. The tiny pores called stomata, are mostly found on the upper surface of the leaves. ()

8. The papyrus plant grows very close to the ground and has short stems. ()

9.  Transpiration works to increase the temperature of the air around the plant. ()

10.  During the process of photosynthesis, plants act as a "natural air purifier" by releasing oxygen into the air. ()

3 Correct the underlined words:

1. The stem absorbs water directly from the soil. (.....)
2. Plants lose excess water in the form of water vapor through tiny pores called roots. (.....)
3. The process of water inside the plant changing into water vapor and being released into the air is called photosynthesis. (.....)
4. Water changes into oxygen gas during transpiration. (.....)
5. A wilted plant dies immediately after watering its base. (.....)
6. Water is transported from the roots to the rest of the plant through specific connected tubes located in the stomata. (.....)
7. The tiny pores mostly on the underside of leaves that act as exits for water vapor are called roots. (.....)
8.  During photosynthesis, green plants act as a natural air purifier by taking in the oxygen that humans breathe out. (.....)
9.  The process of photosynthesis works to lower the temperature around the plant. (.....)
10.  Papyrus is used to make clothes in ancient times. (.....)

4 Write the scientific term:

1. It is the process in which some of the water absorbed from the roots changes into water vapor and is released into the air from the leaves. (.....)
2. They are the tiny pores located mostly on the underside of leaves that act as exits for water vapor. (.....)
3. It is the specific plant part responsible for transporting water from the roots to the leaves. (.....)
4. It is the nutrient produced by plants using sunlight during the photosynthesis process. (.....)
5. They are the parts of the lotus plant (water lily) that have a flat and large shape to act like solar panels and catch strong sunlight. (.....)
6. It is the process where green plants take in the carbon dioxide humans breathe out and release oxygen, acting as a natural air purifier. (.....)
7.  It is the specific tall plant growing near water that was used in ancient times to make paper. (.....)
8.  They are structures inside the papyrus stem that carry the water absorbed by the roots all the way to the top at once. (.....)
9. It is the specific gas released by plants into the air during the process of photosynthesis. (.....)
10.  It is the biological process that acts like a natural sprinkler to lower the temperature around plants in a desert country. (.....)

5 Complete the following sentences:

1. Plants absorb water from the through their
2. The carries water from the roots to the leaves.
3. When observing the cut surfaces of a plant soaked in colored water, the parts that turned red indicate the for the colored water.
4. The green plants along the Nile act as a natural because they take in the carbon dioxide humans breathe out.
5. Water is transported inside the plant in a specific order: first the, then the, and finally the
6. The tiny pores that act as exits for water vapor are called, and they are mostly located on the of the leaves.
7. 💡 Transpiration acts like a natural in the desert country of Egypt because releasing water vapor works to lower the around the plant.
8. 💡 The lotus (water lily) has a and leaf shape to catch as much of Egypt's strong sunlight as possible.

6 Cross out the Odd word, and mention the reason:

1. Roots / Stem / Leaves / Stomata (.....)
Reason:
2. Carbon dioxide / Sunlight / Starch / Red colored water (.....)
Reason:
3. 💡 Lower temperature / Water vapor / Stomata / Red colored paths (.....)
Reason:
4. 💡 Natural sprinkler / Lower temperature / Transpiration / Make paper (.....)
Reason:

Essay Questions

7 What's meant by:

1. Transpiration?

.....

2. Stomata?

.....

8 Mention the importance of:

1. The stem in a plant.
.....
2. Stomata for plant leaves.
.....
3. The flat and large shape of lotus leaves.
.....
4. 💡 The transpiration process for the environment in a desert country like Egypt.
.....
5. 💡 The papyrus plant in ancient times.
.....

9 Compare between each of the following:

1. Plant A (with leaves) and Plant B (without leaves) in the transpiration experiment.
(In terms of the results observed inside the plastic bags)
.....
2. The function of the roots and the function of the leaves. (Regarding plant survival)
.....
3. Photosynthesis and transpiration.
(Regarding the substances a plant releases into the surrounding air)
.....

10 Give a reason for:

1. Water is essential for plants.
.....
2. Water droplets form inside the plastic bag covering a leafy plant on a sunny day.
.....
3. A wilted plant recovers after a while when you water its base.
.....
4. It is necessary to wash the plant's roots with water before putting them in the flask.
.....
5. 💡 It feels remarkably cool when you get close to plants in the desert country of Egypt.
.....
6. 💡 The air stays clean around the beautiful green plants along the Nile River.
.....
7. 💡 Water absorbed by the roots of the papyrus plant can reach all the way to the top at once.
.....

11 What happens:

1. If you place a plastic bag over a plant without leaves on a sunny day?
.....
2. If you soak the roots of a plant in a flask containing colored water for a few hours and then cut the roots, stems, and leaves?
.....
3. If green plants along the Nile River perform photosynthesis?
.....
4. If all the tiny pores (stomata) on the underside of a plant's leaves are completely blocked?
.....
5. 💡 To the air temperature around a green plant in the desert when it releases water vapor from its leaves?
.....
6. 💡 If the strong, water paths inside the papyrus stem absorb water from the roots?
.....

12 Study the following figures, then answer the following questions:

Figure 1:

- a) What is the purpose of using coloured water in this experiment?
.....
- b) If you cut the stem of this plant after a few hours, what will you observe on the cut surface?
.....

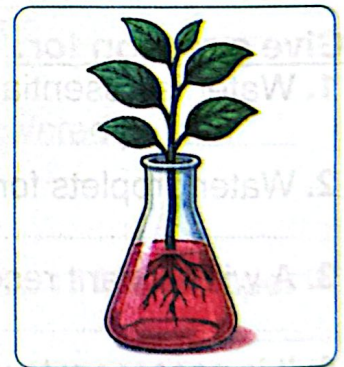


Figure 2:

- a) Inside which plastic bag will you observe water droplets forming?
.....
- b) What is the name of the biological process being tested in this figure?
.....

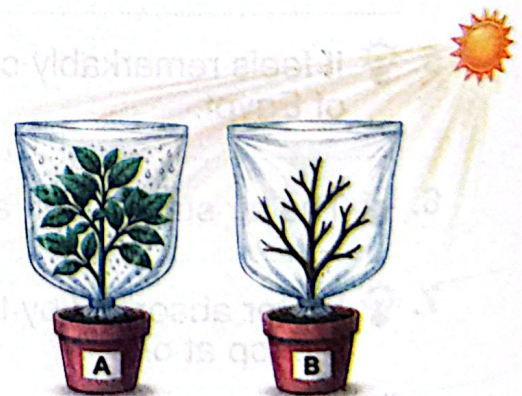
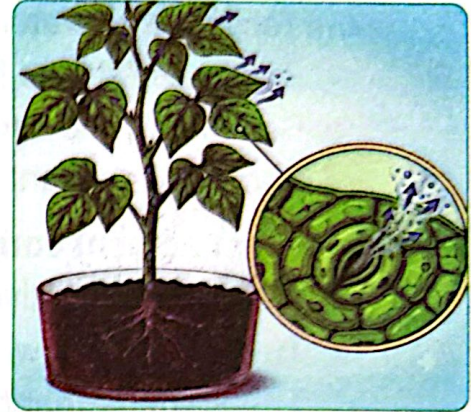


Figure 3:

- ① According to the blue arrows in the figure, what is the exact order in which water is transported inside the plant?
-
- ② What is the scientific name for the tiny pore shown in the magnified section, and where are these pores mostly located?
-
- ③ Explain the relationship between the blue arrows moving up the plant and the vapor escaping from the magnified pore. What process does the escaping vapour represent?
-



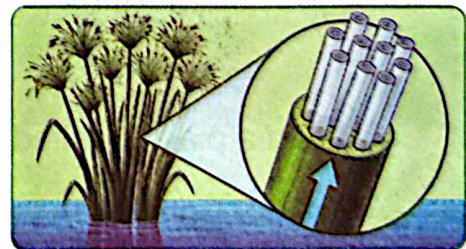
 **Figure 4:**

- ①  What is the name of the plant shown in this figure?
-
- ②  How does the specific physical shape of these leaves help the plant produce nutrients efficiently?
-



 **Figure 5:**

- ①  What was this specific plant used to make in ancient times?
-
- ②  What is the function of the straight tubes shown inside the magnified stem?
-



1 Choose the correct answer:

1. In the experiment to check that water comes out of the leaves, what is the reason why water droplets formed inside the plastic bag?
 - (a) Because it rained from outside.
 - (b) Because water vapor came out of the leaves and changed into water.
 - (c) Because the plant breathed and released carbon dioxide.
2. Which statement correctly explains transpiration?
 - (a) Transpiration actively happens from the stems, not the leaves.
 - (b) Transpiration is when plants release oxygen.
 - (c) Transpiration happens through the small pores on the underside of the leaves, which act as exits for water vapor.
3. Which statement correctly explains the path of water in plants?
 - (a) Water flows freely everywhere inside the stem.
 - (b) Tubes are connected from the roots to the tips of the leaves to carry water.
 - (c) The water absorbed from the roots passes through the stems, but does not go to the leaves.

2 Answer the following questions:

1. What is it called when the water inside a plant changes into water vapor and is released from the leaves?
.....
2. What happens after a while when you water the base of a wilted plant?
.....
3. What are the small pores called, which are mostly on the underside of leaves, that act as exits for water vapor?
.....
4. When a plant is wilted, what should you do to recover it?
.....
5. Write the order in which the water absorbed from the roots passes through. Fill in the blanks with the correct words. (1) → (2) → (3)
.....

Chapter 7 Food Chain



Lessons of Chapter 7:

- Lesson 1: Food Chain
- Lesson 2: Living Organisms, Air, and Water

Main Vocabulary

Page 135

Food Chain	سلسلة غذائية	Producers	كائنات منتجة	Carnivores	أكلى اللحوم
Herbivores	أكلى العشب	Omnivore	أكلى اللحوم و العشب	Consumers	كائنات مستهلكة

Page 136

Grass	العشب	Grasshoppers	جراد أخضر	Frog	ضفدع
Snake	ثعبان	Sustaining	الحفاظ	Circulating	تدوير

Lesson 1 Food Chain

- Living organisms need **energy** to grow and survive.
- Living organisms can get energy from **food**.



We can classify Living organisms according to the type of food into:

Producers (Plants)

They use sunlight to produce nutrients inside their bodies.



Examples:

Grass, algae, ...etc.

Herbivores

They are consumers (animals) that eat plants.



Examples:

Grasshoppers, rabbits, ...etc.

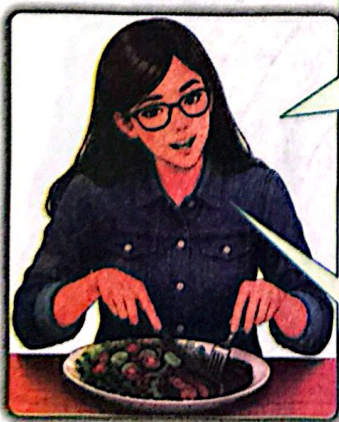
Carnivores

They are consumers that eat other animals.



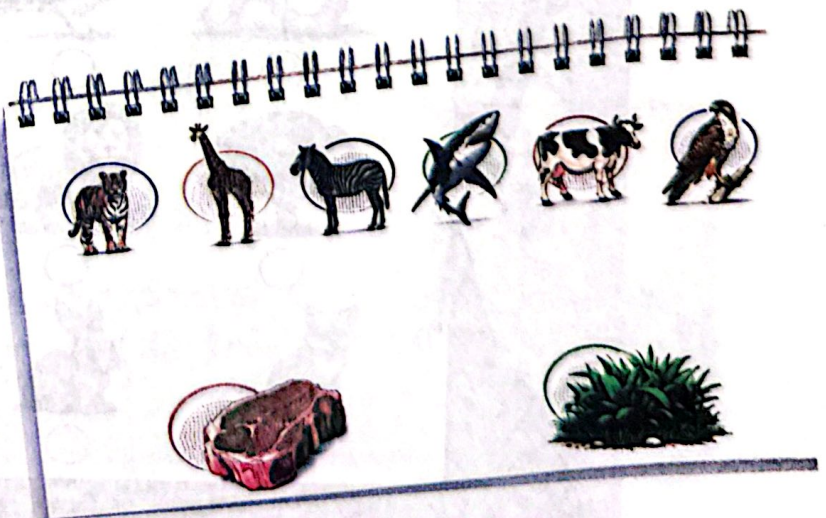
Examples:

Snakes, eagles, lions, ...etc.



Human is **omnivore** that can eat **plants** and **animals**.

Now, try to match each animal with its food.



- The following figure represents a **food chain** that shows the feeding relationships between living organisms in an ecosystem.



The arrow (→) points to the **direction of energy**.

Food chain starts with **plants** and ends with **large (strong) carnivore**.

- Grass** uses sunlight to make its food.
- Grasshopper** gets energy from eating grass.
- Frog** gets energy from eating grasshopper.
- Snake** gets energy from eating frog.

Food chain

It is the "eat and be eaten" connection (feeding relationship) between living organisms in an ecosystem.

What happens if: Frogs disappear from the food chain?

- The number of Grasshopper will increase.
- The number of Snake will decrease.

ARRANGE THE FOOD CHAINS

Look at the pictures in each row. Write the numbers 1, 2, and 3 in the circles to show the correct order of the food chain.

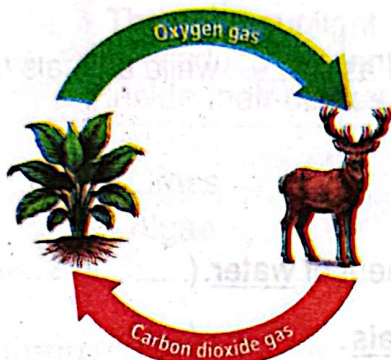
 ○	 ○	 ○
 ○	 ○	 ○
 ○	 ○	 ○

Lesson 2 Living Organisms, Air, and Water

- Living organisms, air, and water are connected by invisible bonds.

Let's discover how air and water move between living organisms.

Connection of living organisms through air:



- Animals use the **oxygen** released by plants to breathe.
- Plants use the **carbon dioxide** breathed out by animals for photosynthesis.

Connection of living organisms through water:



- Plants release **water** absorbed from their roots into the air through **transpiration**, and it falls back to the ground as **rain**, sustaining the lives of animals and plants.



Let's feel grateful for water and air!

Our lives are constantly supported by the oxygen produced by plants and the water circulating around the Earth!





Evaluate your Understanding On Lessons (1 and 2)

1 Complete the following sentences:

1. Plants use to produce their food through process, and they release gas into the air that animal use to breathe.
2. Plants release water absorbed from their roots in the form of into the air through process.
3. Animals that eat another animals are known as while animals that eat plants are known as

2 Correct the underlined word:

1. The arrow (→) in a food chain shows movement of water. (.....)
2. Plants can get energy they need from animals. (.....)

3 Cross out the odd word:

1. Grasshopper – Lion – Rabbit – Cow (.....)
2. Grass – Algae – Snake – Tree (.....)

4 Study the opposite figure, and then complete the following sentences from word bank:

carbon dioxide

Oxygen gas

Water vapour

respiration

rain

1. If the process (1) stops completely, the amount of in the atmosphere will decrease, leading to less formation.
2. If gas (4) is not released, animals would be unable to perform
3. If plants completely disappeared, gas will increases, while gas will decrease in air.



Summary on Chapter 7

Food Chain



Must Know
Before the
Exam

Classification of living organisms:

- Living organisms can get energy they need to survive from **food**.

We can classify living organisms according to the type of food into:

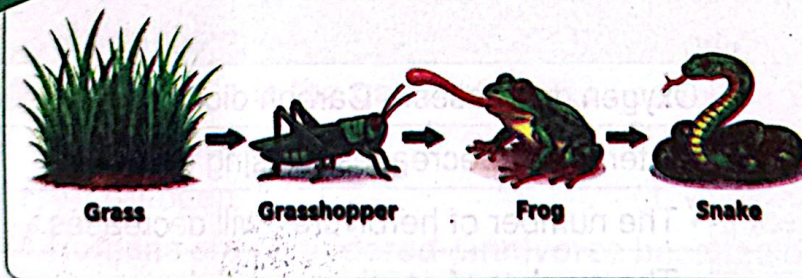
	Producers (Plants)	Herbivores (Animals)	Carnivores (Animals)	Omnivores (Humans and Animals)
Food	They use sunlight to produce nutrients inside their bodies.	They eat plants.	They eat animals.	They eat plants and animals.
Examples	- Grass - Algae	- Grasshoppers - Rabbits	- Snakes - Eagles - lions	Human

Food Chain:

Food chain

It is the “eat and be eaten” connection (feeding relationship) between living organisms in an ecosystem.

Example:



The arrow (→) points to the **direction of energy**.

Food chain starts with **plants** and ends with **large (strong) carnivore**.

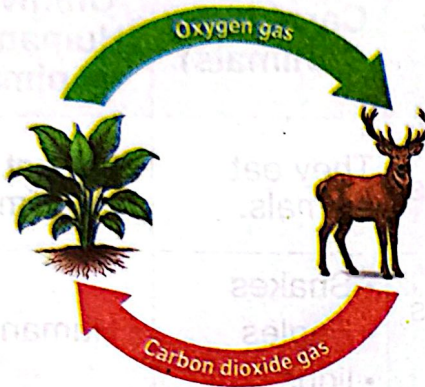
What happens if: Frogs disappear from the food chain?

- The number of grasshopper will increase.
- The number of snake will decrease.
- The balance of the ecosystem would be disrupted.

Living Organisms, Air and Water:

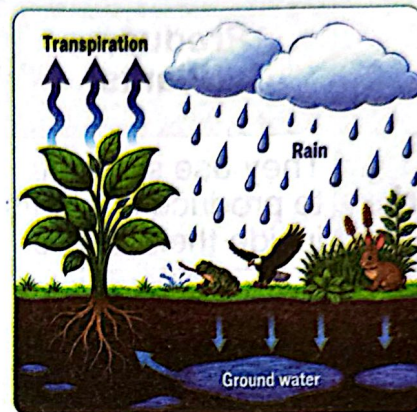
- Living organisms, air, and water are connected by invisible bonds.

Connection of living organisms through air:



- Animals use the **oxygen** released by plants to breathe.
- Plants use the **carbon dioxide** breathed out by animals for photosynthesis.

Connection of living organisms through water:



- Plants release **water** absorbed from their roots into the air through **transpiration**, and it falls back to the ground as **rain**, sustaining the lives of animals and plants.

Affects you must know:

What happens if:	
Photosynthesis stops?	Oxygen decreases. - Carbon dioxide increases.
Transpiration stops?	Water vapor decreases causing less rain.
Plants (producers) disappear?	• The number of herbivores will decrease.
Herbivores disappear?	• The number of carnivores will decrease. • The number of producers will increase.

Exercises on Chapter 7

Food Chain

First PONY Questions

Objective Questions

1 Choose the correct answer:

1. Which of the following best describes the role of plants in a food chain?

- (a) They eat other animals.
- (b) They are omnivores.
- (c) They use sunlight to produce nutrients.
- (d) They only absorb water.

2. Select the correct sequence of a food chain.

- (a) Frog → Snake → Grasshopper → Grass
- (b) Grass → Grasshopper → Frog → Snake
- (c) Grasshopper → Grass → Snake → Frog
- (d) Snake → Frog → Grasshopper → Grass

3. The arrow (→) in a food chain represents

- (a) the movement of water
- (b) the direction of energy
- (c) the breathing process
- (d) the release of carbon dioxide

4. is classified as an herbivore.

- (a) Lion
- (b) Snake
- (c) Eagle
- (d) Rabbit

5. An organism that eats both plants and animals is known as a(n)

- (a) carnivore
- (b) producer
- (c) omnivore
- (d) herbivore

6. is the gas that plants use for photosynthesis.

- (a) Oxygen
- (b) Carbon dioxide
- (c) Nitrogen
- (d) Water vapor

7. Humans are considered omnivores because they have the ability to eat

- (a) only other animals
- (b) both plants and animals
- (c) only producers
- (d) solely water and air

8. A typical food chain usually ends with a

- (a) small herbivore
- (b) plant or producer
- (c) large (strong) carnivore
- (d) source of groundwater

9. According to the connection of living organisms through water, the water on Earth is constantly

- (a) disappearing into space
- (b) changing its shape and circulating
- (c) decreasing in total amount
- (d) remaining stationary underground

10. In the food chain consisting of Grass → Grasshopper → Frog → Snake, if the frog population completely disappears, the expected result is that

- (a) the number of snakes will increase
- (b) the grasshoppers will also disappear
- (c) the number of grasshoppers will increase
- (d) the grass will grow faster

11. If plants were to completely disappear from the ecosystem, the atmosphere would experience

- (a) an increase in oxygen and a decrease in carbon dioxide
- (b) a decrease in oxygen and an increase in carbon dioxide
- (c) a complete loss of water vapor
- (d) an increase in both oxygen and carbon dioxide

2 Put (✓) for correct statements or (X) for false statements:

1. The food chain always starts with a large, strong carnivore. ()
2. Animals use the oxygen released by plants to breathe. ()
3. Transpiration is the process where plants release water absorbed from their roots into the air. ()
4. In a food chain consisting of grass, a grasshopper, a frog, and a snake, the disappearance of frogs will cause the snake population to decrease. ()
5. Humans are classified as herbivores because they eat plants only. ()
6. The water on Earth is changing its shape and circulating. ()
7. The arrow (→) in a food chain diagram points in the direction that energy is carried from one organism to another. ()
8. Plants use the oxygen breathed out by animals to perform photosynthesis and produce their nutrients. ()
9. Living organisms, air, and water are completely independent of each other and share no connection. ()
10. If plants completely disappeared from the Earth, the amount of carbon dioxide gas in the atmosphere would increase. ()

③ Correct the underlined words:

1. Plants use sunlight to produce nutrients through the transpiration process. (.....)
2. The "eat and be eaten" connection between living organisms is called a water cycle. (.....)
3. Animals that eat other animals are called herbivores. (.....)
4. Plants use oxygen breathed out by animals for photosynthesis. (.....)
5. Plants release water absorbed from their roots into the air in the form of rain. (.....)
6. Living organisms can get water from food to help them grow and survive. (.....)
7. Animals use the carbon dioxide released by plants to breathe. (.....)
8. The water on Earth is changing its shape and disappearing as it is used repeatedly by many living organisms. (.....)

④ Write the scientific term:

1. It is the "eat and be eaten" connection (feeding relationship) between living organisms in an ecosystem. (.....)
2. They are living organisms that use sunlight to produce nutrients inside their bodies. (.....)
3. They are animals that eat plants. (.....)
4. They are animals that eat other animals. (.....)
5. It is the process by which plants release water absorbed from their roots into the air. (.....)
6. It is a living organism that can eat both plants and animals, such as a human. (.....)
7. It is the state of water when it is released into the air by plants during the transpiration process. (.....)
8. It is the form in which water falls back to the ground after it has been released into the air by plants. (.....)

⑤ Complete the following sentences:

1. A food chain starts with and ends with large
2. The arrow in a food chain points to the direction of
3. Living organisms, air, and water are connected by bonds.
4. Plants release water into the air through transpiration, and it falls back to the ground as, sustaining the lives of animals and plants.
5. Animals that eat plants are called, while animals that eat other animals are called

6. In the food chain containing grass, a grasshopper, a frog, and a snake, if the frogs completely disappear, the number of grasshoppers will and the number of snakes will
7. Through the process of, plants release water absorbed from their roots into the air as
8. If plants completely disappear from the ecosystem, the amount of gas in the air will increase, while the amount of gas will decrease.

6 Cross out the Odd word, and mention the reason:

1. Cow – Grasshopper – Rabbit – Frog (.....)
Reason:
2. Grass – Wheat – Algae – Rabbit (.....)
Reason:
3. Eagle – Snake – Frog – Rabbit (.....)
Reason:

Essay Questions

7 What's meant by:

1. Food chain?
.....
2. Herbivores?
.....
3. Carnivores?
.....
4. Producer?
.....

8 Mention the importance of:

1. Sunlight for plants.
.....
2. Oxygen gas for animals.
.....
3. Carbon dioxide gas for plants.
.....
4. The arrow (→) in a food chain diagram.
.....
5. Plants (Producers) in an ecosystem.
.....

9 Compare between each of the following:

1. Herbivores and Carnivores. (In terms of: Type of food and Examples)
.....
2. The connection of living organisms through air.
(In terms of: What plants release/use vs. What animals release/use)
.....
3. Producers (Plants) and Omnivores.
(In terms of: How they obtain energy and Examples)
.....
4. Transpiration and Rain. (In terms of: The direction of water movement)
.....

10 Give a reason for:

1. Humans are considered omnivores.
.....
2. Plants are placed at the beginning of the food chain.
.....
3. Living organisms must obtain food.
.....
4. The water on Earth can be used without ending by many living organisms over time.
.....
5. The environment where animals can successfully breathe is maintained on Earth.
.....

11 What happens:

1. If frogs completely disappear from the food chain (Grass → Grasshopper → Frog → Snake)?
.....
2. If plants completely disappear from the ecosystem?
(In terms of the amount of oxygen and carbon dioxide gases in the air)
.....
3. If the transpiration process stops completely in an ecosystem?
.....
4. To the water on Earth over time as it interacts with living organisms and the environment?
.....
5. If living organisms consume food?
.....

12 Study the following figures, then answer the following questions:

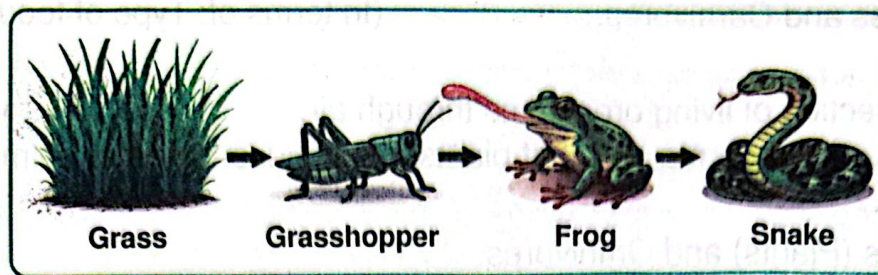


Figure A:

- (a) Identify the producer in this food chain.
.....
- (b) Which organism gets its energy directly by eating the grasshopper?
.....
- (c) What does the arrow represent?
.....

Figure B:

- (a) What is the gas does the green arrow represent?
.....
- (b) What is the gas does the red arrow represent?
.....

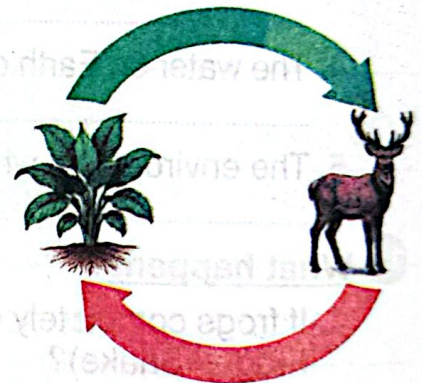


Figure C:

- (a) Name the process by which water is released from the plant's roots into the air as water vapor.
.....
- (b) How does the water return to the ground after it has been released into the air?
.....

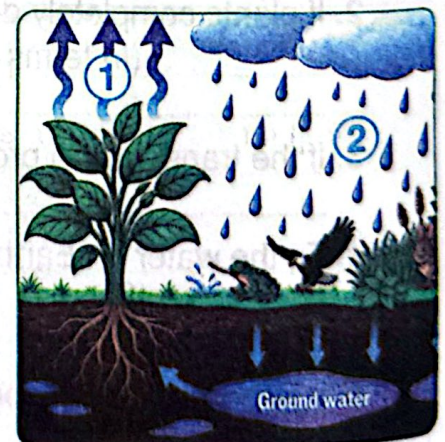


Figure D:



(a) Name the process represented by the arrow (1) and the water form produced from this process?

.....

(b) What essential gas is represented by the arrow (4)?

.....

(c) What gas is represented by the arrow (3)?

.....

(d) What is name of water from represented by the arrow (2)?

.....

(e) What process does the tree perform using the gas released by the rabbit?

.....

13 Form a food chain by arranging the following living organisms in the correct order:

1. [Frog / Grass / Snake / Grasshopper]

(.....) → (.....) → (.....) → (.....)

2. [Grasshopper / Wheat / Eagle / Frog]

(.....) → (.....) → (.....) → (.....)

3. [Earthworm / Bird / Leaf]

(.....) → (.....) → (.....)

4. [Lion / Tree / Giraffe]

(.....) → (.....) → (.....)

5. [Fox / Grass / Rabbit]

(.....) → (.....) → (.....)

6. [Carnivore / Producer / Herbivore]

(.....) → (.....) → (.....)

Second School Book Questions

1 Choose the correct answer:

1. What kind of living organisms that are found at the beginning of the food chain?
 - (a) Strong carnivores
 - (b) Herbivores like insects.
 - (c) Plants that produce nutrients using sunlight.
2. What do we call the process where plants release water absorbed from their roots into the air as water vapor?
 - (a) Evaporation
 - (b) Transpiration
 - (c) Breathing
3. Which statement correctly explains the food chain?
 - (a) Arrows are drawn from the one that eats to the one that is eaten.
 - (b) If carnivores disappear, plants will grow healthier.
 - (c) Plants use sunlight to produce nutrients inside their bodies.
4. Which statement correctly explains the relationship between living organisms and air?
 - (a) Both animals and plants only decrease oxygen and increase carbon dioxide.
 - (b) The environment where animals can breathe is maintained because plants release oxygen.
5. The water on Earth is changing its shape and, and it is used repeatedly by many living organisms.
 - (a) disappearing
 - (b) circulating
 - (c) increasing

2 Answer the following questions:

1. What do we call the feeding relationship between living organisms?
.....
2. Arrange the following living organisms in the correct order of the food chain and connect them with arrows.
(Grasshopper / Wheat / Eagle / Frog)
.....

Chapter 8 Food Chains in Egypt



Lessons of Chapter 8:

- Lesson 1: Desert and Nile Food Chains

Main Vocabulary

Page (151)

Aquatic environments	بيئة مائية	Arid environments	بيئة قاحلة	Algae	طحالب
Nile Tilapia	سمك البطلي النيلي	Nile crocodile	تمساح النيل	Shrubs	شجيرات
Jerboa	اليربوع	Fennec fox	ثعلب الفنك	Egyptian vulture	النسر المصري

Page (152)

Nile perch	سمك الفرخ النيلي	Horned viper	أفعى مقرنة	Seeds	بنور
------------	------------------	--------------	------------	-------	------

Page (153)

Food pyramid	هرم غذائي	Shrimp	جمبرى	Harsh	قاسية
Lizards	سحالي	Consumers	كائنات مستهلكة	Disrupted	تتعطل

Page (154)

Fossils	حفريات	Ancient	عتيق	Ocean	محيط
---------	--------	---------	------	-------	------

Lesson 1

Desert and Nile Food Chains

Egypt has completely different food chains such as in:

Aquatic environments
(Nile River)

Arid environments
(Deserts)

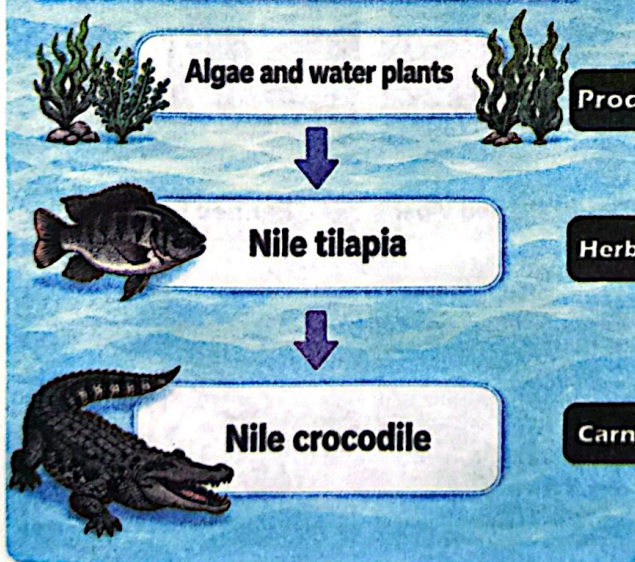


Nile crocodile is the king of Nile River.

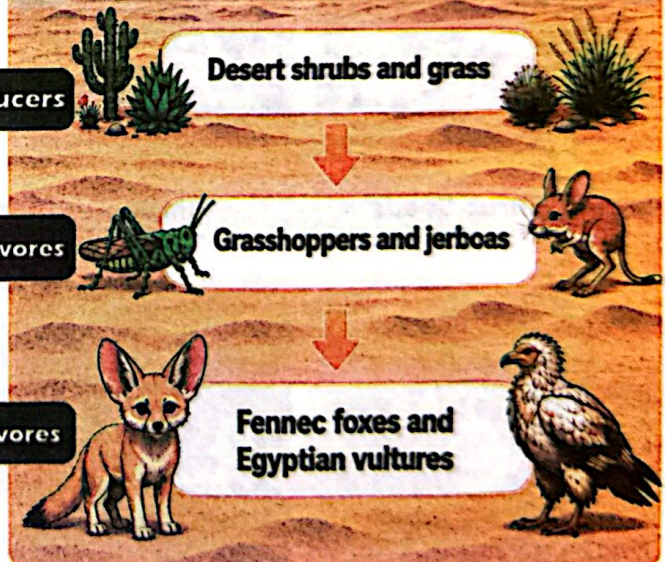
Egyptian vulture is the king of desert.



Food Chain in the Nile River



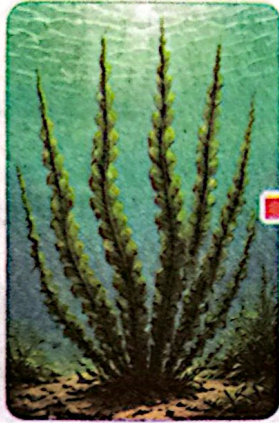
Food Chain in the Desert



Even if the types of animals are different, the chain always starts with **plants** and ends with **large carnivores**.

Let's Expand!

Let's look at the food chains in Egypt.



Algae



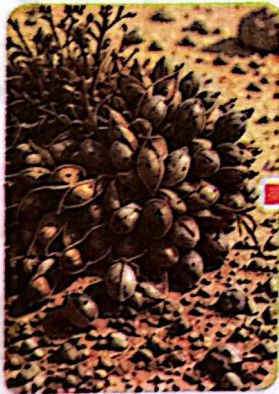
Nile Tilapia



Nile Perch



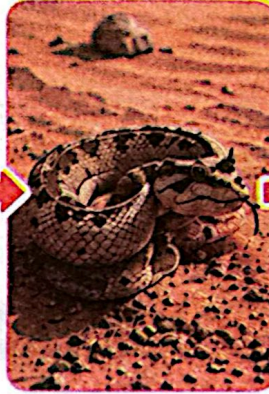
Nile Crocodile



Shrub Seeds



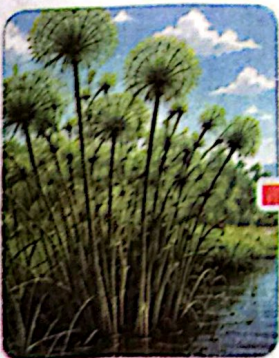
Jerboa



Desert Horned Viper



Fennec Fox



Papyrus



Grasshopper



Frog



Egyptian Vulture

Enrichment Activity

It Always Starts with Plants

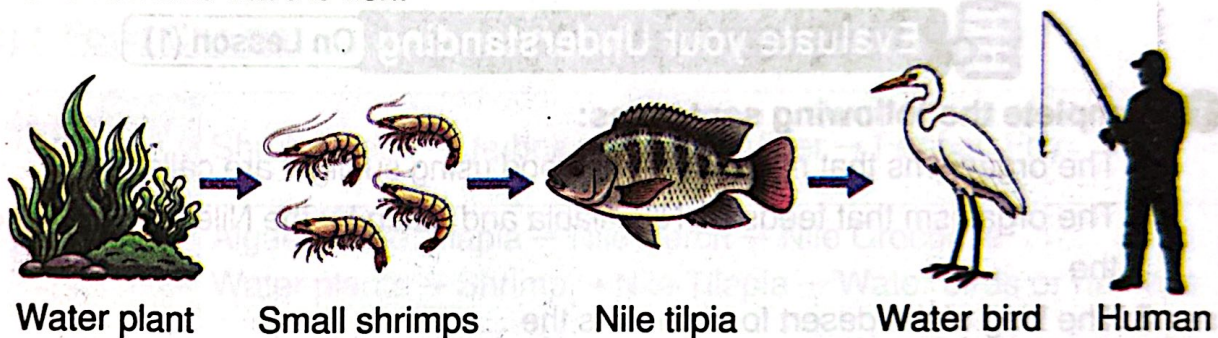
The Base of the Pyramid:

- The diagram of a food chain is called a food pyramid.
- The bottom of this pyramid is always supported by **plants (producers)**, which produce their own food from **sunlight**.



The Nile's Chain:

- In the Nile River, there is a beautiful circle of life where, small shrimp eat water plants, fish (like the Nile tilapia) eat the shrimp, and then water birds and humans eat the fish.



Surviving in the Harsh Desert

- The water flowing in Egypt is actually part of a "global cycle" that reaches all the way from countries far to the south.

The Desert Hunter Fennec Fox:

- In the desert where there are few plants, animals that eat the small amount of grass seeds or lizards sustain the food chain.
- Without consumers like the fennec fox, the balance of the desert ecosystem would be disrupted.



Memories of Wadi al-Hitan "Valley of the Whales"

It is a **desert** now, but it is filled with **fossils** from when it used to be an **ocean**.

By studying this place, we can see that tens of millions of years ago, the **ancient ocean** had a complete food chain just like the Nile does today.

From the past to the future, the connection of life remains **unbroken**.



Evaluate your Understanding On Lesson (1)

1 Complete the following sentences:

1. The organisms that make their own food using sunlight are called
2. The organism that feeds on Nile tilapia and eaten by the Nile crocodile is the
3. The king of the desert food chain is the
4. The remains of ancient living organisms preserved in rocks are called

2 Correct the underlined word:

1. If the fennec fox is known as the king of the Nile River. (.....)
2. Papyrus is a carnivore in the desert food chain. (.....)
3. The food pyramid always begins with large carnivores. (.....)

3 Cross out the Odd word:

1. Nile tilapia – Nile perch – Small shrimp – Egyptian vulture (.....)
2. Grasshopper – Frog – Water bird – Shrub seeds (.....)
3. Papyrus – Water plants – Shrub seeds – Sunlight (.....)



Egypt's Environments:

- Egypt has completely different food chains such as in:

P.O.C	Aquatic environments (Nile River)	Arid environments (Deserts)
Producers	Algae – water plants	Grass – Desert shrubs
Herbivores	Nile tilapia	Grasshopper – jerboa
Carnivores	Nile crocodile	Fennec fox – Egyptian vulture
King of environment	Nile crocodile	Egyptian vulture

Egypt's Food Chains:

Desert Food Chain	Shrub Seeds → Jerboa → Horned Viper → Fennec Fox
Nile River Food Chain	Algae → Nile Tilapia → Nile Perch → Nile Crocodile Water plants → Shrimp → Nile Tilapia → Water birds or humans

The Base of the Pyramid:

- The base (bottom) of this pyramid is always supported by **plants (producers)**.



Memories of Wadi al-Hitan “Valley of the Whales”:

- It is a **desert** now, but it is filled with **fossils** as it used to be an **ocean** tens of millions of years ago.
- The ancient ocean had a complete food chains just like the Nile does today.





First PONY Questions

Objective questions

1 Choose the correct answer:

1. A diagram representing the "eat and be eaten" relationship among living organisms is known as a
(a) fossil (b) food pyramid
(c) arid area (d) water plant
2. Which of the following is considered a producer that uses sunlight to make its own food in the desert food chain?
(a) Jerboa (b) Small shrimp
(c) Shrub seeds (d) Fennec fox
3. In the desert food chain, which organism feeds directly on the jerboa?
(a) Frog (b) Nile perch
(c) Nile crocodile (d) Desert Horned Viper
4. The fossils discovered in Wadi al-Hitan indicate that tens of millions of years ago, the area was
(a) a dense forest (b) a dry desert
(c) an ancient ocean (d) the Nile River
5. The type of environment that features a food chain including algae, water plants, and the Nile crocodile is known as
(a) an arid area (b) a dense forest
(c) an aquatic environment (d) a rocky mountain
6. Based on the food chains of Egypt, which statement is correct?
(a) Crocodiles eat algae directly in the Nile River.
(b) Fennec foxes eat small animals like jerboas in the desert.
(c) Frogs produce their own food using sunlight.
(d) Small shrimp prey on Nile tilapia.

7.  The organisms that support the base of the food pyramid are

- (a) carnivores (b) herbivorous fish
(c) small shrimp (d) plants

8. Which of the following chains correctly represents a desert environment?

- (a) Algae → Nile Tilapia → Nile Perch
(b) Grass → little water → small shrimp
(c) Shrub Seeds → Jerboa → Desert Horned Viper
(d) Papyrus → Nile Crocodile → Egyptian Vulture

② Put (✓) for correct statements or (X) for false statements:

1.  The connection of life remains unbroken from the past to the future, as seen by the fossils in Wadi al-Hitan. ()
2.  The top of the food pyramid is always supported by plants (producers). ()
3. Egypt has completely similar food chains in aquatic environments (the Nile River) and arid areas (deserts). ()
4. In the Nile River food chain, small shrimp eat water plants, and then fish like the Nile tilapia eat the shrimp. ()
5.  Wadi al-Hitan, is a desert now but used to be an ocean tens of millions of years ago. ()
6. Fennec foxes eat small animals like jerboas directly. ()
7.  In the Nile River food pyramid, water birds and humans are considered at the apex (top) of food pyramid. ()

③ Correct the underlined words:

1. The fennec fox is known as the king of the Nile River. (.....)
2. The food pyramid always begins with large carnivores. (.....)
3. Papyrus is a carnivore in the desert food chain. (.....)
4.  Wadi al-Hitan is filled with plants from when it used to be an ocean. (.....)
5. Egypt has completely similar food chains in aquatic environments and arid areas. (.....)
6. Without producers like the fennec fox, the balance of the desert ecosystem would be disrupted. (.....)
7.  By studying Wadi al-Hitan, we can see that tens of millions of years ago, the area was an ancient forest. (.....)

4 Write the scientific term:

1.  It is the diagram of a food chain where living organisms are connected by an "eat and be eaten" relationship. (.....)
2.  They are organisms at the base of the food pyramid that produce their own food from sunlight. (.....)
3.  They are the remains of ancient living organisms preserved in rocks. (.....)
4.  It is a place in Egypt that is currently a desert but contains fossils proving it had a complete ocean food chain tens of millions of years ago. (.....)

5 Complete the following sentences:

1. The organisms that make their own food using sunlight are called
2. The predator that feeds on Nile tilapia and is eaten by the Nile crocodile is the
3. The king of the desert food chain is the
4.  The remains of ancient living organisms preserved in rocks are called
5. In the aquatic food chain, algae and water plants are eaten by herbivorous fish like the
6. The organisms that make their own food using sunlight are called

6 Cross out the Odd word, and mention the reason:

1. Nile tilapia — Nile perch — Small shrimp — Egyptian vulture (.....)
The reason:
2. Papyrus — Water plants — Shrub seeds — Sunlight (.....)
The reason:
3. Fennec Fox — Desert Horned Viper — Jerboa — Algae (.....)
The reason:
4. Papyrus — Water plants — Algae — Jerboa (.....)
The reason:

Essay Questions

7 What's meant by:

1.  Food pyramid?
.....

2. Producers?
.....

8 Mention the importance of:

1. 💡 Sunlight for the food pyramid.

.....

2. 💡 Studying Wadi al-Hitan.

.....

3. Plants (producers) in an environment.

.....

9 Compare between each of the following:

- The food chain in the Nile River and the food chain in the desert by giving one example of a producer and one example of a top carnivore for each environment.
-
-

10 Give a reason for:

1. 💡 The bottom of the food pyramid is always supported by plants.

.....

2. 💡 We know that the desert of Wadi al-Hitan used to be an ocean with a complete food chain.

.....

3. 💡 The fennec fox is considered essential to the desert environment.

.....

11 What happens to:

1. The carnivores if all the plants (producers) in the desert die out?

.....

2. The Nile tilapia if all the small shrimp disappear from the Nile River?

.....

3. 💡 The bottom of the food pyramid when there is no sunlight available?

.....

12 Study the "Food Pyramid" figure, then answer the following questions:

- a  Identify the source of energy that the organisms at the bottom of the pyramid use to make their own food.
- b  What specific group of living organisms occupies this bottom level to support the entire pyramid?



13 Study the "Food Pyramid" figure, then answer the following questions:

1. Study Food Chain A:

Algae → Nile Tilapia → (X) → Nile Crocodile: Identify organism (X)

2. Study Food Chain B:

(Y) → Grasshopper → Frog → Egyptian Vulture: Identify organism (Y)

3. Study Food Chain C:

Shrub Seeds → Jerboa → Desert Horned Viper → Fennec Fox: Based on this figure,
Which organism represents the base of the pyramid (producer)?

Second School Book Questions

1 Choose the correct answer:

- Which statement correctly explains the food chains in Egypt?
- a In the Nile River, crocodiles eat algae directly.
- b In the desert, fennec foxes eat small animals like jerboas.

2 Answer the following questions:

1. Give one example of a carnivore at the top of the food chain in the Nile River.
2. If all the plants in the desert died out, what do you think would happen to the carnivores? Write your own thoughts.
3. Give one example of a herbivore that eats plants in the desert food chain.

Chapter 9

Properties of Solutions

**Lessons of Chapter 9:**

- Lesson 1: Grouping Solutions Grouping Solutions
- Lesson 2: What Is Dissolved in Solutions

Main Vocabulary

Page 163

Salt	ملح	Solution	محلول	Saltwater	مياه مالحة
------	-----	----------	-------	-----------	------------

Page 164

Litmus paper	ورقة دوار الشمس	Vinegar	خل	Hydrochloric acid	حمض الهيدروكلوريك
Distilled water	ماء مقطر	Soap	صابون	Ammonia solution	محلول الأمونيا

Page 165

Filter paper	ورقة ترشيح	Glass rod	ساق زجاجية		
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Page 166

Rinse	يفسل	Wipe	يمسح	Ventilate	تهوية
Acidic	حمضي	Neutral	متعادل	Alkaline	قاعدي

Page 167

Evaporating	تبخير	Baking soda	صودا الخبيز	Dissolved substances	مواد مذابة
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Page 168

Pipette	ماصة	Gas stove	موقد غاز		
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Page 169

Dish	طبق				
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Page 170

Wisdom	حكمة	Natron	ملح النظرون		
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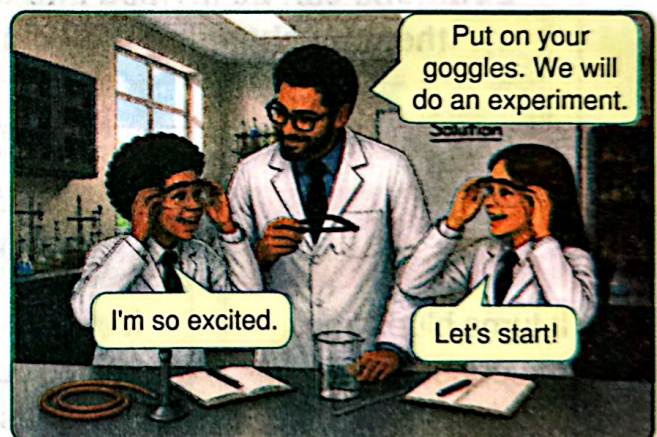
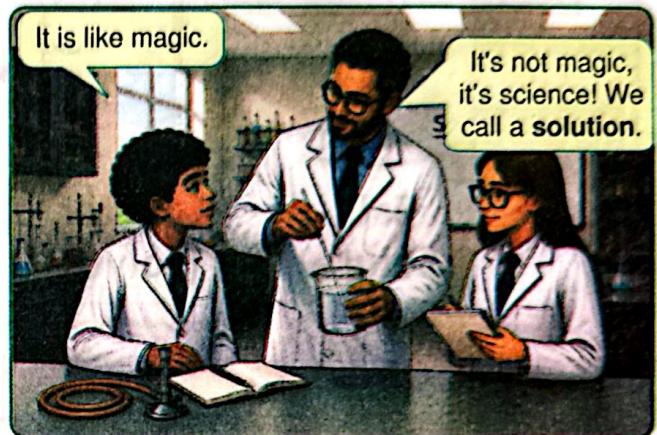
Page 171

Diagnosing	تشخيص	Current	حالي	Condition	حالة
Cotton	قطن	Wheat	قمح	Harvest	يحصد
Delicious crops	محاصيل لذيذة	Monitor	يراقب	Water Quality Management	التحكم بجودة المياه
Wastewater	مياه الصرف الصحي	Carefully	بحرص	Ensure	يتأكد

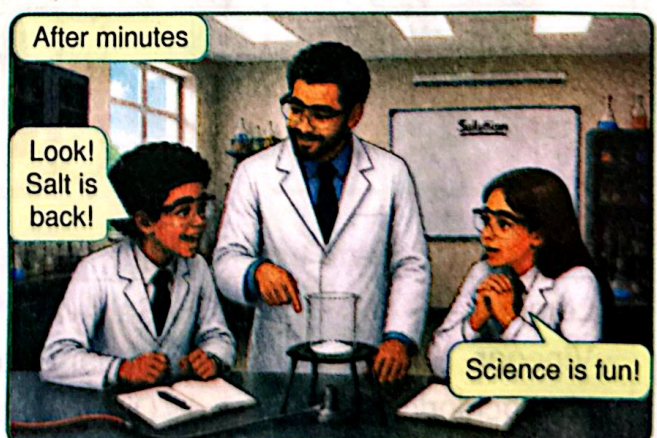
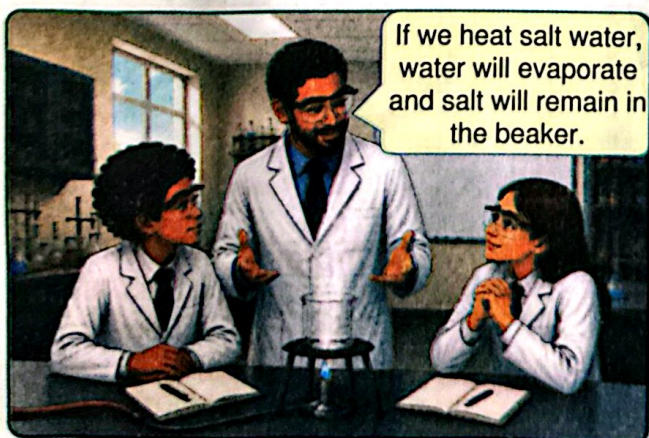
Lesson 1 Grouping Solutions

Warm up!

The teacher put a spoon of salt in water and starts to stir it.

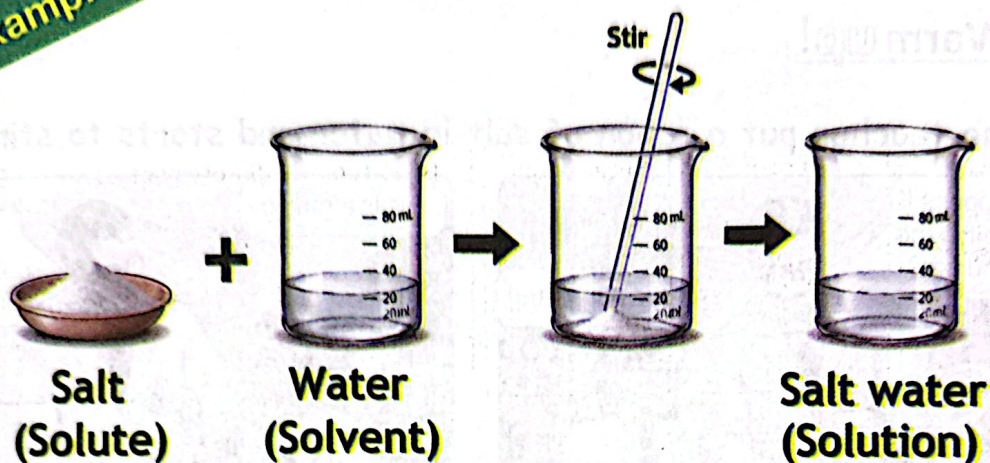


The teacher heats the solution on the flame.



When we mix a substance with water and it **disappears**, it forms a **solution**.

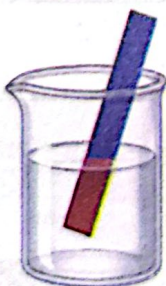
Example:



Solutions can be divided into three groups and we can identify them by changing the colour of litmus paper as follow:

Acidic solution

It turns blue litmus paper **red**.



Examples:

- Lemon juice
- Vinegar
- Hydrochloric acid

Neutral solution

It **does not change** the colour of either litmus paper.



Examples:

- Salt water
- Sugar water
- Distilled water

Alkaline solution

It turns red litmus paper **blue**.



Examples:

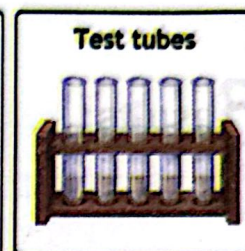
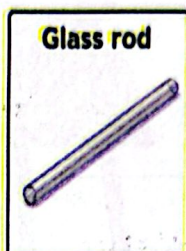
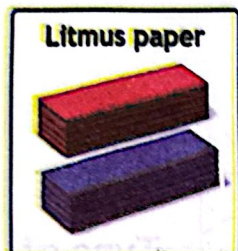
- Soapy water
- Limewater
- Ammonia solution



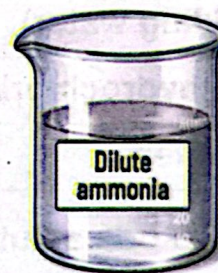
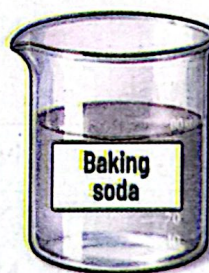
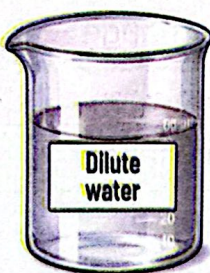
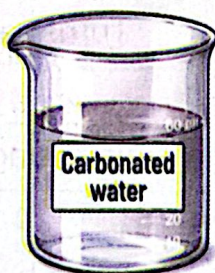
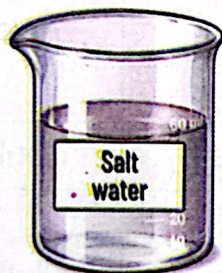
Experiment

Grouping Solutions Using Litmus Paper

Preparation:

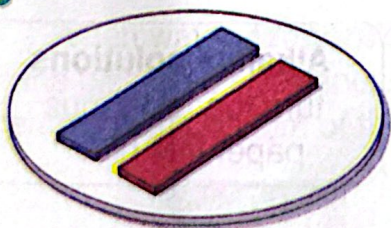


Solutions (in beakers)



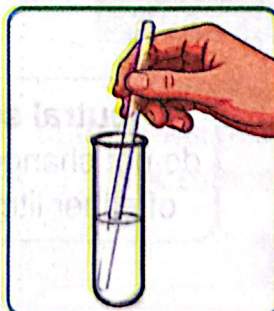
Steps:

1



Put blue and red strips of litmus paper on the filter paper.

2



Use a glass rod to add one drop of the solution you want to test onto both litmus strips.

3

Check the change in colour of the litmus strips in each solution.



- Wear **safety goggles**.
- When changing the solution, **rinse** the glass rod with water and **wipe** it off every time.
- Make sure to **ventilate** the room.

Results:

Solution	Effect on		Type of solution
	Red litmus paper	Blue litmus paper	
Carbonated water (sparkling water)	No change	Turns red	Acidic
Dilute hydrochloric acid			
Salt water	No change	No change	Neutral
Baking soda solution	No change	Turns blue	Alkaline
Dilute ammonia solution			

Observations:

Acidic solutions
turn the blue litmus paper into red.

Neutral solutions
do not change the colour of either litmus paper.

Alkaline solutions
turn the red litmus paper into blue.

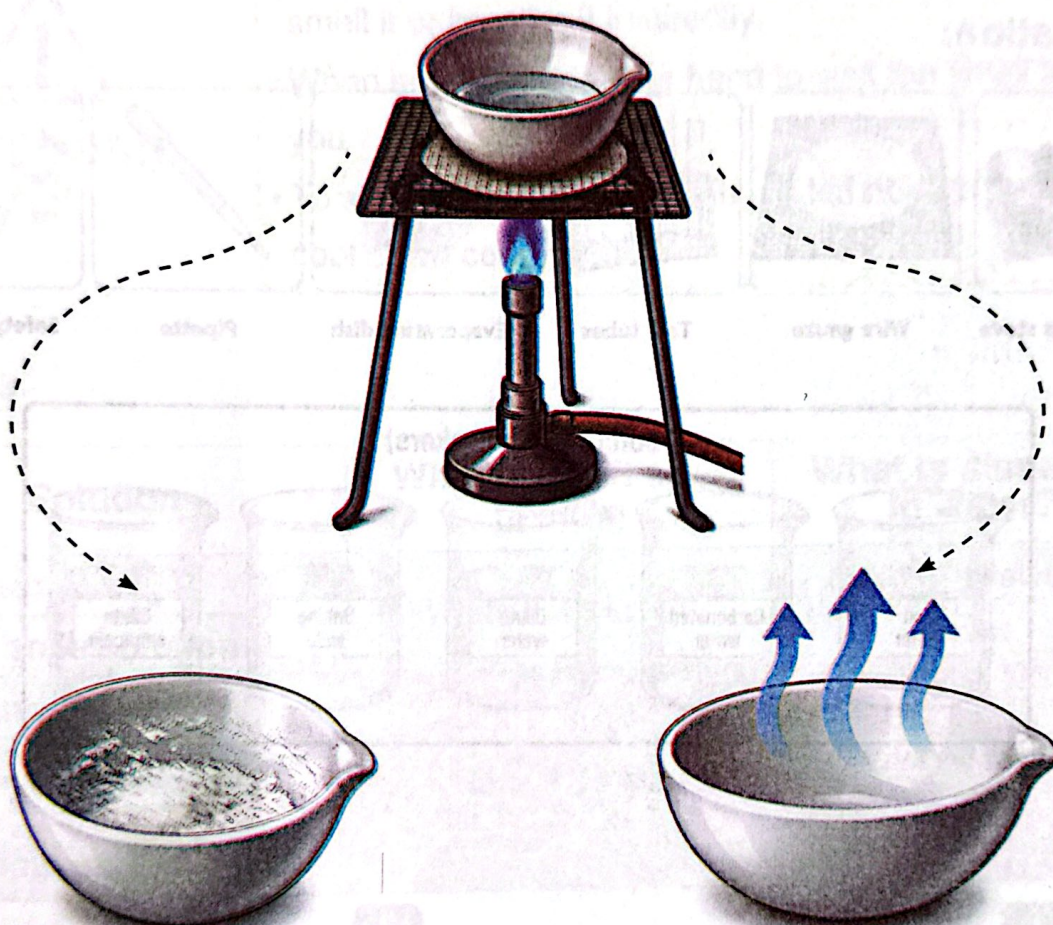
Conclusion:

- Litmus paper can be used to identify the type of solution is acidic, neutral, or alkaline by observing its colour change.

Lesson 2

What Is Dissolved in Solutions

By **evaporating** a solution, we can find out what was dissolved inside.



Solids dissolved in water:

When water **evaporates**, the dissolved substances will remain at the bottom of the dish.

Examples:

- Baking soda in water
- Salt in water

Gases dissolved in water:

When water **evaporates**, nothing will remain because the dissolved substance escapes into the air.

Examples:

- Sparkling water (Carbonated water)

It is carbon dioxide dissolved in water.

- Dilute hydrochloric acid
- Dilute ammonia solution



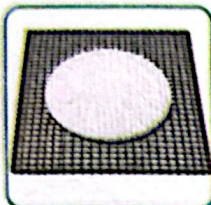
Experiment

Heating Solutions to Observe Dissolved Substances

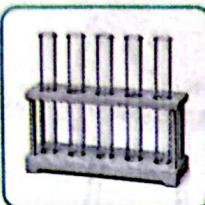
Preparation:



Portable gas stove



Wire gauze



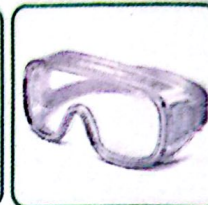
Test tubes



Evaporating dish

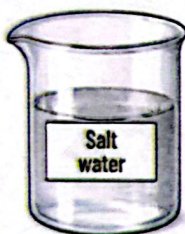


Pipette

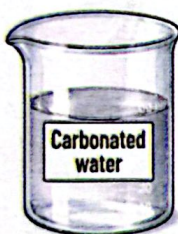


Safety goggles

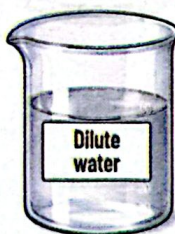
Solutions (in beakers)



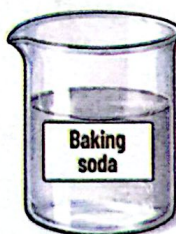
Salt water



Carbonated water



Dilute water



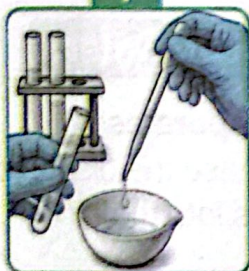
Baking soda



Dilute ammonia

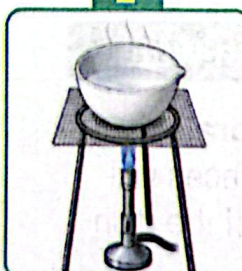
Steps:

1



Use a pipette to transfer the solution from the test tube to the evaporating dish.

2



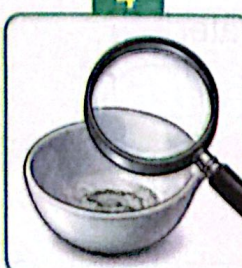
Heat it gently over low heat with a lab gas stove.

3



Turn off the heat while a little liquid is still left, and let the remaining heat dry it.

4



Observe the substances that will remain at the bottom of the dish.



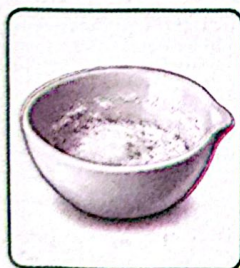
- Wear **safety goggles**.
- Do not bring your face close to the evaporating dish to smell it or breathe it in directly.
- When smelling, use your hand to waft the smell toward you.
- To avoid burns, do not touch heated objects until they cool down completely.

Results:

Solution	What was left after heating	What is dissolved in water?
Salt water	White solid is left.	Solids dissolved in water.
Baking soda solution		
Carbonated water	No solid is left.	Gases dissolved in water.
Dilute hydrochloric acid		
Dilute ammonia solution		

Observation:

- When the solutions are heated, the **water is evaporated** and then:



The dissolved solid substances will remain at the bottom of the dish.



The dissolved gases will escape into the air.

Conclusion:

- Heating helps us identify what is dissolved in a solution.

Enrichment Activity

The "Chemical Eye" That Sees Invisible Forces

Chemical Eye:

It is a scientific tool, like Litmus paper, used to see invisible properties of solution and check if a solution is neutral, acidic or alkaline.

- Water solutions may look clear, but they hide mysterious properties.
- Being acidic, neutral, or alkaline can only be told apart using **litmus paper**.
- The wisdom to control these properties has been used in Ancient Egypt.

Natural Alkaline Powder "Natron"

Its importance:

Ancient Egyptians used it in creating mummies that kept their shape for thousands of years.

Reason:

Because it had a powerful ability to absorb water from the body.

Its location:

It is found in desert salt lakes.

Its properties:

- A white powder
- Strongly alkaline



Natron



Acids and Alkalis in Our Daily Lives:

Even today, we use the power of these properties without realizing it, such as:

- Lemon juice (acidic) is used for cooking.
- Soapy water (alkaline) is used for cleaning.



Diagnosing the Earth and the Nile

- In modern Egypt, testing the properties of water solutions is an important diagnostic tool to understand the current condition of the land and the Nile River.
- The **color change** of **litmus paper** is a scientific language that helps us read important messages from nature to protect our beautiful environment.

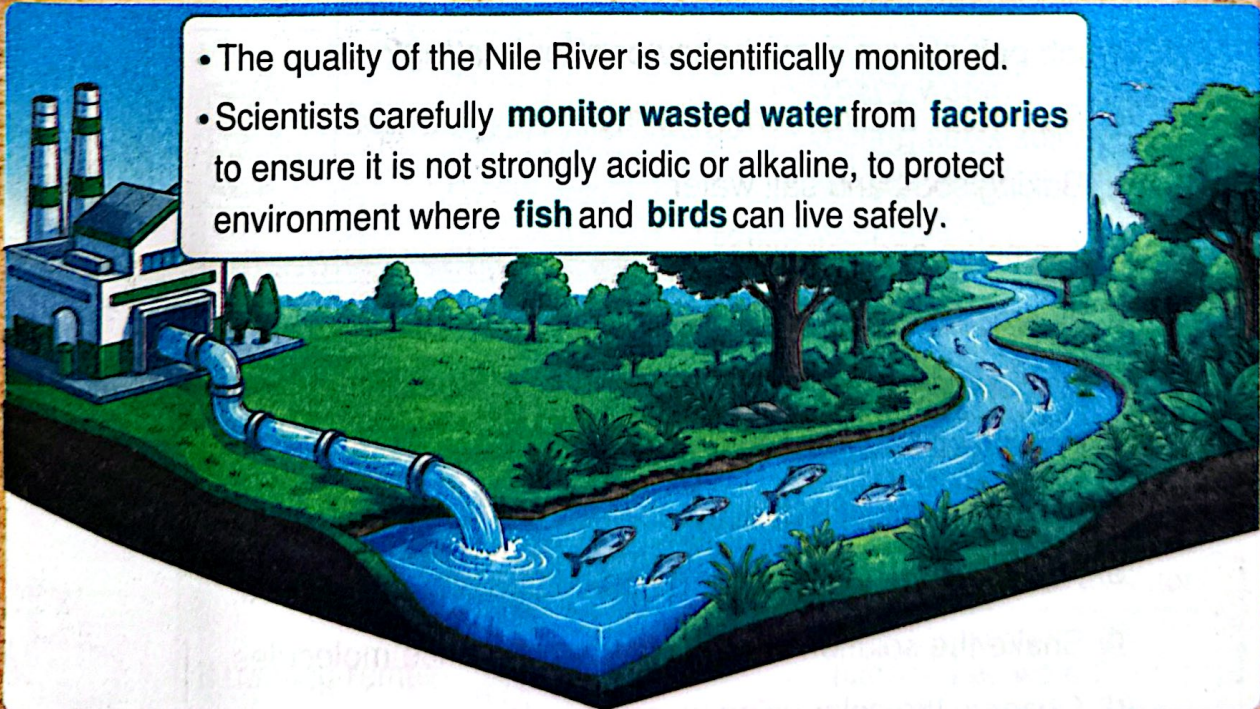
The Health of the Soil for Growing Crops:

- In the vast fields of Egypt, farmers are always checking whether the **soil** is **acidic** or **alkaline**.
- They adjust the soil to the **perfect condition** for the plants they grow, like **cotton** and **wheat**.
- They cleverly ensure a large harvest of delicious crops.



Water Quality Management of the Nile River:

- The quality of the Nile River is scientifically monitored.
- Scientists carefully **monitor wasted water** from **factories** to ensure it is not strongly acidic or alkaline, to protect environment where **fish** and **birds** can live safely.





Evaluate your Understanding On Lessons (1 and 2)

1 Complete the following sentences using the word bank:

solid

acidic

litmus

evaporates

neutral

1. paper is used to identify types of solutions.
2. When water is heated, it leaving dissolved substances behind.
3. A solution that does not change litmus color is
4. A solution that turns blue litmus red must be, even if it looks clear.

2 Correct the underlined word:

1. Ammonia solution is classified as an acidic solution. (.....)
2. Litmus paper identifies solutions based on temperature change. (.....)

3 Cross out the odd word:

1. Lemon juice – Vinegar – Hydrochloric acid – Salt water (.....)
2. Soapy water – Limewater – Ammonia solution – Vinegar (.....)

4 Choose the correct answer:

1. Which pair shows same behavior after heating?
 - (a) Salt water and carbonated water
 - (b) Baking soda and salt water
 - (c) Ammonia and salt water
 - (d) Hydrochloric acid and baking soda
2. A scientist wants to identify a dissolved substance in water. What is the best method?
 - (a) Smell the solution directly.
 - (b) Heat the solution and check if a substance is remained.
 - (c) Shake the solution to observe the substance molecules.
 - (d) Observe the color using magnifying lens.

Summary on Chapter 9

Properties of Solutions



Must Know
Before the
Exam

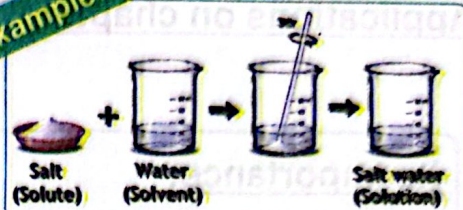
Formation of a Solution:

- Solution is a mixture formed when a substance dissolves (disappears) in water.

Types of solutions:

- Solutions can be divided into three groups which are **acidic**, **neutral**, and **alkaline** solutions.
- **Litmus paper** can be used to identify the type of solution is by observing its **colour change**.

Example:



Type	Figure	Effect on Litmus paper		Examples
		Red	Blue	
Acidic solution		No change	Turns red	• Lemon juice • Dilute hydrochloric acid • Carbonated (sparkling) water • Vinegar
Neutral solution		No change	No change	• Salt water • Sugar water • Distilled water
Alkaline solution		Turns blue	No change	• Soapy water • Baking soda solution • Ammonia solution • Limewater

How to identify dissolved substances in solutions:

- When the solution is heated, the water is evaporated and then:



If the dissolved substances remains

This means

Solid substance was dissolved in water.

Examples:

- Baking soda in water
- Salt in water



If nothing remain

This means

Gas substance was dissolved in water.

Example:

- Sparkling water (carbonated water)
- Dilute hydrochloric acid
- Dilute ammonia solution

- **Litmus paper** identifies the type of solution.
- **Heating** identifies the dissolved substance is a solid or a gas.

Applications on chapter:

1. Natron:

Its importance:

Ancient Egyptians used it in creating mummies that kept their shape for thousands of years.

Reason:

Because it had a powerful ability to absorb water from the body.

Its location:

It is found in desert salt lakes.

Its properties:

- A white powder
- Strongly alkaline



Natron

2. Acids and Alkalis in Our Daily Lives:

Lemon juice
(acidic substance)
is used for **cooking**.



Soapy water
(alkaline substance)
is used for **cleaning**.

3. The Health of the Soil for Growing Crops:

Farmers are always checking whether the **soil** is **acidic** or **alkaline** to adjust the soil to the **perfect condition** for the plants they grow in it, like **cotton** and **wheat**.



4. Water Quality Management of the Nile River:

- The quality of the Nile River is scientifically monitored.
- Scientists carefully monitor wastewater from factories to ensure it is not strongly acidic or alkaline, to protect environment where fish and birds can live safely.





First PONY Questions

Objective Questions

1 Choose the correct answer:

1. Heating salt water results in the evaporation of water, which leaves behind
(a) a strongly alkaline gas (b) nothing, as it escapes into the air
(c) salt at the bottom of the beaker (d) carbon dioxide
2. A solution that turns red litmus paper blue is classified as a/an solution.
(a) acidic (b) neutral (c) alkaline (d) gaseous
3. Select the substance that represents a gas dissolved in water.
(a) Salt (b) Baking soda
(c) Sparkling water (d) Natron
4. Farmers check whether the soil is acidic or alkaline to ensure the perfect conditions for growing crops like
(a) rice and corn (b) cotton and wheat
(c) lemons and tomatoes (d) apples and oranges
5. To smell a chemical safely during an experiment, the correct technique is to
(a) bring your face close to the dish to smell it directly
(b) heat the dish and inhale the fumes deeply
(c) use your hand to waft the smell toward you
(d) dip blue litmus paper into the solution first
6. Which of the following solutions does not change the color of either red or blue litmus paper?
(a) Lemon juice (b) Distilled water (c) Soapy water (d) Vinegar
7. Ancient Egyptians used a strong alkaline substance called natron in order to
(a) grow cotton in desert salt lakes
(b) clean their clothes with alkaline water
(c) create mummies that kept their shape
(d) monitor the quality of the Nile River

8.  To clean greasy dishes in the kitchen, the best solution to use based on its properties is
 (a) lemon juice (b) salt water (c) soapy water (d) vinegar
9. Identify the group of solutions that includes salt water, sugar water, and distilled water.
 (a) Acidic solutions (b) Neutral solutions
 (c) Alkaline solutions (d) Carbonated solutions
10. The appropriate tool used to place exactly one drop of a solution onto a litmus paper strip during an experiment is a
 (a) pair of tweezers (b) magnifying lens
 (c) glass rod (d) test tube rack
11. If an unknown clear liquid turns a piece of red litmus paper blue, which of the following substances could that liquid be?
 (a) Ammonia solution (b) Hydrochloric acid
 (c) Distilled water (d) Carbonated water
12. In the laboratory setup for evaporating a solution, the piece of equipment placed directly under the evaporating dish to support it over the gas stove is a
 (a) wire gauze (b) test tube rack (c) pair of tweezers (d) glass rod

2 Put (✓) for correct statements or (X) for false statements:

1. Neutral solutions turn blue litmus paper red. ()
2. When a solution of dilute ammonia is heated until the water evaporates, a solid powder remains at the bottom of the dish. ()
3.  Natron is a white powder found in desert salt lakes and is strongly alkaline. ()
4.  Scientists monitor the wastewater from factories to ensure it is strongly acidic before it enters the Nile River. ()
5. When testing multiple solutions, you must rinse the glass rod with water and wipe it off every time you change the solution. ()
6. Limewater and soapy water are examples of alkaline solutions. ()
7. Carbonated water and dilute hydrochloric acid will both turn a blue strip of litmus paper red. ()
8. If a solution changes the color of red litmus paper to blue, it is classified as an acidic solution. ()
9. Sugar water and distilled water are examples of solutions that will not change the color of either red or blue litmus paper. ()

3 Correct the underlined words:

1. When we mix a substance with water and it disappears, it forms a gas.
(.....)
2. Baking soda dissolved in water is an example of a gas dissolved in water.
(.....)
3. Acidic solutions turn the blue litmus paper into blue.
(.....)
4. 💡 Ancient Egyptians used vinegar in creating mummies because of its powerful ability to absorb water.
(.....)
5. If you heat dilute hydrochloric acid, a white solid remains in the evaporating dish.
(.....)
6. A solution that does not change the color of either blue or red litmus paper is classified as acidic.
(.....)
7. If an unknown clear liquid turns red litmus paper blue, the liquid could be a solution of distilled water.
(.....)
8. 💡 Ancient Egyptians discovered the strongly alkaline powder known as natron in the muddy banks of the Nile River.
(.....)

4 Write the scientific term:

1. It is a type of solution that does not change the color of either blue or red litmus paper.
(.....)
2. 💡 It is a strongly alkaline white powder used by Ancient Egyptians to absorb water from the body.
(.....)
3. It is the process used to identify if a dissolved substance in a solution is a solid or a gas by heating the liquid.
(.....)
4. It is a tool consisting of colored paper strips used to identify whether a solution is acidic, neutral, or alkaline.
(.....)
5. It is a classification of solutions, such as vinegar and dilute hydrochloric acid, that turns blue litmus paper into red.
(.....)
6. It is the specific tool used to transfer exactly one drop of a test solution onto litmus paper strips.
(.....)
7. 💡 It is the specific discharge from factories that scientists carefully monitor to ensure it is not strongly acidic or alkaline to protect the Nile River.
(.....)
8. It is a classification of solutions, such as limewater or ammonia solution, that changes the color of red litmus paper to blue.
(.....)

5 Complete the following sentences:

1. Solutions can be divided into three groups based on their effect on litmus paper, which are neutral, acidic and
2. During an experiment, you should always wear safety to protect your eyes.
3. When water evaporates from a salt water solution, the dissolved substances will remain at the bottom of the dish.
4. 💡 In modern Egypt, testing the properties of water solutions helps scientists monitor from factories to protect fish and birds in the Nile River.
5. Sparkling water, also known as carbonated water, contains gas dissolved in water.
6. Because soapy water is an alkaline solution, it will change the color of litmus paper into blue.
7. 💡 If a farmer wants to ensure a large harvest of healthy cotton and wheat, they must test the soil to check whether it is acidic or
8. 💡 To protect the Nile River's ecosystem so fish and birds can live safely, scientists strictly monitor factory to ensure it is not strongly acidic or alkaline.
9. After heating dilute hydrochloric acid, the evaporating dish is left completely empty because the dissolved substance was a
10. 💡 Ancient Egyptians relied on natron to make mummies because this strongly alkaline powder had a powerful ability to absorb from the body.
11. In the laboratory, the specific tool used to transfer a solution from a test tube into the evaporating dish is called a

6 Cross out the Odd word, and mention the reason:

1. Lemon juice – Vinegar – Hydrochloric acid – Sugar water (.....)
Reason:
2. Baking soda in water – Salt in water – Sparkling water (.....)
Reason:
3. Soapy water – Limewater – Ammonia solution – Vinegar (.....)
Reason:
4. Carbonated water – Dilute hydrochloric acid – Dilute ammonia solution – Baking soda solution (.....)
Reason:
5. Salt water – Sugar water – Distilled water – Dilute hydrochloric acid (.....)
Reason:
6. Beaker – Test tube – Evaporating dish – Natron (.....)
Reason:

Essay Questions

7 What's meant by:

1. A neutral solution?

.....

2. An acidic solution?

.....

3. An alkaline solution?

.....

4. 💡 Natron?

.....

5. Carbonated water (sparkling water)?

.....

8 Mention the importance of:

1. Litmus paper in the laboratory.

.....

2. 💡 Natron for Ancient Egyptians.

.....

3. Evaporating (heating) a solution.

.....

4. 💡 Farmers checking whether the soil is acidic or alkaline.

.....

5. 💡 Scientists monitoring wastewater from factories.

.....

6. Lemon juice in our daily lives,

.....

7. Soapy water in our daily lives.

.....

8. A glass rod during the litmus paper experiment.

.....

9 Compare between each of the following:

1. Acidic solutions and Alkaline solutions.
(In terms of their effect on litmus paper, and provide one example of each)
.....
2. Heating salt water and Heating carbonated water.
(In terms of what remains in the evaporating dish)
.....
3. Dilute hydrochloric acid and Baking soda solution.
(In terms of their effect on litmus paper and what remains in the dish after heating)
.....
4.  Lemon juice and Soapy water.
(In terms of their solution classification (type of solution) and their everyday uses)
.....

10 Give a reason for:

1.  Ancient Egyptians used natron in creating mummies.
.....
2. Nothing is left in the evaporating dish after heating carbonated water.
.....
3.  Scientists carefully monitor wastewater coming from factories.
.....
4. Dilute hydrochloric acid and lemon juice change the color of blue litmus paper to red.
.....
5. Distilled water and sugar water do not change the color of either red or blue litmus paper.
.....
6.  Farmers in the vast fields of Egypt continuously check whether their soil is acidic or alkaline.
.....

11 What happens if:

1. You put a piece of blue litmus paper in dilute hydrochloric acid?
.....
2. You mix a spoon of salt in water and stir it?
.....
3. You heat a baking soda solution until all the water evaporates?
.....

4. You place a drop of distilled water onto both a red and a blue strip of litmus paper?
.....
5. 💡 Ancient Egyptians applied natron to bodies during the mummification process?
.....
6. You heat a solution of dilute ammonia over a gas stove until all the water evaporates?
.....

12 Study the "Food Pyramid" figure, then answer the following questions:

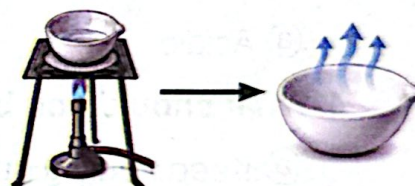
Figure A:

- a) Does this beaker contain an acidic, neutral, or alkaline solution?
.....
- b) Give one example of a solution from your material that causes this specific color change.
.....



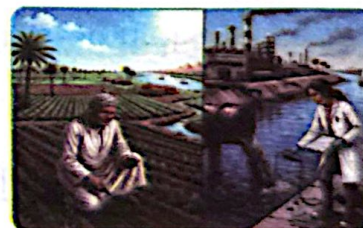
Figure B:

- a) What type of dissolved substance (solid or gas) was in this solution before it was heated?
.....
- b) Mention one example of a solution that behaves this way upon heating.
.....



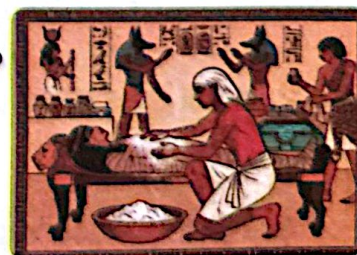
💡 Figure C:

- a) 💡 Why is the farmer on the left checking whether the soil is acidic or alkaline?
.....
- b) 💡 What specific liquid discharge is the scientist on the right monitoring, and why must they ensure it is not strongly acidic or alkaline?
.....



💡 Figure D:

- a) 💡 What is the scientific name of this natural white powder?
.....
- b) 💡 What powerful physical ability does this substance possess that makes it essential for creating mummies that keep their shape for thousands of years?
.....



Second School Book Questions

1 Choose the correct answer:

1. Which is the correct combination for the litmus paper reaction?
 - (a) An alkaline solution turns red litmus paper blue.
 - (b) An acidic solution turns red litmus paper blue.
 - (c) A neutral solution changes the color of both litmus papers.
2. Why is nothing left at the bottom of the dish when dilute hydrochloric acid was evaporated?
 - (a) Because nothing was dissolved in the dilute hydrochloric acid.
 - (b) Because what was dissolved escaped as a gas.
 - (c) Because it melted from the heat.
3. Soap water turned red litmus paper blue. What kind of solution is soapy water?
 - (a) Acidic
 - (b) Neutral
 - (c) Alkaline
4. What should you be careful of in the experiment to evaporate a solution?
 - (a) Keep heating on high heat until the bottom of the evaporating dish burns.
 - (b) When smelling, breathe it in directly near the evaporating dish.
 - (c) Turn off the heat when there is only a little solution.
5. Which of the following solutions leaves nothing behind when evaporated?
 - (a) Sugar water
 - (b) Dilute ammonia solution
 - (c) Salt water

2 Answer the following questions:

1. What are some neutral solutions? Answer with one example

.....

2. What type of solution turns blue litmus paper red?

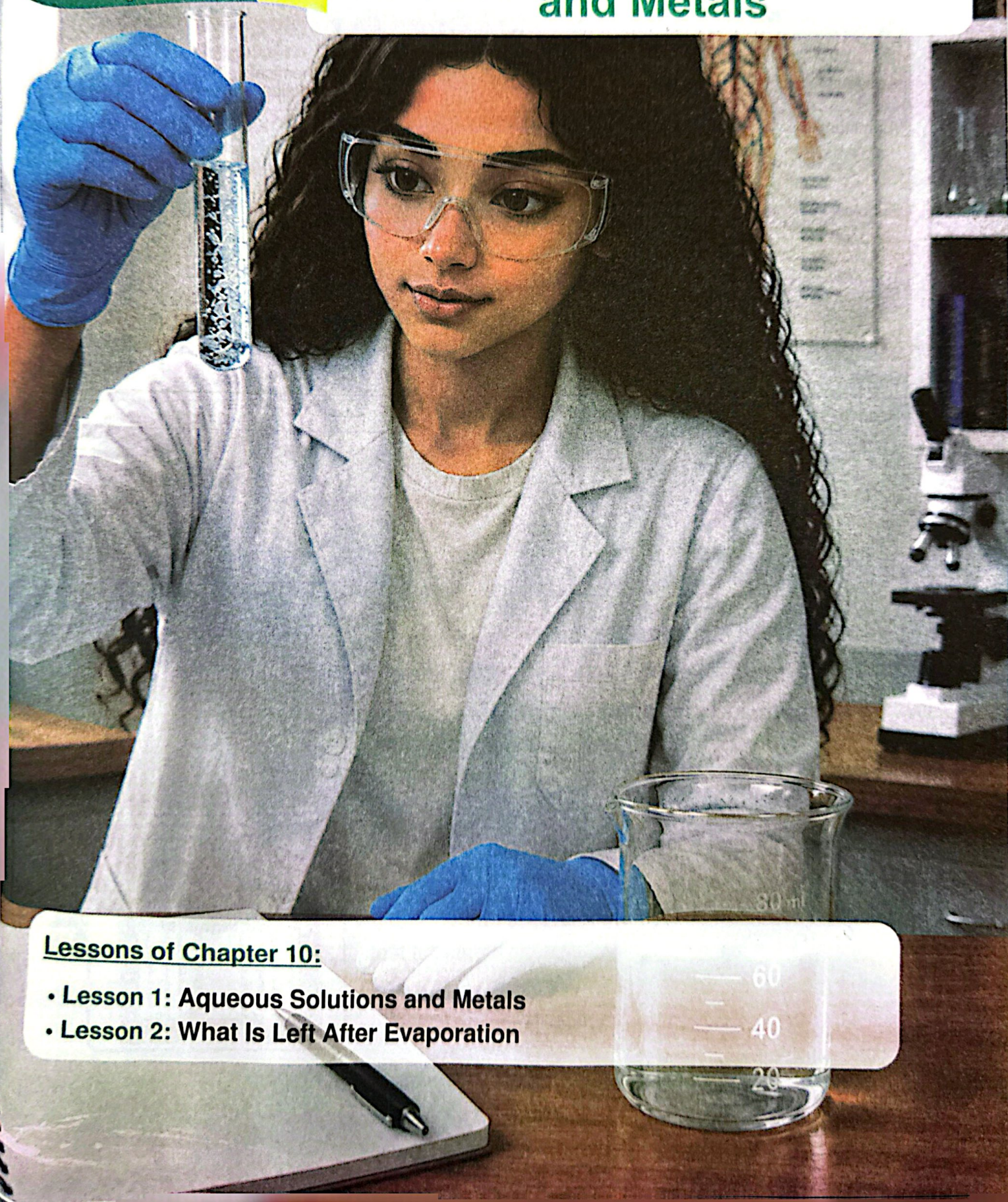
.....

3. What is dissolved in carbonated water?

.....

Chapter 10

Reaction Between Solutions and Metals



Lessons of Chapter 10:

- Lesson 1: Aqueous Solutions and Metals
- Lesson 2: What Is Left After Evaporation

Main Vocabulary

Page (185)

Aqueous Solutions	محلول مائي	Metals	معادن	Chemical reaction	تفاعل كيميائي
Aluminum	ألومنيوم	Iron	حديد		

Page (186)

Bubbles	فقاعات				
---------	--------	--	--	--	--

Page (188)

Shiny	لامع	Dry	جاف		
-------	------	-----	-----	--	--

Page (189)

Secret	سر	Shine	يلمع	Stable	مستقر
Reduce	يقلل	Trash	قمامة		

Lesson 1 Aqueous Solutions and Metals

In this chapter, we will explore how metals react with acids and learn how to identify the chemical reaction.

- Some aqueous solutions such as hydrochloric acid can dissolve metals such as aluminum and iron, while other aqueous solutions such as water can't.



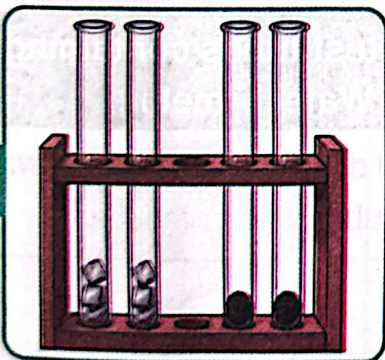
Experiment Testing Metal Reactions in Solutions

Preparation:

Dilute hydrochloric acid 	Beaker contains water 	Aluminum 	Iron (Steel wool) 
Test tubes 	Pipette 	Rag 	Safety goggles 

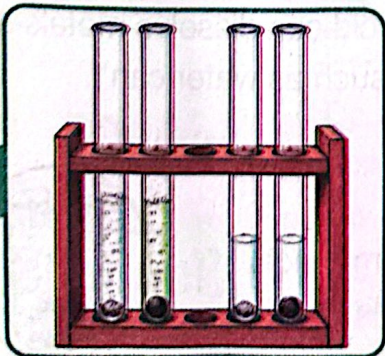
Steps:

1



- Cut aluminum into small pieces and put them in two test tubes.
- Tear off a small amount of steel wool, roll it into a ball, and put it in another two test tubes.

2



- Use a pipette to add dilute hydrochloric acid to all test tubes.



- Wear **safety goggles**.
- Be careful not to let the liquid touch your skin. If it does, wash it off right away with running water.
- Make sure to **ventilate** the room.

Results:

Aqueous solutions	Metal used	Observations	Reaction
Hydrochloric acid	Aluminum	• Many bubbles • Metal dissolve in acid quickly.	Strong reaction
Hydrochloric acid	Iron	• Few bubbles • Metal dissolve in acid slowly.	Weak reaction
Water	Aluminum	• No bubbles • No change in metal.	No reaction
Water	Iron	• No bubbles • No change in metal.	No reaction

Observations:

In the test tubes containing Dilute hydrochloric acid + metal:

- The metals **dissolve in acid**.
- **Bubbles** are produced.

In the test tubes containing Water + metal:

- The metal **does not dissolve in water**.
- **No gas bubbles** are produced.

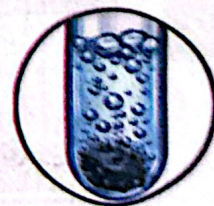
Conclusion:

- Some aqueous solutions such as dilute hydrochloric acid can dissolve metals such as aluminum and iron, while other aqueous solutions such as water can't.



Note:

The bubbles that are produced when iron or aluminum reacts with dilute hydrochloric acid are actually hydrogen gas.



Lesson 2 What Is Left After Evaporation

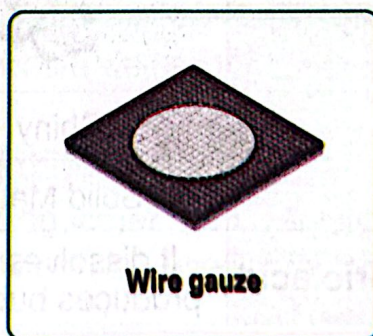
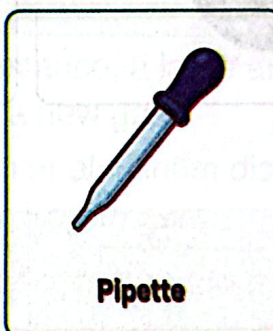
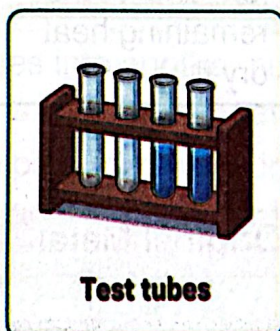
Evaporation of liquid of Metal dissolved in acid:

- When Aluminum reacts with dilute hydrochloric acid, it forms a new substance with completely different properties.
- When you **evaporate** the liquid of aluminum dissolved in dilute hydrochloric acid, a **white solid powder** is formed.
- The white solid powder doesn't react with acid.



Experiment What Is Left After Evaporation?

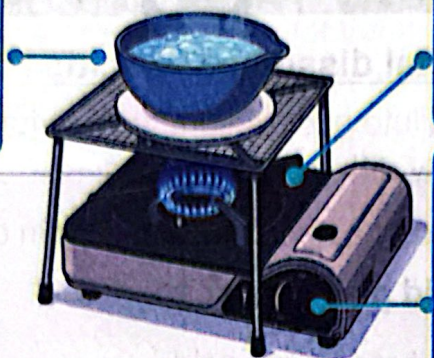
Preparation:



[Caution!]

- Do not touch heated items until they have cooled down completely.
- Do not touch the remaining solid directly with your hands.
- Do not bring your face close to the evaporating dish or breathe in the fumes.

1 Put the liquid with the dissolved metal into an evaporating dish.



2 Heat it gently on low heat with a lab gas burner.

3 Turn off the heat while there is still a little liquid left, and let the remaining heat dry it.

4 Observe what is left.



5 Turn off the heat while there is still a little liquid left, and let the remaining heat dry it.



Results:

P.O.C	Original Metal	Remaining solid
Figure		
Appearance	Shiny	Not shiny (Dull)
State	Solid Metal	Dry White powder
Reaction with hydrochloric acid	It dissolves and produces bubbles.	It doesn't dissolve.

Observation:

- When the liquid is heated, it **evaporates** and leaves a **white solid powder** that does not react with hydrochloric acid.

Conclusion:

- The original metal changed into a new substance with completely different properties by dissolving in the aqueous solution.

Enrichment Activity

The Science of Change-How Metals are Reborn

The Secret of Solutions and the Pharaoh's Wisdom

Why the Pharaoh Chose Gold:

Tutankhamun's golden mask is still beautiful today and continues to shine even after thousands of years.

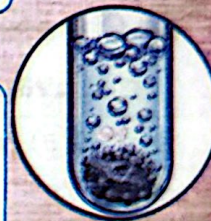
Reason:

Because gold has an extremely stable property as it does not react with or dissolve in strong solutions like hydrochloric acid.



The Energy Released When Metals Dissolve:

- When a metal changes into another substance, a large amount of **chemical energy** is at work to create a new gas.
- The bubbles that are produced when iron or aluminum dissolves in dilute hydrochloric acid are actually **hydrogen gas**.



The Power of Recycling to Reuse

- This ability to understand "invisible changes" is incredibly useful in modern factories and in the world of recycling, where we use the Earth's limited resources over and over again.

The Technology of Evaporating to Recover:

- The technology of **evaporating water** from a solution containing dissolved metal to extract the **solid** is used in factories to make very pure materials.



Egypt's Future and Recycling:

- Instead of throwing away **old metal** items, we can use the power of chemistry to turn them back into **clean materials**.
- The rules of change you have learned will be a great power to **reduce trash** and make **Egypt's future green and rich**.





Evaluate your Understanding On Lessons (1, 2)

1 Complete the following sentences:

1. Heating the solution causes the liquid to
2. The visible sign of reaction of aluminum with hydrochloric acid is the formation of
3. Aluminum reacts with aqueous solution such as

2 Correct the underlined word:

1. The bubbles formed when adding iron piece to dilute hydrochloric acid represent carbon dioxide gas. (.....)
2. When you evaporate the liquid of aluminum dissolved in dilute hydrochloric acid, a liquid metal is produced. (.....)

3 Choose the correct answer:

1. Evaporation process can remove from solution.
(a) metal (b) gas (c) liquid (d) solid
2. gas is produced when iron react with dilute hydrochloric acid.
(a) Oxygen (b) Carbon dioxide (c) Nitrogen (d) Hydrogen
3. A student observes that after evaporation, white solid forms which does not react again with hydrochloric acid. He suggests that:
(a) A physical change occurred. (b) The metal remained unchanged.
(c) A new substance was formed. (d) The acid became stronger.
4.  If gold were placed in hydrochloric acid under the same conditions, what would MOST likely happen?
(a) Formation of gas bubbles (b) No reaction occurs.
(c) Formation of white powder (d) Disappearance of gold
5. A student observes no bubbles when iron is placed in a solution. Which conclusion is MOST scientifically correct?
(a) Iron is not metal.
(b) The solution may not be an acid.
(c) The iron disappeared.
(d) Gas is not formed in any reaction.



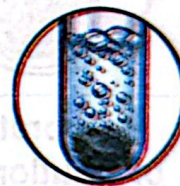
Reaction of metals with aqueous solution:

Test tube contains	Observation	Reaction	Conclusion
Dilute Hydrochloric acid + Aluminum	- Many bubbles are formed. - Metal dissolves in acid quickly.	Strong reaction	Acid reacts with metals.
Dilute Hydrochloric acid + Iron	- Few bubbles are formed. - Metal dissolves in acid slowly.	Weak reaction	
Water + Aluminum	- No bubbles are formed. - Metal doesn't dissolve in water.	No reaction	Water does not react with metals such as aluminum or iron.
Water + Iron			

The bubbles represent **hydrogen gas**.

Evaporation of liquid of metal dissolved in acid:

- When Aluminum reacts with dilute hydrochloric acid, it forms a new substance with completely different properties.
- When you **evaporate** the liquid of aluminum dissolved in dilute hydrochloric acid, a **white solid powder** is formed.
- The white solid powder doesn't react with acid.



P.O.C	Original Metal	Remaining solid
Figure		
Appearance	Shiny	Not shiny (Dull)
State	Solid Metal	Dry White powder
Dissolves in hydrochloric acid	It dissolves and produces bubbles.	It doesn't dissolve.

Applications on Chapter:

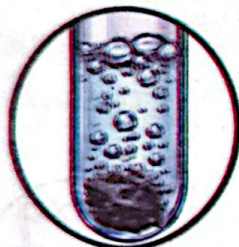
Tutankhamun's golden mask



Tutankhamun's golden mask continues to shine even after thousands of years.

Because it was made from gold that is stable metal and does not react with or dissolve in strong solutions like hydrochloric acid.

Releasing energy



When a metal changes into another substance, a large amount of chemical energy is released to create a new gas.

Evaporation of solutions in factories



Factories use evaporation to separate the solid from a solution and produce very pure materials.

Recycling Metals



- We can use chemistry to turn **old metal** items into **clean materials**.
- Recycling helps to **reduce trash** and **make Egypt's future green and rich**.



First PONY Questions

Objective Questions

1 Choose the correct answer:

1. Which of the following describes the reaction of iron with dilute hydrochloric acid?

- (a) Strong reaction with many bubbles
- (b) Weak reaction with few bubbles
- (c) No reaction occurs.
- (d) The metal turns into a liquid.

2. A scientist places gold in a strong solution like hydrochloric acid.

The expected observation is that the gold will

- (a) dissolve quickly in the acid
- (b) change into a white powder
- (c) not react with or dissolve in the solution
- (d) produce hydrogen gas bubbles

3. To safely perform the evaporation experiment, you must turn off the heat source when

- (a) all the liquid has completely evaporated
- (b) the white powder starts to turn brown
- (c) there is still a little liquid left
- (d) the metal regains its shiny appearance

4.  The technology of evaporating water from a solution containing dissolved metal is primarily used in factories to

- (a) produce strong acids for future experiments
- (b) make very pure materials
- (c) generate hydrogen gas for energy
- (d) clean aluminum and iron surfaces

5. A student accidentally spills dilute hydrochloric acid on their hands during an experiment. The immediate safety action required is to

- (a) wipe it with a rag
- (b) wash it off right away with running water
- (c) wait for it to evaporate naturally
- (d) apply a white solid powder to neutralize it

6.  Tutankhamun's golden mask maintains its beautiful shine over thousands of years due to a specific chemical characteristic. This indicates that gold

- (a) reacts rapidly with oxygen in the air
- (b) dissolves completely in water
- (c) has as an extremely stable property and does not react with strong solutions
- (d) transforms into a white solid powder over time

7. A student tests a solution by placing a rolled-up ball of steel wool in it, observing absolutely no bubbles and no change in the metal. The liquid in the test tube is most likely

- (a) dilute hydrochloric acid
- (b) an alkaline solution
- (c) water
- (d) an acidic solution

2 Put (✓) for correct statements or (X) for false statements:

- 1. Aluminum reacts with water to produce many hydrogen gas bubbles. ()
- 2. The solid remaining after evaporating the dissolved aluminum solution is shiny and reacts with hydrochloric acid. ()
- 3. When a metal changes into another substance, a large amount of chemical energy is at work to create a new gas. ()
- 4. If dilute hydrochloric acid touches your skin, you should wash it off right away with running water. ()
- 5.  Tutankhamun's mask shines because gold has extremely stable properties and does not dissolve in strong solutions. ()

6. Iron dissolves in dilute hydrochloric acid more slowly than aluminum and produces fewer bubbles. ()
7. The gas bubbles released during the reaction between aluminum and hydrochloric acid are carbon dioxide gas. ()
8. The solid remaining after evaporating the dissolved aluminum solution retains the shiny, metallic appearance of the original aluminum. ()
9. 💡 The technology of evaporating water from a solution containing dissolved metals is completely useless in modern factories. ()
10. 💡 According to the principles of recycling, old metal items can be turned back into clean materials through the power of chemistry. ()
11. 💡 Reusing the Earth's limited resources by extracting hidden parts from dissolved metals helps reduce trash and makes Egypt's future green and rich. ()

③ Correct the underlined words:

1. The bubbles formed when iron dissolves in dilute hydrochloric acid are oxygen gas. (.....)
2. When you evaporate the liquid of aluminum dissolved in dilute hydrochloric acid, a liquid metal is produced. (.....)
3. Iron dissolves in dilute hydrochloric acid quickly producing many bubbles. (.....)
4. During evaporation, you should turn off the heat when the liquid is completely dry. (.....)
5. 💡 When a metal changes into another substance during the reaction, a large amount of electrical energy is at work to create a new gas. (.....)
6. The solid substance that remains after evaporating the dissolved aluminum solution is very shiny in appearance. (.....)
7. 💡 Gold maintains its beautiful shine for thousands of years because it has an extremely reactive property. (.....)
8. 💡 Using the power of chemistry to turn old metal items back into clean materials is a process that helps to increase trash in the future. (.....)

4 Write the scientific term:

1. It is the gas produced as bubbles when aluminum or iron reacts with dilute hydrochloric acid. (.....)
2. It is the state of the new substance left after evaporating the liquid of aluminum dissolved in dilute hydrochloric acid. (.....)
3. 💡 It is a process used in factories to extract a solid from a solution containing dissolved metal to make very pure materials. (.....)
4. 💡 It is the type of energy that works to create a new gas when a metal reacts with an acid and changes into another substance. (.....)
5. It is the specific gas that is dissolved in carbonated water. (.....)
6. It is the type of reaction that occurs when aluminum is placed in dilute hydrochloric acid, characterized by the metal dissolving quickly and producing many bubbles. (.....)
7. It is the liquid that does not dissolve aluminum or iron (.....)
8. It is the safety equipment that must be worn on the face to protect the eyes from splashes and fumes during the chemical reaction experiment. (.....)

5 Complete the following sentences:

1. Some aqueous solutions such as can dissolve metals like aluminum, while cannot.
2. The original metal changed into a new substance with completely different by dissolving in the aqueous solution.
3. 💡 Instead of throwing away old metal items, we can use the power of to turn them back into clean materials.
4. When iron or aluminum dissolves in dilute hydrochloric acid, the bubbles that are produced are actually gas.

5. The reaction of aluminum with dilute hydrochloric acid is classified as a reaction because the metal dissolves quickly and produces many bubbles.
6. If dilute hydrochloric acid accidentally touches your skin during an experiment, safety rules require you to wash it off right away with
7. After evaporating the liquid of aluminum dissolved in acid, the original shiny metal is revealed to have transformed into a dull, dry powder.
8. 💡 When a metal reacts and changes into another substance, a large amount of energy is at work to create a new gas.
9. 💡 By using the power of chemistry to recover clean materials from old metal items, we can reduce trash and make Egypt's future and
10. To safely observe the reaction without injuring your eyes, you must wear during the experiment.

6 Cross out the Odd word, and mention the reason:

1. Aluminum - Iron – Gold (.....)

Reason:

2. Dilute hydrochloric acid - Water - Acidic solution (.....)

Reason:

3. Shiny - Dissolves in hydrochloric acid - Dry white powder (.....)

Reason:

4. Hydrogen gas - Bubbles - Carbon dioxide - Dissolving metal (.....)

Reason:

5. Shiny appearance - Produces bubbles in acid - White solid powder - Solid metal (.....)

Reason:

6. 💡 Acidic - Chemical energy - Alkaline – Neutral (.....)

Reason:

7. Wear safety goggles - Touch the remaining solid directly - Ventilate the room -

Wash skin with running water. (.....)

Reason:

Essay Questions

7 What's meant by:

1. 💡 The power of recycling to reuse?

.....

2. 💡 Stable property of gold?

.....

3. A "strong reaction" when a metal is placed in an aqueous solution?

.....

4. A "weak reaction" when a metal is placed in an aqueous solution?

.....

8 Mention the importance of:

1. Dilute hydrochloric acid in the reaction experiment.

.....

2. Turning off the heat while there is still a little liquid left during evaporation.

.....

3. 💡 The extremely stable property of gold in relation to historical artifacts like Tutankhamun's mask.

.....

4. 💡 Applying the power of chemistry to old, discarded metal items.

.....

5. Wearing safety goggles and ventilating the room when adding dilute hydrochloric acid to metals like aluminum or iron.

.....

6. 💡 The technology of evaporating water from a solution containing dissolved metals in modern factories.

.....

9 Compare between each of the following:

1. The reaction of Aluminum and Iron when placed in dilute hydrochloric acid.

.....

2. The original aluminum metal and the remaining solid after evaporation.

(Regarding their appearance and reaction with hydrochloric acid)

.....

3. Dilute hydrochloric acid and water.

(Regarding their effect when poured on pieces of aluminum)

.....

4. 💡 Gold and Aluminum.

(Regarding their stability and how they react when placed in a strong solution like hydrochloric acid)

.....

5. "Strong reaction" and a "Weak reaction".

(Based on the results of the experiment involving metals and dilute hydrochloric acid)

.....

10 Give a reason for:

1. 💡 Tutankhamun's golden mask is still beautiful today and continues to shine even after thousands of years.
.....
2. You must wear safety goggles and ventilate the room when dissolving metals in acid.
.....
3. Placing a piece of aluminum or steel wool (iron) into a test tube filled with plain water results in absolutely no bubbles and no change to the metal.
.....
4. Visible gas bubbles appear when metals like aluminum or iron are placed in an acidic aqueous solution.
.....
5. 💡 Modern factories utilize the technology of evaporating water from solutions that contain dissolved metals.
.....
6. 💡 Understanding "invisible changes" (where metals dissolve in liquids) is considered important for the future of recycling in Egypt.
.....

11 What happens:

1. If aluminum is placed in water instead of dilute hydrochloric acid?
.....
2. If the liquid of aluminum dissolved in dilute hydrochloric acid is gently heated in an evaporating dish until it dries?
.....

3. If you try to put the dry white powder (extracted after evaporation) back into dilute hydrochloric acid?

.....

4.  If gold is placed in a strong solution like hydrochloric acid?

.....

5. If dilute hydrochloric acid is added to a test tube containing small pieces of aluminum?

.....

6. If water is added to a test tube containing either aluminum or iron?

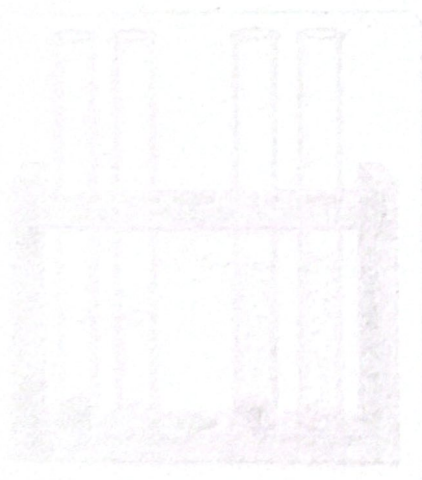
.....

7.  To discarded, old metal items when we apply the power of chemistry to recycle them?

.....

8. If the liquid of aluminum dissolved in dilute hydrochloric acid is gently heated in an evaporating dish until the liquid disappears?

.....



12 Study the following figures and then answer the following questions:

Figure A:

- (a) Identify the liquid inside the test tube that causes this reaction.

.....

- (b) What is the name of the gas forming the bubbles?

.....

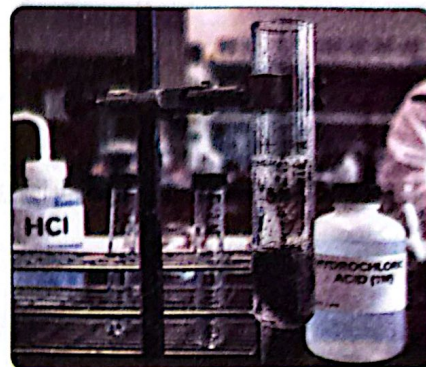


Figure B:

- (a) What safety precaution must be taken before the liquid completely disappears from the dish?

.....

- (b) What substance will be left in the dish once the process is complete?

.....



Figure C:

- (a) Identify the liquid added to the test tubes that are showing bubbles.

.....

- (b) Identify the liquid added to the test tubes showing no reaction.

.....

- (c) What is the name of the gas forming the bubbles?

.....

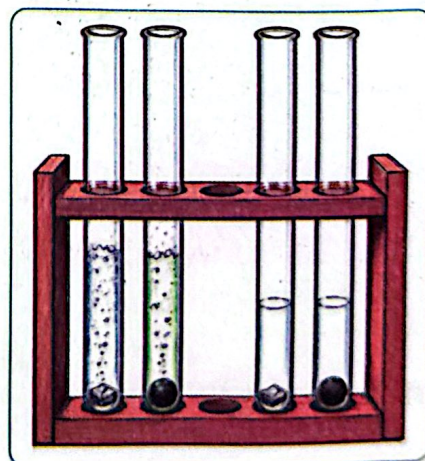


Figure D:

- a  What specific chemical property of gold allows Tutankhamun's mask to maintain its beautiful shine for thousands of years without dissolving?



- b  Why do modern factories apply the technology of evaporating water from solutions containing dissolved metals?

- c  How does understanding that a dissolved metal's "original parts are still hidden inside" help make Egypt's future green and rich?

Second School Book Questions

1 Choose the correct answer:

1. What do you think happened to the metal that dissolved in the aqueous solution?

- (a) It is just hiding and remains as a metal.
- (b) It reacted with the aqueous solution and changed into something with different properties.

2. Which statement is correct about the experiment after dissolving the metal?

- (a) When evaporated, the original shiny metal comes back.
- (b) The powder left after evaporation is a different substance from the metal.

3. Which statement correctly explains the properties of aqueous solutions that dissolve metals?

- (a) Hydrochloric acid dissolves iron, but does not dissolve aluminum.
- (b) Hydrochloric acid can dissolve aluminum and iron.

2 Answer the following questions:

1. What happens to metals like aluminum and iron when you pour dilute hydrochloric acid on them?

.....

2. Is the powder left after evaporating the dilute hydrochloric acid in which aluminum was dissolved the same as the original aluminum?

.....

3. When you pour dilute hydrochloric acid again on the powder that appeared after evaporation, are bubbles produced?

.....

NOTES

NOTES

PONY
سلسلة كتب الأستاذ
SCIENCE
Main Book

6th Primary
First Term
By Ahmed Omara



تابع كل جديد على صفحة
سلسلة كتب الأستاذ



تصدر هذه السلسلة تحت إشراف

سيف حمري مصطفى
أحمد حمري مصطفى



أحرص على اقتناء كتاب الأستاذ في:

– **MATH**

– الدراسات الاجتماعية.

– **ICT**

– اللغة العربية.

250
جنيهاً

يصرف معه مجاناً

Revision Book
& Model Answers