



Arab Republic of Egypt  
Ministry of Education &  
Technical Education  
Central Administration of  
Book Affairs

# Science & you

LEARN AND INNOVATE

Sixth Primary  
**6**



غير مصرح بتداول هذا الكتاب  
خارج وزارة التربية والتعليم والتعليم الفني

**Student's Book**  
**Second Term**

**2022 - 2023**

## **Prepared By**

**Mr. Mohamed Reda Ali Ibrahim**

**Dr. Mohamed Ahmed Abu Leila**

**Dr. Ahmed Reyadh El Sayed Hassan**

**Science Development office**

**Dr. Aziza Ragab Khalifa**

### **All rights reserved**

no part of this book may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without prior written permission of the Publishers.

Issued: 2010

D.N: 8934/2010

**ISBN: 978-977-706-002-8**



## Introduction

### Dear pupils:

We are pleased to present this book (**Science and you**) which represents one of the cornerstones of the developed curriculum in science for sixth primary grade. This book achieves the curriculum development process to face the challenges of the twenty first century whose beginning goes in line with a competitive revolution in information and communication technology.

This book aims to achieve the following trends:

- ⦿ Enlightening you with the relationship between science and technology in the science field and its impact on development.
- ⦿ Ensuring the suitable situations that indicate the influence of scientific and technological progress in producing knowledge.
- ⦿ Focusing on your practice of reasonable and effective behavior towards using technological outputs.
- ⦿ Ensuring your acquisition of the scientific thinking methodology which enables you to move away from education based on recitation and pouring information to education based on self-learning merged with fun and excitement.
- ⦿ Focusing on your dependence on exploration to reach information and acquire more experiences, through improving basic thinking skills: observation, analysis, deduction and justification.
- ⦿ Providing you with opportunities to practice the roles of citizenship through self-learning methods, team work, negotiation, persuasion, acceptance of the other opinion and avoidance of fanaticism.
- ⦿ Working on your acquisition of life skills and management applied practical abilities through giving more concern to the practical and applied aspects.
- ⦿ This book consists of four units. Each unit includes integrated lessons that achieve the desired objectives of each unit.

We ask God Almighty that you gain advantage of this book. We pray Him that this book will be one of the cornerstones to be added to the love and belonging to Egypt.

**Preparation Team**



# CONTENTS

Second Term

## Unit (1) (Force and Motion)

Lesson One	Types of levers .....	2
Lesson Two	Law of levers .....	12
Unit (1) test .....		20



## Unit (2) (Electric Energy)

Lesson One	The electric lamps .....	24
Lesson Two	Dangers of electricity and how to deal with it ..	34
Unit (2) test .....		44



## Unit (3) (The Universe)

Lesson One	The solar eclipse .....	48
Lesson Two	The lunar eclipse .....	55
Unit (3) test .....		62





## Unit (4)

### (Structure and Function of Living organisms)

Absorption and transmission  
of water and mineral  
salts in plants ..... 66

Unit (4) test..... 71



#### Safety in science

Scientists know that they must work safely when doing experiments. You need to be careful when doing experiments too. Here are some safety tips remember

##### Safety Tips

- ✓ Read each experiment and activity carefully.
- ✓ Wear safety goggles when needed.
- ✓ Clean up spills right away
- ✓ Never taste or smell chemical substances unless directed to do so by your teacher.
- ✓ Handle sharp items carefully.
- ✓ Tape sharp edges of materials.
- ✓ Handle thermometers carefully.
- ✓ Use chemicals carefully.
- ✓ Dispose of chemicals properly.
- ✓ Put materials away you finish an experiment.
- ✓ Wash your hands thoroughly after each experiment.



# Unit 1 Unit

## Force and Motion



### Unit Objectives

By the end of this unit, you should be able to:

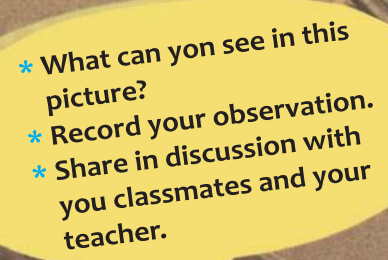
- Determine what is meant by a lever and its importance.
- List examples explaining types of levers.
- Identify some applications of levers in the daily life.
- Carry out practical experiments to deduce the law of levers.
- Apply some examples of the law of levers.



### Unit introduction

Machines do a lot of work, It is enough to walk on the roads of the city in order to see the machines while they lift the weights, pull cars, or dig the ground, etc... You can also visit a factory to see machines working to prepare various products. The levers are considered the most important simple machine that man uses in his daily life.



- 
- \* What can you see in this picture?
  - \* Record your observation.
  - \* Share in discussion with you classmates and your teacher.

### Lesson One

## Types of levers

### Lesson Two

## Law of the levers



## Lesson One (1-1)

## Types of levers

**Objectives**

By the end of this lesson, you should be able to:

- Determine what is meant by a lever and its importance.
- List examples explaining types of levers.
- Identify some applications of levers in the daily life.

**Basic concepts**

- Levers
- Force
- Resistance
- Fulcrum

A long time ago, man invented many simple machines to help him perform heavy tasks more easily. Some believe that in the past, levers were the first machines man invented. Levers were first described in the year 260 B.C by the Greek scientist (Archimedes).

Search through the Egyptian Knowledge Bank  
How did man make use of levers in the past and in the present



**Fig (1-1):** Some people believe that in the past, levers were the first machines man invented.



## Discover the concept of levers

- In the pictures, there are a group of simple machines followed by several sentences. Examine the pictures then put (✓) in front of the sentences that represent shared properties for all these machines, and put (✗) in front of the sentences that represent unshared properties:



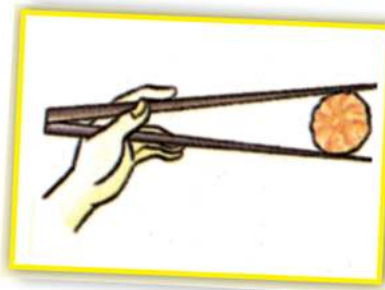
Crowbar



Nutcrackers



Hammer



Sweat holder



The wheel barrow



Bottle opener

Fig (1-2): A group of simple machines.

- ◆ All of the previous machines are similar in shape and size. ( )
- ◆ All of the previous machines consist of a rigid bar (straight or curved). ( )
- ◆ These machines are made of the same material. ( )
- ◆ All of the previous machines are used to move an object. ( )
- ◆ A person inflicts force on each machine. ( )
- ◆ There is a fixed point that each machine rotates on. ( )

# Types of levers

★ **Conclusions:** the previous machines share in the following:

- They consist of a rigid bar (straight or curved).
- An effort is exerted to overcome the resistance.
- There is a force inflicted by a person to equilibrate the resistance.
- There is a fixed point that the bar rotates on called "fulcrum".
- **The lever:** is a rigid bar that rotates around a fixed point called the fulcrum, and is affected by force and resistance.

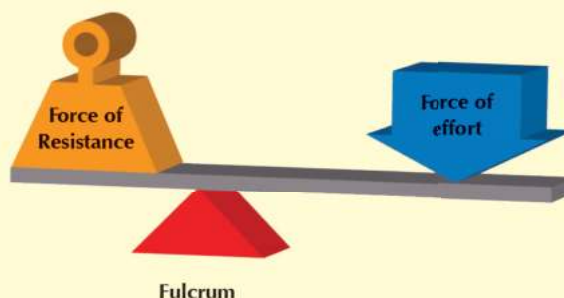


Fig (1-3): The lever



## Discover the importance of the levers

The following are pictures of some levers. Examine each lever, then write its name and function:



.....



.....



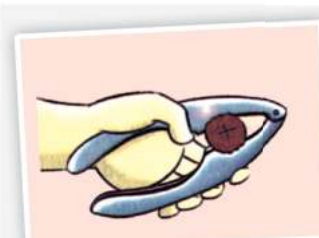
.....



.....



.....



.....

Fig (1-4): A set of pictures for some levers



★ We deduce that levers make the tasks perform more easily by doing one or more of the following functions:

- **Increasing force:** Some levers allow the conservation of the effort exerted by means of using small force to move heavy load, like in the crowbar and nutcracker.
- **Increasing distance:** Some of levers allow exerting a force for a small distance to make an object move a longer distance. With the manual broom, you hand moves small distances at the upper part of the broom, while the lower part moves a longer distance.
- **Increasing speed:** Some of levers allow the increase in the speed of objects we inflict on as in the hockey bat.
- **Moving the force from one place to another:** Instead of the person bending down to collect the garbage, he uses the manual broom to move the force of his hand downward.
- **Accuracy in performance:** For example, you use the tweezers to pick up a very small object.
- **Avoid dangers:** Like heat, cold and poisonous materials as in the coal holder, which protects man from heat.



Fig (1-5): Hockey bat.



Fig (1-6): Tweezers.

Use the free electronic encyclopedia:

<http://ar.wikipedia.org>

to search about: levers-  
types of Levers.



SEARCH  
IN THE  
INTERHET

## Types of levers



How do you know about the types of levers?

### Types of levers:

Functions that can be performed by levers are determined according to the locations of the force, resistance, fulcrum and according to their relation to each other. Thus, levers are classified into three types:

#### 1 First class levers

#### Discover first class levers



### Exercise

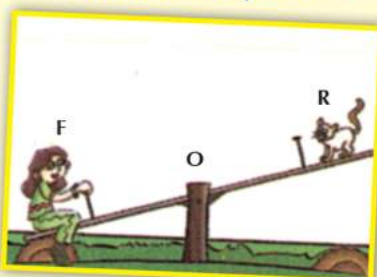
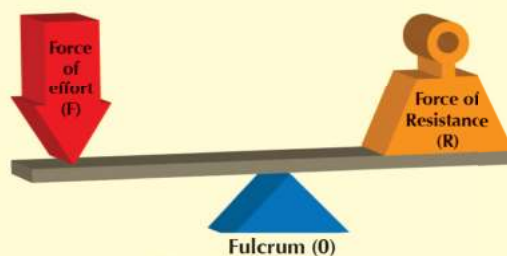
- The following picture represents one of the types of levers that were designed by a group of students.
- ◆ observe the picture, then determine the position of:
  - Force of effort (F)
  - Force of resistance (R)
  - Fulcrum (O)



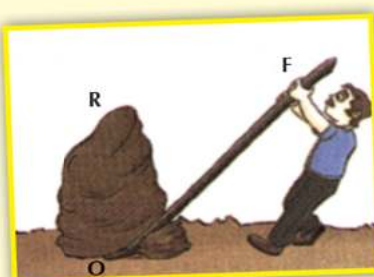
Fig (1-7): A first class levers

#### ★ We conclude that:

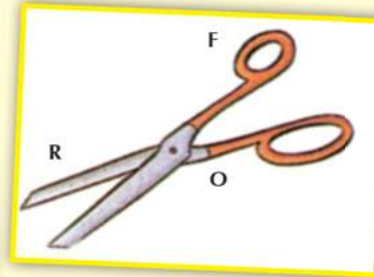
- In the first class lever, the fulcrum is between force and resistance.
  - First class levers are considered the most popular type of levers in our daily life.
- Some examples are:



◆ The see-saw is a lever of the first class lever



◆ The crowbar is a first class lever



◆ The scissors are two levers of the first class lever

Fig (1-8): Examples of first class levers



## 2 Second class levers



### Discover second class levers

#### Exercise

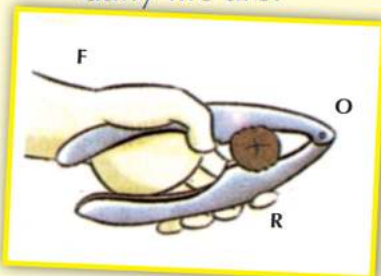
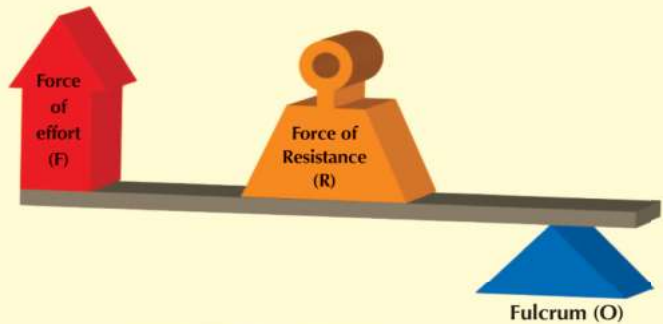
- The following picture represents one of the types of levers that were designed by a group of students.
- Observe the picture then determine the position of:
  - Force of effort (F)
  - Force of resistance (R)
  - The fulcrum (O)



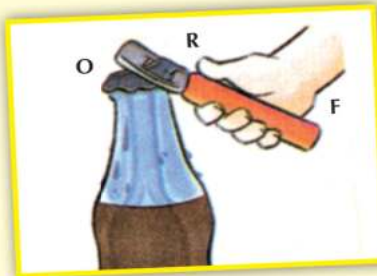
Fig (1-9): A second class levers

#### ★ We conclude that:

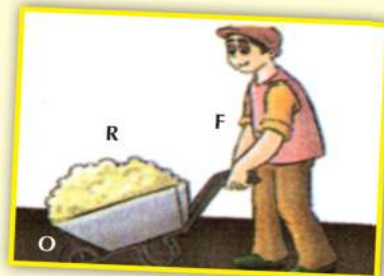
- In the second class levers, the force of resistance is between the force of effort and fulcrum.
- Some of the examples of second class levers in our daily life are:



❖ The nutcrackers is a second class lever



❖ The soda-water opener is a second class lever



❖ The wheel barrow is a second class lever

Fig (1-10): Examples of seconds class levers



# Types of levers

## 3 Third class levers



### Exercise

### Discover third class levers

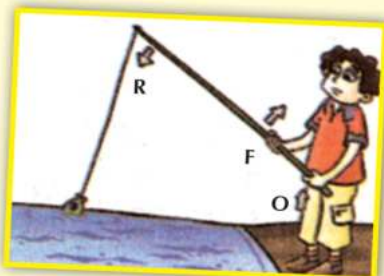
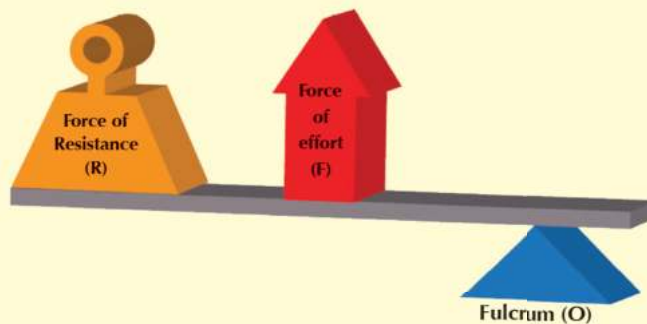
- The following picture represents one of the types of levers that were designed by a group of students.
- observe the picture, then determine the position of:
  - Force of effort (F)
  - Force of resistance (R)
  - The fulcrum (O)



Fig (1-11): A lever of the third class

### ★ We conclude that:

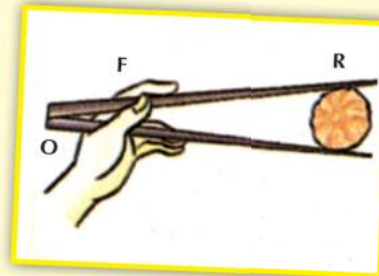
- In the third class levers, the force of effort is between the fulcrum and the force of resistance.
- Some examples of third class levers in our daily life are:



❖ The fish hook is a third class lever



❖ The manual broom is a third class lever



❖ The sweet holder is a double two levers of the third class lever

Fig (1-12): Examples of third class levers

## How to determine the type of a lever.

- Imagine the way a lever works.
- Determine the position of the force of effort, the force of resistance, and the fulcrum on use.
- Determine the type of the lever by identifying its middle position as in the following:

What is the difference between balance, bottle opener and fish pole



The middle position	The fulcrum	The force resistance	The force of effort
Type of lever	First Class	Second Class	Third Class



## The maize of levers

- Mona is trying to pass through the lever maize to reach the ice-cream at the end of the maize. But, in one condition she has to pass only through the squares that have first class levers.
- Determine the way that Mona should take to get to ice-cream.



Exercise



# Types of levers

## Exercises

### 1 Write the scientific term:

- a The fixed point of a rigid bar on which the bar rotates.
- b A rigid bar rotates on a fixed point, and is affected by a force and resistance.
- c Levers that have the fixed point between the force and the resistance.
- d Levers that have the force between the resistance and the fixed point.
- e Levers that have the resistance between the force and the fixed point.

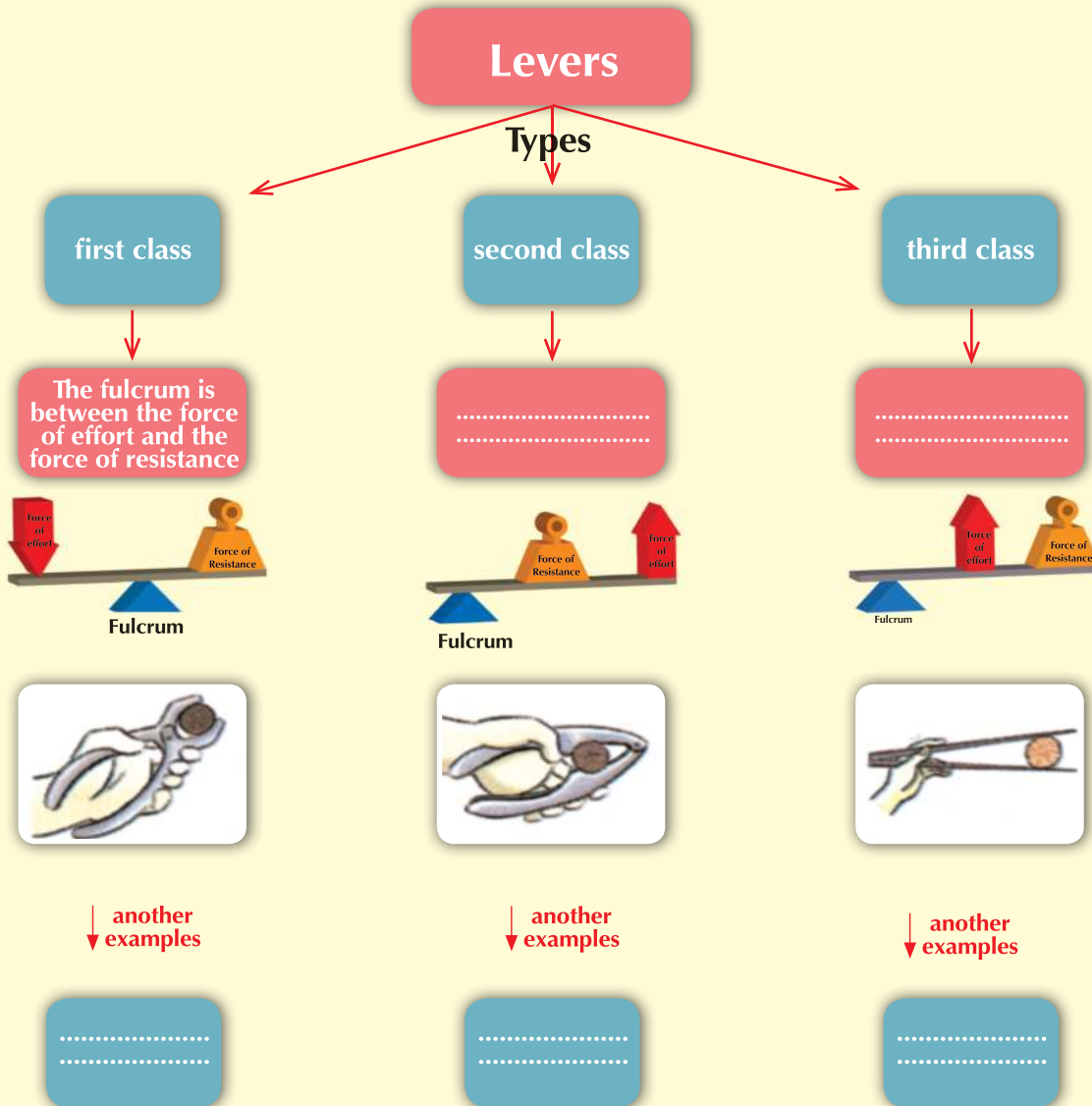
### 2 Complete the following sentences:

- a Levers which make tasks perform more easily by means of ....., ..... or .....
- b The crowbar is considered a ..... class lever, but the manual broom is a ..... class lever.
- c ..... and ..... are examples of the first class levers.
- d ..... and ..... are examples of the second class levers.
- e ..... and ..... are examples of the third class levers.

### 3 Classify the following tools according to the type of lever:



4 Complete the following diagram:





## Lesson Two (1 -2)

## Law of levers

**Objectives**

By the end of this lesson,  
you should be able to:

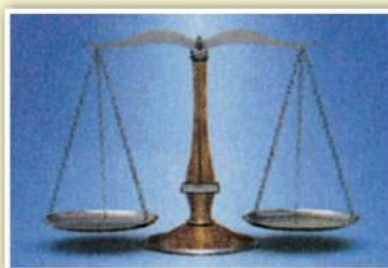
- Deduce the law of levers.
- Apply some examples of the law of levers.

**Basic concepts**

- The arm of force
- The arm of resistance

You learned in the previous lesson that the lever is a rigid bar that rotates on a focal point and is affected by the force and resistance. The force sometimes is smaller than the resistance. It could be larger or equal. Therefore, according to the type of the lever used, what are the factors that determine the values of the force and the resistance in the lever? And what is the relationship that describes how to change the force with the change in resistance?.

What is the relationship between the force and the resistance in the balance?



**Fig (1-13):** Balance is an example of levers





## Activity

### Deduce the law of levers

☉ **What do you need?** Several heavy objects with different weights, a metal bar or a long piece of wood, a strong rope (thread), 1 spring balance, metric ruler.

☉ **What should you do?**



**Fig (1-14): Set the value of the resistance and force**

- ◆ Assign the weight of the first object, and let it be your school bag by using the spring balance. Therefore, you have determined the value of "resistance".
- ◆ Hang the metal bar from the middle by the thread (fixed point) where it is completely stable in an upright position.
- ◆ Fix the bag at one end of the metal bar.
- ◆ fix the spring balance at the other end of the metal bar.
- ◆ Pull the spring balance down to produce the balance.
- ◆ Assign the balance reading at the balance. Therefore, you have determined the value of "force".
- ◆ Measure the distance between the force and the fulcrum which is known as "the arm of force".
- ◆ Measure the distance between the resistance and the fulcrum known as "the arm of resistance".
- ◆ Repeat the previous steps while changing the weight of the object and its position and also the position of the spring balance then record the results in a table of your design.

☉ **Observation:** .....

☉ **Conclusion:** .....



# Law of levers

Object	The force (Newton)	Arm of the force (cm)	Resistance (Newton)	Arm of the resistance (cm)	The force X its arm	The resistance X its arm
1					.....	.....
2					.....	.....
3					.....	.....
4					.....	.....

★ From the previous activity, you can deduce what is known as “the law of levers” and it states that in the case of lever balance is:

$$\text{The force X its arm} = \text{The resistance X its arm}$$

★ By the previous activity, you can observe and deduce the following

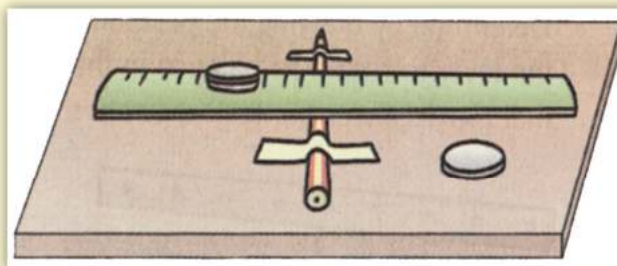
- When the arm of the force and arm of resistance are equal, then the force and the resistance are equal as in case (1) in the table.
- If the arm of force is longer than the arm of resistance, then the force is smaller than the resistance and thus the lever conserves the effort as in case (2) in the table.
- If the arm of the force is shorter than the arm of the resistance, then the force is larger than the resistance and thus the lever does not conserve the effort as in case (3) in the table.

## Law of levers

### Examples:

#### ● Example 1:

- ◆ The following figure illustrates one of the means of verifying the law of levers without using the spring balance and that is by using a ruler, similar coins and a pencil. Observe the figure, then complete the table using law of levers.



**Fig (1-15):** One of the means of verifying the law of levers

- ◆ **Note:** The values of force and resistance are expressed by a number of coins. This is because either the force or the resistance is compatible with the number of coins. The more the number of coins increases, the more the force and the resistance increase:

The force (number of coins)	The arm of the force (cm)	The resistance (number of coins)	The arm of the resistance (cm)
2	5	1	a
3	10	b	10
4	c	2	10
d	15	6	5

#### ● Solution:

- ◆ By applying the law of the levers: the force X its arm = the resistance X its arm

a  $2 \times 5 = 1 \times \text{arm of the resistance}$   
Arm of the resistance = 10 cm

c  $4 \times \text{arm of the force} = 2 \times 10$   
Arm of the force = 5 cm

b  $3 \times 10 = \text{the resistance} \times 10$   
The resistance = 3 coins

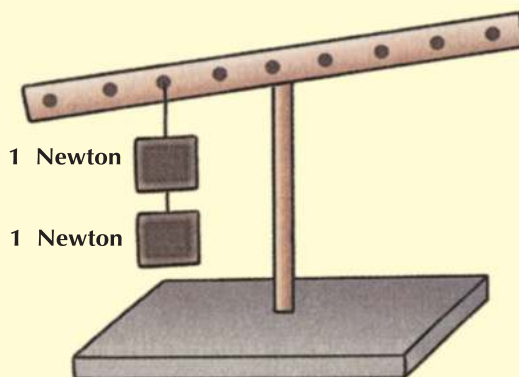
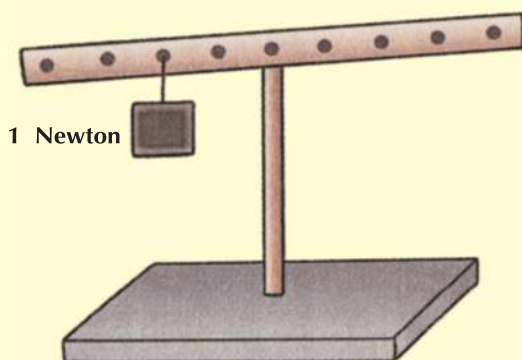
d The force  $\times 15 = 6 \times 5$   
The force = 2 coins



# Law of levers

## Example 2:

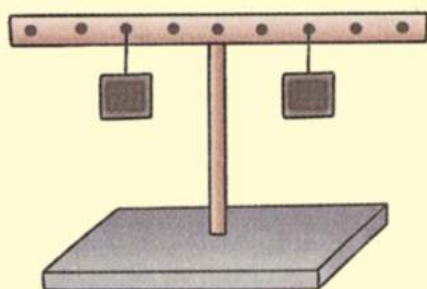
- Determine by drawing the position where only 1 Newton weight is placed for the lever to regain its balance in the following figures, keeping in mind that the distances between every two openings is 1 cm:



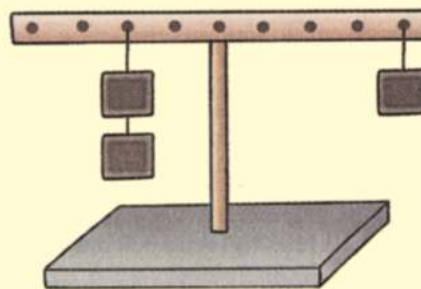
## Solution:

- By applying the law of the levers: the force  $\times$  its arm = the resistance  $\times$  its arm

- The resistance = 1 Newton
- The force = 1 Newton
- Arm of the resistance = 2 cm
- The force  $\times$  its arm = The resistance  $\times$  its arm
- 1  $\times$  arm of the force = 1  $\times$  2
- Arm of the force = 2 cm



- The resistance = 2 Newton
- The force = 1 Newton
- Arm of the resistance = 2 cm
- The force  $\times$  its arm = The resistance  $\times$  its arm
- 1  $\times$  arm of the force = 2  $\times$  2
- Arm of the force = 4 cm



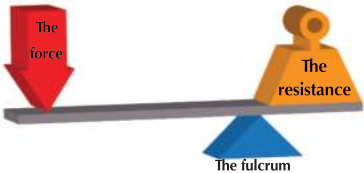
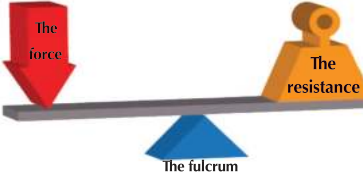
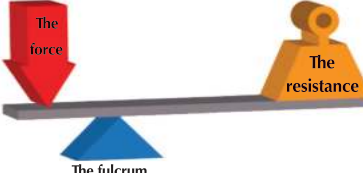
## What are the levers which conserve the effort:

Are the levers conserve the effort?



### ① First class levers:

In the first class levers, there are three possibilities in regards to the length of each of the arm of the force and the arm of the resistance. The possibilities are:

Arm of the force is longer than the arm of the resistance	Arm of the force is equal to the arm of the resistance	Arm of the force is smaller than the arm of the resistance
 <p>The force is smaller than the resistance and thus conservation of the effort (has a mechanical benefit)</p>	 <p>The force is equal to the resistance thus no conservation of the effort (has no mechanical benefit)</p>	 <p>The force is larger than the resistance and thus no conservation of the effort (has no mechanical benefit)</p>

### ② The second class levers:

The second class levers conserve the effort because the arm of the force is always longer than the arm of the resistance and thus the force is smaller than the resistance (has a mechanical benefit).

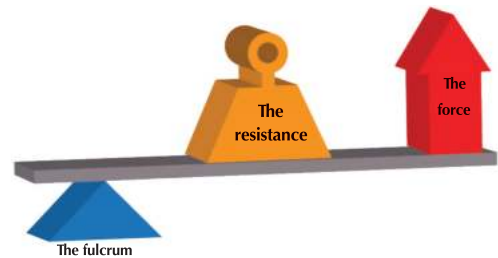


Fig (1-16): The second class levers

### ③ The third class levers:

Third class levers do not conserve the effort since the arm of resistance is longer than the arm of force, So the force is always larger than resistance.

- ⦿ Despite the fact that some of the machines do not conserve the effort, but these machines are beneficial in other things such as increasing the distance, speed or precision, etc....

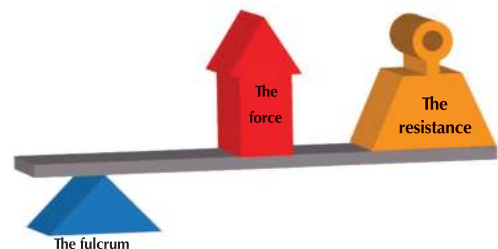


Fig (1-17): The third class levers



# Law of levers

## Exercises

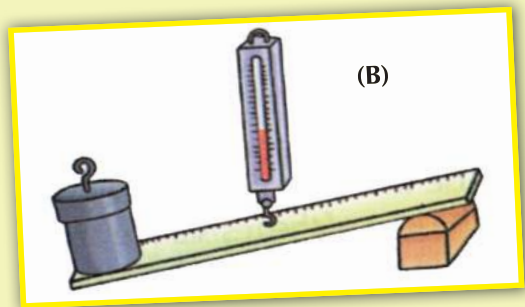
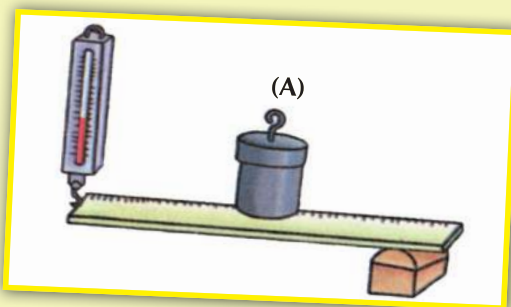
### 1 Complete the following sentences:

- a The law of levers states that .....
- b The type of levers that always conserves effort is ..... while the type of levers that always does not conserve effort is .....
- c There is a conservation of effort for the first class levers if the ..... is larger than .....
- d The force and the resistance are equal in levers if .....

### 2 Explain the following:

- a The second class levers conserve effort.
- b The third class levers always do not conserve effort.
- c The force and the resistance can be equal only in the first class levers.
- d Some of the levers are important to man although they do not conserve effort.

### 3 Determine which of the following levers conserve the effort. Give reason for your answer:



### 4 The exerted force of the first class lever equals 500 Newton and the length of its arm is 20 cm and is affected by a resistance with a value of 200 Newton. Find the value of the arm of the resistance.

5 Write your own paragraph on each concept:

The force  $\times$  its arms =  
The resistance  $\times$  its arms

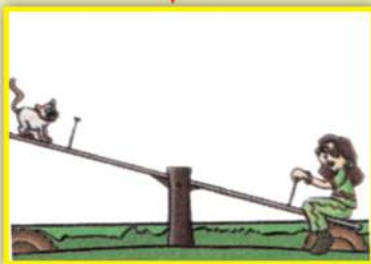
States that

Law of  
levers

Used in

Determining the  
mechanical purpose  
of levers

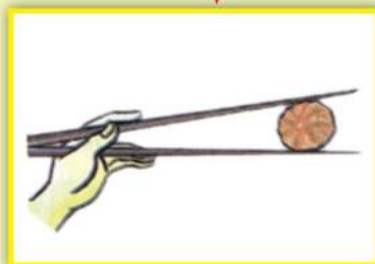
First class  
levers



Second class  
levers



Third class  
levers



Don't conserve  
effort when  
the force arm  
is equal to the  
resistance arm

Conserve  
effort



## Unit (1) Test

## Unit (1) Test

1 Match column (a) with its correspondence in column (b):

	Column (a)
1	First class levers
2	Second class levers
3	Third class levers
4	The levers
5	The force
6	The resistance
7	The fulcrum

	Column (b)
a	Levers that always conserve the effort
b	Levers that never conserve the effort
c	Levers that sometimes conserve the effort
d	Fixed point that a rigid bar sits on
e	A rigid bar rotates around a focal point, and is affected by a force and a resistance

2 Put (✓) or (✗) in front of each of the following sentences, and correct the false ones:

- a The first class levers has the resistance between the force and the fulcrum. ( )
- b The second class levers has the force between the resistance and the fulcrum. ( )
- c The third class levers has the fulcrum between the force and the resistance. ( )
- d The crowbar is an example of the first class levers. ( )
- e If the arm of the force is smaller than the arm of the resistance, then the lever conserves the effort. ( )

3 Complete the following sentences:

- a The nutcracker is an example of the ..... levers.
- b The manual broom is an example of the ..... levers.
- c The scissors are an example of the ..... levers.
- d The force  $\times$  its arm = .....  $\times$  .....
- e The type of the levers where the arm of the force and the arm of resistance are equal is .....

4 Compare between the three types of levers using the following table:

Points of comparison	First class lever	Second class lever	Third class lever
Definition			
Conservation of effort			
Examples			

5 Classify the following machines according to the type of lever:



6 The force affecting a second class lever equals 200 Newton and the length of its arm is 50 cm and a resistance with a value of 1000 Newton; calculate the value of the arm of the resistance.

7 The arm length of a third class lever is 5 cm, and the length of the arm of the resistance is 15 cm. If the resistance has a value of 300 Newton, Calculate the value of the affecting force.



# Electric Energy



## Unit Objectives

By the end of this unit, you should be able to:

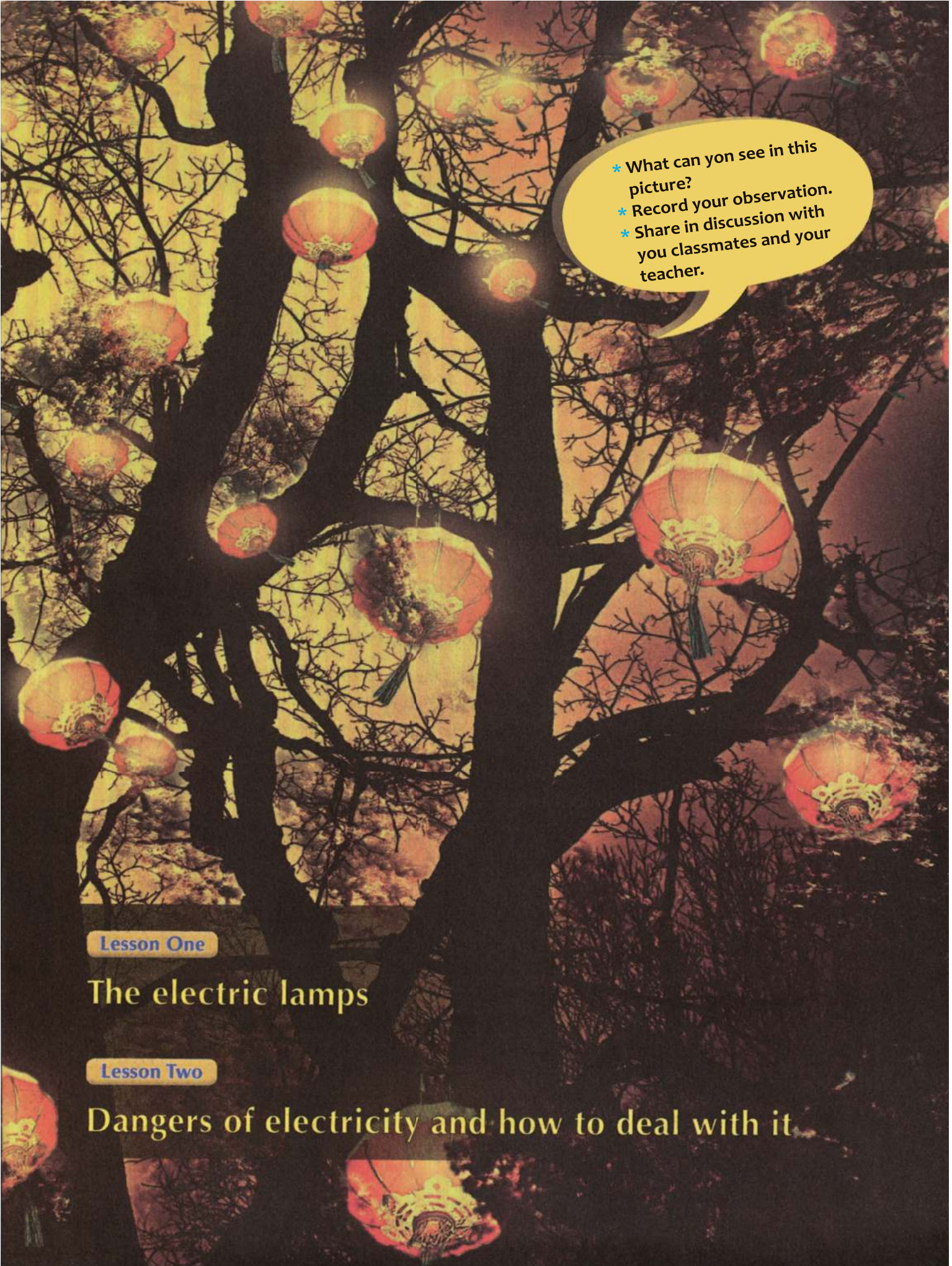
- Identify the structure of some electric lamps.
- Compare between the ways of connecting electric lamps, in series and in parallel.
- Deduce the way to connect electric lamps in the house.
- Carry out experiments to determine some solid materials that are conductors and non-conductors of electricity.
- Identify dangers of electricity and precautions in dealing with it in the house.



## Unit introduction

Electric energy is one of the important energies used in our lives. We use it in lighting the lamps and in operating several electric machines in the house. Despite the importance of electric energy, there are several dangers and harms if we handle it with neglect and carelessness.



- 
- \* What can you see in this picture?  
\* Record your observation.  
\* Share in discussion with you classmates and your teacher.

### Lesson One

## The electric lamps

### Lesson Two

## Dangers of electricity and how to deal with it



## Lesson One (2 -1)

## The electric lamps

## Objectives

By the end of this lesson, you should be able to:

- Identify the structure of some electric lamps.
- Compare between the ways of connecting electric lamps. in series and in parallel.
- Deduce the way to **connect** electric lamps in the house.

## Basic concepts

- Electric lamps
- Light bulbs
- Fluorescent lamps
- Electric circuits
- Series connection.
- Parallel connection.

*It is known that the sun is main source of light. When man felt that daylight is not enough and felt the cruelty of night, he started to search for artificial light sources that allow him to perform his activities at night fall. It has not been too long that all light sources depended on torches.*

What do you know about lamps?



*Now torches, candles, and oil lamps have disappeared from most of the countries in the world to be replaced by what is known as electric lamps. The electric lamp represents a constant source of light that is clear, bright, and smoke, vapors and odors free. So, what is the electric lamp installation and what are its types?*



**Fig (2-1):** Some types of the oil lamps that were used in the lighting before discovering the electric lamp

## Electric lamps:

There are many types of electric lamps, some are glowing which emit light through heating a special type of a wire made of tungsten till glowing while other electric lamps generate light from the vapour or gas when electric current passes through it.

Although there are many types of used electric lamps nowadays but we are going to study most popular ones which are light bulbs and fluorescent lamps.



Some types of electric lamps

### Scientists helped humanity



Thomas Alpha Edison is an American inventor that invented the light bulb. When he died, all the lights and lamps in America were turned off, as the world before him was that way.

## First: Light bulbs:

Light bulbs are considered the most popular source of artificial light in almost every house. Also car lights and torch are considered one type of light bulbs. To recognize how to install the light bulbs; co-operate with your colleagues to conduct the following activity:

### Activity

#### Parts of The light bulb



⦿ **What do you need?** Light bulb, a magnifying lens.

⦿ **What should you do?**

- ◆ Check the light bulb with the magnifying lens thoroughly and be careful it does not break.
- ◆ Identify the main parts the light bulb consists of and record your observations.

⦿ **What do you observe?** .....

⦿ **What do you conclude?** .....



Fig (2-2): A light bulb and a magnifying lens

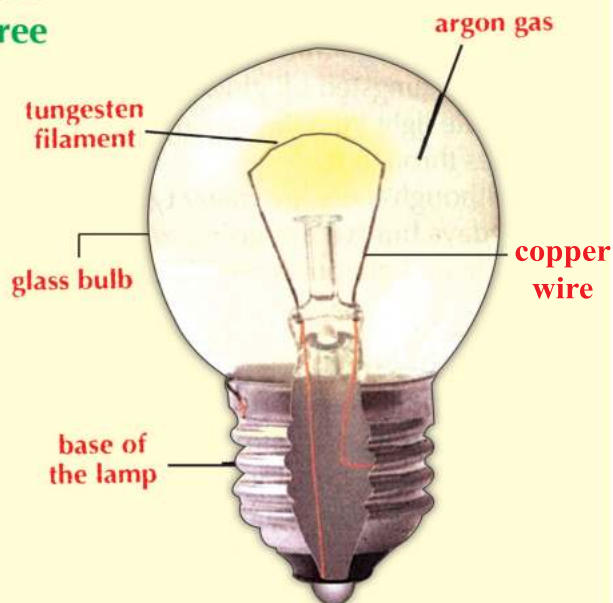


## The electric lamps

From the previous activity, we deduce that the light bulb consists of three main parts They are:

### 1 The filament:

It is a coiled thin wire from tungsten that has electricity flowing through it by means of connecting wires from copper and lead that connect the base of the lamp to the filament. The passage of the electric current in the tungsten wire leads to heating, then it glows and emits Light. The tungsten is used because its melting point is high which protects it from melting in high temperatures.



**Fig (2-3):** The light bulb consists of three main parts

### 2 A glass bulb:

Its function is to prevent air from reaching the filament thus protects it from burning. Most of the lamps contain one type of the inert gases as the argon gas instead of air to increase the life of the filament.

### 3 The base of the light bulb:

It carries the lamp upright, positions it, and connects the lamp with the electric circuit. There are two types of lamp bases. The first is spiral and has a piece of lead for connection and the second has two side nails and two inside pieces of lead for connection.



**Fig (2-4):** The nail light bulb base that has two pieces of lead for connection.



**Fig (2-5):** The spiral light bulb base that has a piece of lead for connection.



## Second: The fluorescent lamps:

The fluorescent lighting lamps, known as neon lamps, are used in houses, offices, decorating commercial stores, and commercial advertisements. What are the parts of the fluorescent lamps?.



**Fig (2-6):** The fluorescent lamp are used to light the underground metro.

### The Components of the fluorescent lamp:

#### ① Glass tube:

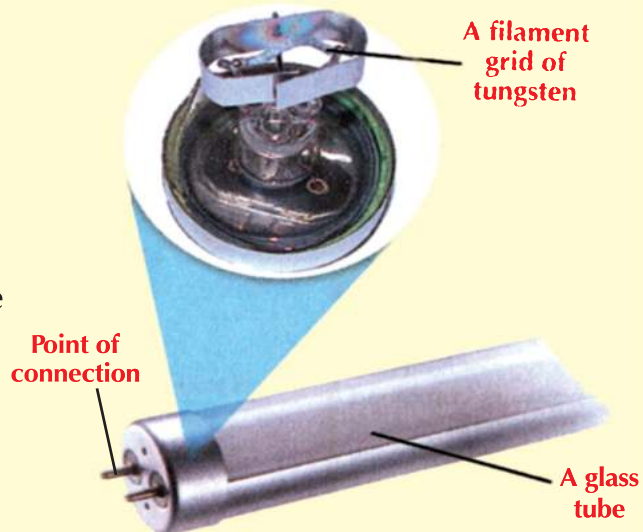
It is vacuumed and contains the inert argon gas and it also contains a little of mercury vapor and the inner tube surface is covered with a phosphoric material.

#### ② Two filaments of tungsten:

At the tips of the lamp from the inside.

#### ③ Points of connection:

There are two points of connection on each tip of the lamp to cconnect the electricity.



**Fig (2-7):** Parts of the fluorescent lamp

### Do you know?



The inert neon gas is not used in making the fluorescent lamp but these types of lamps are known as the neon lamps.

# The electric lamps

How many methods do we have to connect electric lamps?



## Do you know?



There is a type of fluorescent lamp known as combined fluorescent lamp. This type is different from the bulb lamps because it does not consume electric current as the light bulbs. It stays longer than the ordinary electric bulbs from 8 to 18 times. Its assumed working time is from 8000 to 15000 hours. While the bulb lamps are from 750 to 1000 hours.



There are two methods to connect electric lamps which are: **connecting in series** and **connecting in parallel**.

## First: Connecting the electric lamps in the electric circuits:

The simple electric circuits consist of a battery (the electric current source), connecting wires, electric switch.

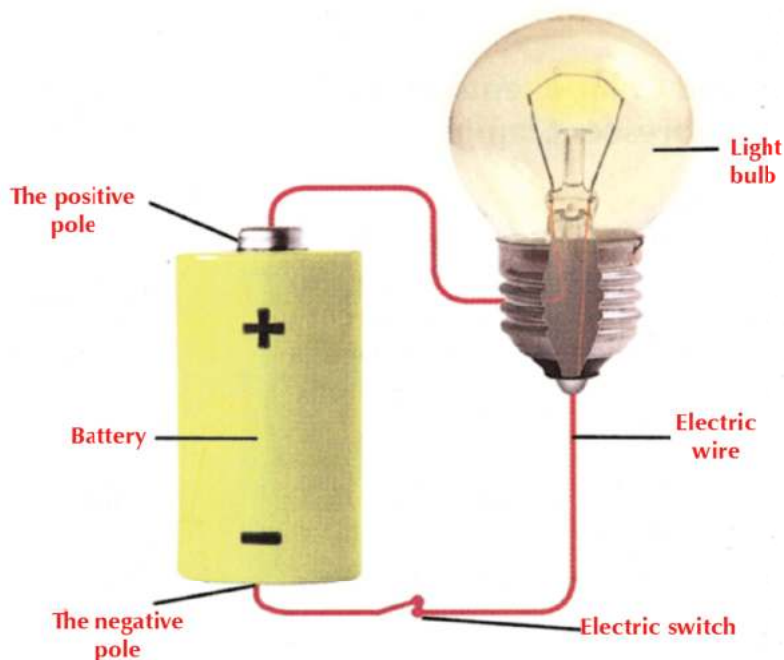


Fig.(2-8): The simple electric circuit

In order for the electric current to pass through the circuit, we must connect all the parts of the electric circuit. In this case, the circuit is a closed one, thus the electric current passes through. In case that any of the parts are not connected, the electric current does not pass through.

## 1 Connecting electric lamps in series in the electric circuits:

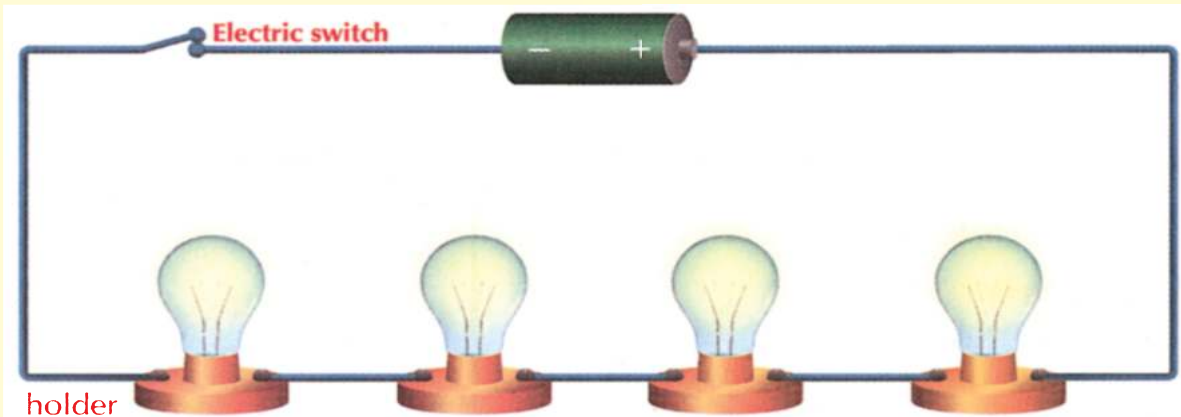
In order to recognize the way of connecting in series, cooperate with your classmates to conduct the following activity:



## Activity

### Recognize the way to connect electric lamps in series

☉ **What do you need?** 4 Small light bulbs, 4 light bulb holders, battery, masking tape copper connecting wires with naked tips, and a screw driver.



**Fig (2-9): Four light bulbs connected in series**

#### ☉ **What should you do?**

- ◆ Fix a bulb inside the holder.
- ◆ Use the screw driver to fix the connecting wires to the bulb holder.
- ◆ Fix the tips of the connecting wires to the tips of the battery with the masking tape and observe the light intensity of the bulb.
- ◆ Add another light bulb by using another bulb holder and connect it by using the connecting wires as shown in the drawing, and compare between the light intensity of one bulb and the light intensity of both bulbs?
- ◆ Repeat the previous steps until they become four light bulbs and compare in each time between the light intensity of one bulb and the light intensity of more than one bulb?
- ◆ Unscrew one lamp in the electric circuit while it is connected (closed), what do you observe?
- ◆ By using a pencil draw a line starting from the battery from one of its tips and ending with the other tip while passing through the lamps and observe the shape of the line?

☉ **What do you observe?** .....

☉ **What do you conclude?** .....



# The electric lamps

## 1 Connecting electric lamps in parallel in the electric circuit:

To recognize this way of connecting electric lamps in parallel, collaborate with your colleagues to conduct the following activity:



### Activity

#### Recognize the way to connect the electric lamps in parallel

- **What do you need?** 4 Small lamps, 4 Small lamp holders, masking tips, copper connecting wires with naked tips, and a screw driver.

- **What should need?**

- ◆ Fix two lamps inside two holders.
- ◆ Use the screw driver to fix the connecting wire to the two holders as shown in the figure.
- ◆ Fix the connecting wire tips to the tips of the battery with the masking tape and observe the light intensity of the two lamps?.
- ◆ Add two other lamps and compare between the light intensity of the two lamps and the light intensity of four lamps.
- ◆ Unscrew one lamp in the electric circuit while connected (closed), what do you observe?.
- ◆ By using the pencil draw a line starting from one tip of the battery and ending at the other tip while passing through the lamps: record your observations.

- **What do you observe?** .....

.....

- **What do you conclude?** .....

.....

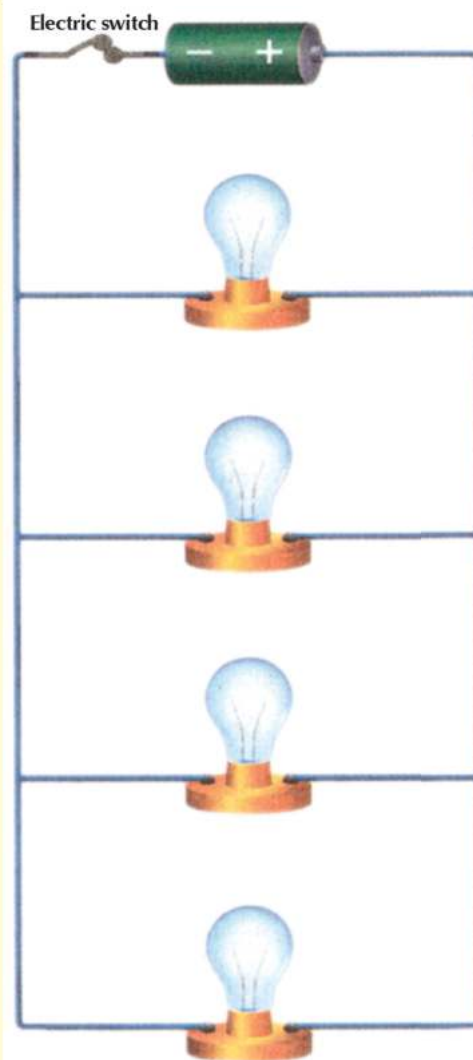


Fig (2-10): Four lamps connected in parallel

★ *We deduce from the previous activities that:*

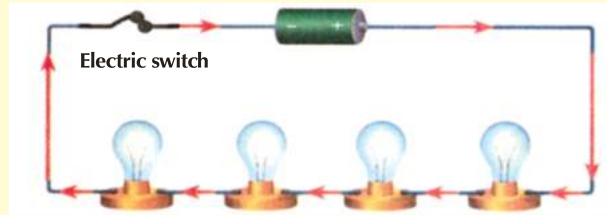
- When we connect the light bulbs in series the electric light bulbs are connected one after another.

Therefore, there is one route for the electric current to pass through in the circuit, thus when we cut this route by unscrewing a bulb or when it burns out the current does not continue to flow and all the bulbs in the electric circuit are turned off.

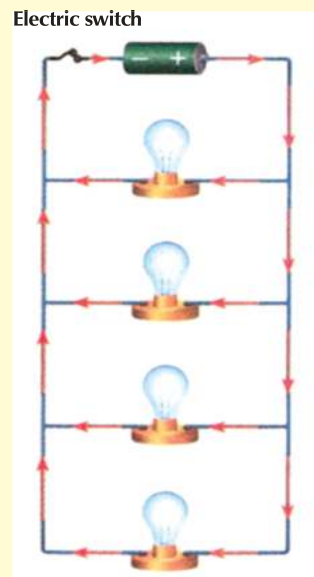
- When we connect more than one bulb with the circuit in series the lighting of the bulbs decrease until weakens when a large number of bulbs are connected to the circuit.
- When we connect the electric bulbs in parallel, the electric bulbs are connected in branching routes.

The electric current has more than one route to pass through in the circuit. Therefore when we cut one of these routes by unscrewing one bulb or when it burns out the current moves in the other routes and the rest of the bulbs in the circuit do not turn off.

- When we connect more than one bulb with the circuit in parallel the lighting of the bulbs remain as it is.



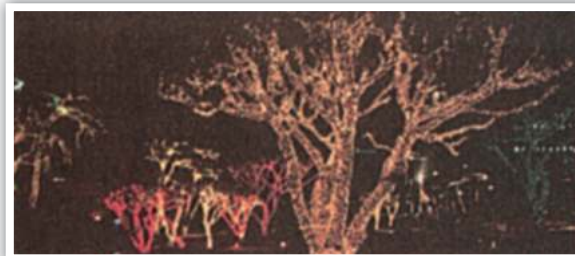
**Fig (2-11): Connecting in series :** There is one route for the flow of the electric current in the circuit.



**Fig (2-12): Connecting in parallel:** There is more than one route for the flow of the electric current in the circuit.

## Life applications

In the decorative lights used in religious celebrations and weddings, the lamps are connected in parallel. Therefore this makes it easier to reach the burnt out lamp and replace it besides the burning out of the lamp does not cause the current to be cut off in the rest of the lamps and they turn off.



**Fig (2-13): lamps are connected in parallel.**

# The electric lamps

## Second: Connecting electric lamps in a house:

How are the various electric lamps in a house connected? Are they connected in parallel or in series? To answer the previous question, cooperate with your colleagues to conduct the following activity:



### Activity

#### Recognize the way to connect the electric lamps in house

#### ◎ What should you do?



**Fig (2-14):** Ways to connect the electric lamps in the house.

- ◆ Turn on the lamps in all the rooms of the house.
- ◆ Operate one of the electric machines in one of the rooms like the radio or the television.
- ◆ Turn off an electric lamp in one of the rooms. Then observe the rest of the lamps in the rest of the rooms. Are they still on or did they turn off and record your observation?
- ◆ Observe the electric machine: is it still working or did it turn off and record your observation?

◎ What did you observe? .....

◎ What did you conclude? .....

#### ★ We conclude from the previous activity that:

- All lamps in the house are connected in parallel. The lamps in the house are connected to the main distributor of the energy but they function independently. Thus, each lamp functions alone and the lighting in each room is independent from the lighting in any other room so that turning off or the damage of any of the lamps in a room does not affect the lamps present in the rest of the rooms.



## Exercises

### 1 Complete the following sentences:

- a Some of the types of electric lamps are ..... and .....
- b The Filament of the light bulb is made of ..... and that is because it has a high .....
- c The light bulb consists of ..... , ..... and .....
- d The fluorescent lamp contains ..... gas.

### 2 Write the scientific term for each of the following:

- a A way in which the bulbs are connected one after the other, and the light intensity of the bulbs decreases with the increase in their number.
- b Means of converting the electric energy to light energy.
- c The way where the bulbs are connected by branching routes and the lighting of the lamps is not affected with increase in their number.

### 3 What happens if:

- a You make the filament of the light bulb from iron.
- b There is air inside the light bulb.
- c The light bulbs in the house are connected in series.

### 4 Write a scientific explanation for each of the following:

- a There are two pieces of lead in the light bulb.
- b The light bulbs are connected in parallel in the house.
- c The filament of the light bulb is made of tungsten.

## Lesson Two (2 -2 )

## Dangers of electricity and how to deal with it

**Objectives**

By the end of this lesson, you should be able to:

- Carry out experiments to determine some solid materials that are conductors and non-conductors of electricity.
- Identify the dangers of the electricity and the precautions in dealing with it in the house.

**Basic concepts**

- Electric conductors.
- Electric insulators.

*It is difficult to imagine the world around us without electric energy. We use it to cook food and preserve it cold. Also, we use it to light our houses and provide our machines and toys with electricity. Our use of electricity increases due to the increase in our need for this type of energy. We have become unable to live without it. But despite the many benefits of electricity in a person's life as well as the society, it can cause danger the safety of lives and properties and can be the reason for the occurrence of fires, explosions or even death of people. But it is fair to say that electricity is dangerous to those who neglect or ignore the safety precautions and instructions that have to be followed while dealing with it.*

How can we benefit from the electric energy



**Fig (2-15):** Using the electric energy in cooking food



Before identifying the dangers of the electricity and the precautions to deal with it, you have to recognize conductors of electricity and insulators of electricity. This is in order to help us while handling the various electric machines.

## Activity

### Discover conductors of electricity and insulators of electricity



⊙ **What do you need?** Battery 1.5 volt, lamp 1.25 volt, lamp holder, masking tape, two pins, small square piece of cork, three wires with naked tips, screw driver, group of metal materials, and non-metal (key, nail, coin, plastic button, small piece of cloth, eraser).

⊙ **What should you do?**

- ◆ Wrap the tips of two wires around two drawing pins as in the figure, then stick the two pins in the piece of cork.
- ◆ Fix a tip of one of the previous wires to the battery using the masking tape, and position the other wire in the battery holder.
- ◆ Fix the third wire to the other tip of the battery and the lamp holder.
- ◆ Test connecting some of the metal materials (key, nail, and coin) to the electric current by placing it on the pins to connect them. Observe what happens to the lamp and record your observation.
- ◆ Repeat the previous steps but use non metal bodies (plastic button, piece of cloth, and eraser), and observe what happens to the lamp, and record your observation?
- ◆ Complete the following table to compare between the conductors of electricity and insulators of electricity with what you deduced from the activity.



**Fig (2-16):** Good conductors and insulators of electricity.

Conductors of electricity	Insulators of electricity

⊙ **What do you observe?** .....

⊙ **What do you conclude?** .....

# Dangers of electricity and how to deal with it

★ *From the previous activity, we can deduce the following:*

- Materials are divided into two types according to its conductivity of electricity: materials that are conductors of electricity, and materials that are insulators of electricity.
- Conductors of electricity are the materials that allow the flow of electricity through it like metal materials (iron, copper and aluminium). So, when present in an electric circuit it completes the circuit (to make it closed) which causes the electric current to flow in the whole circuit.
- Insulators of electricity are the materials that do not allow the flow of electricity through it like (plastic, rubber, wood, and glass). So, when it exists in an electric circuit, it does not complete the circuit which prevents the electric current to flow in the circuit.

## Life applications

Electricity reaches our houses from electric power stations where the electric current is transmitted through metal cables hanging on high towering poles, and these cables are covered with long insulating materials which prevent the electric current from moving from the cables to the towering poles.



**Fig (2-17):** *Grid network*



**Fig (2-18):** *Electricity is safe if it is handled cautiously*

### **First:** Dangers of electricity:

Electricity is considered safe if it is handled cautiously. But, if handled with neglect, hastiness or in an improper way, it can cause a lot of dangers.





## Identify the dangers of electricity

- ⦿ The following pictures show some possible dangers that electricity leads to. Write under each picture the danger that the picture expresses and the result of the improper use of electricity.



Fig (2-19): Some possible dangers which the electricity causes.

★ From the previous exercise, we deduce that there are two types of injuries resulting from improper use of electricity:

- **The first type: Direct injuries** including fires resulting from electricity, the electric shock and the burns.
- **The second type: Indirect injuries** caused by electricity and they are not the direct cause, like injuries caused by falling from top of a ladder due to an electric shock.

# Dangers of electricity and how to deal with it



**Fig (2-20):** Increasing the electric load could be the cause of fires occurrence

## Enriching information

The human body is considered a good conductor of electricity and that is because 70% of the human body contains water.

How does an electrical shock occur?



## 1 Fires resulting from electricity:

### Reasons:

- ⊙ Placing an electric machine that generate heat (electric iron, electric heater and spot light) near to flammable items like (furniture, curtains, rugs, and clothes) lead to the occurrence of fire due to the burning of these items.
- ⊙ Increasing the electric load by operating more than one machine by means of one socket.
- ⊙ Not disconnecting the electric current from the electric machines that generate heat.

### The difference between fire caused by electricity and regular fire:

Water is used to put off the regular fire, but we cannot use it to put off the fire resulting from electricity. That is because impure water is considered one of the liquid materials that is good conductor of electricity. Therefore, using it increases the fire and could harm the rescuers.

## 2 The electric shock:

- ⊙ The electric shock is the result of an electric current passing through the human body.
- ⊙ The harms resulting from an electric shock depend on the strength of the current passing in the human body and also on the time it took for the current to pass through the human body. In many cases, the electric shock causes death.

As we previously mentioned, electricity should pass in closed circuits. The electric shock occurs when your body is a part of the electric circuit and results in its completion (closure) which leads to the flow of the electric current from a part of your body and its exit from another part. This happens when:

- ⊙ A part of your body touches noninsulated wire that has an electric current in it and touches the ground with another part.
- ⊙ You touch with one part of your body non insulated wire that has an electric current in it and touches a material conducting electricity and connected to the ground.



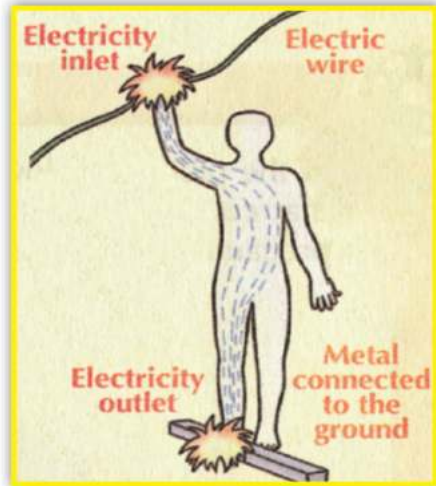
- You touch two non insulated wires conducting electricity.

As we previously mentioned, the electric shock can lead to indirect harms like falling from top of a ladder and resulting in various injuries.

### 3 The body burns resulting from the electric current

Burns resulting from the electric current cause the damage of body tissues as a result of:

- Touching a part of the body directly to an electric current source causing electric shock which lead to the occurrence of the body burns.
- Touching fire or the spark resulting from the occurrence of an electric fire to a part of the body.
- Touching an electric machine that generates heat (heater, electric iron, electric heater) directly with a part of the body, thus causing burns.



**Fig (2-21):** The passing of the electric current through the human body may result in an electric shock

## Life issues

### First aid when accidents occur as a result of the electric current

- The injured is insulated from the electric current by disconnecting the electricity or by insulating him immediately from the electric source by pushing the injured by anything that is non-conducting of electricity such as a piece of wood or plastic.
- Call the physician immediately to the accident location or transported to the nearest hospital.
- If the injured is breathing, you must facilitate his breathing by opening up the tight clothes.
- It is a must to maintain the heart beats by massaging by means of pressing on the chest with the palms of the hand.
- If the injured cannot breathe, start immediately artificial respiration.



**Fig (2-22):** First aid for electric current accidents.

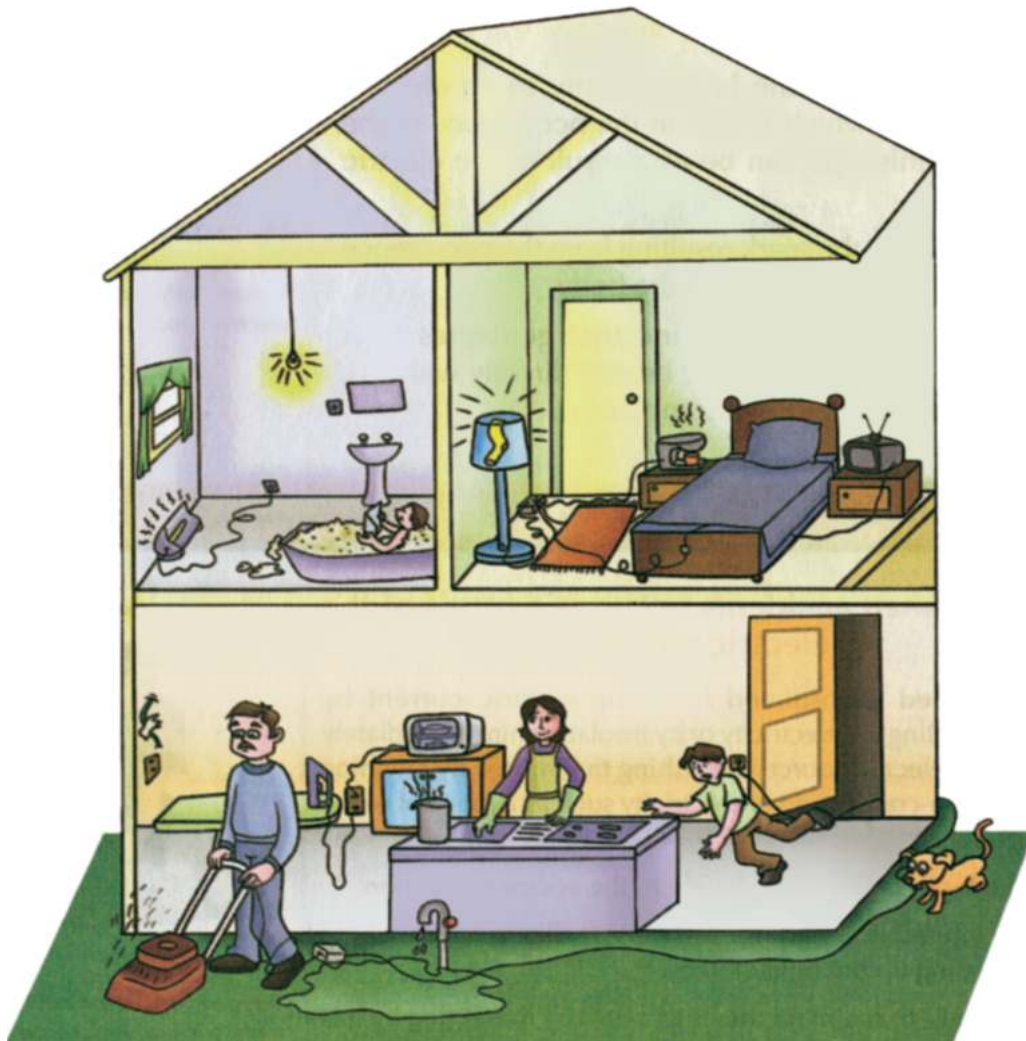
# Dangers of electricity and how to deal with it

**Second : Precautions in dealing with electricity:**



## Precautions in dealing with electricity

- ☉ In the pictures below there are wrong patterns while dealing with electricity that could lead to several dangers. Observe the pictures well then write the precautions that must be followed to prevent the danger of electricity.



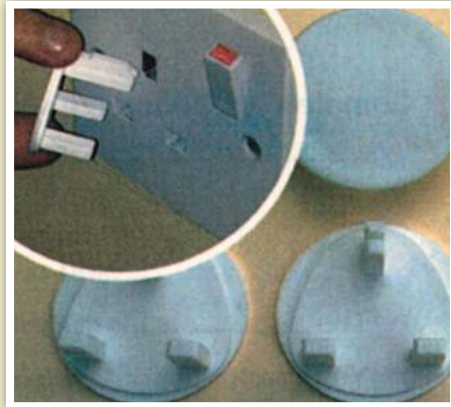
**Fig (2-23): Precautions in dealing with electricity:**

- ☉ **Precautions in dealing with electricity:** .....
- .....
- .....

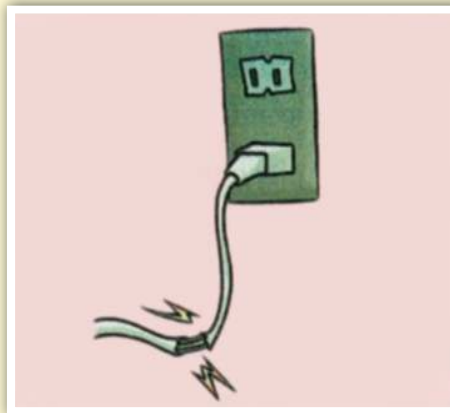


★ *From the previous exercise, we deduce that some precautions in dealing with electricity are:*

- Do not place several connections in the same socket.
- Do not insert a metal object in the socket (nail, non insulated screw driver, metal wire).
- Place a piece of plastic in the socket to prevent inserting another body in it.
- Do not touch the electric machines that are connected to the electrical current with a wet hand.
- Do not leave an electric machine or heater connected with the electrical current while taking a bath.
- Do not play with the electric connections.
- Do not try fix, maintain or clean any electric machine while connected with the electric current.
- Do not place the flammable materials (as curtains, furniture, clothe, covers, rugs, paper) near the electric machines that emit heat (as electric iron, electric heater, spot light, the heater).
- Do not leave the wires naked not insulated.
- Do not place the electric wires extending on the ground so no one trips on them while walking and avoid placing them under the rugs.



**Fig (2-24):** *Placing a piece of plastic in the socket to prevent inserting anything inside it*



**Fig (2-25):** *The naked wires lead to a number of dangers*

# Dangers of electricity and how to deal with it

## Exercises

### 1 Complete the following sentences:

- a ..... and ..... are examples of materials that are electric conductors.
- b ..... , ..... and ..... are examples of materials that are electric insulators.
- c ..... , ..... and ..... are some of the dangers of direct electricity.
- d The body burns resulting from the electric current lead to ..... .
- e You cannot put out the electric fire with water because water is ..... .
- f ..... , ..... and ..... are some of the causes of the electric fires.
- g The electric shock occurs as a result of passing ..... through the human body.
- h The harms resulting from an electric shock depend on ..... and ..... .
- i ..... and ..... are some of the precautions to deal with the electricity.
- j ..... , ..... are some of the causes of the burns resulting from the electricity.

### 2 What would happen if : .....?

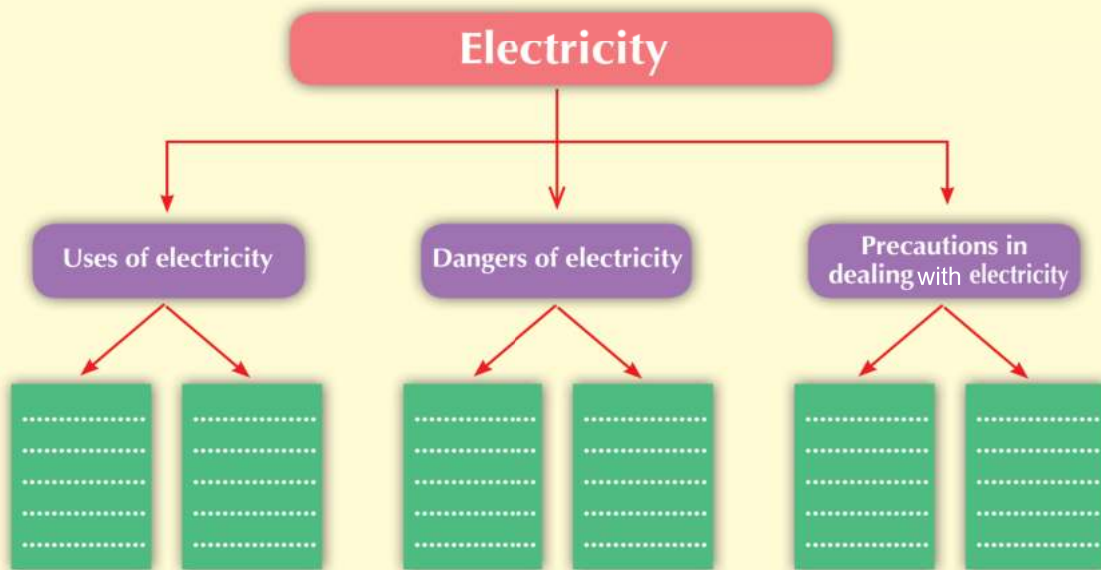
- a You insert a metal bar in an electric socket.
- b You place the electric heater too close to furniture and rugs.
- c You spark resulting from the electric fires touches any part of the body.
- d Touching a naked wire while touching the ground.
- e The electric fire is put out by water.

### 3 Write the scientific term for each of the following:

- a One of the dangers of electricity occurs as a result of the passage of the electric current to the human body.
- b Fires occur as a result of the increase in the temperature of the electric machines.
- c One of the dangers of the electricity is causing the damage of the tissues of the body.



4 Complete the following diagram:



## Unit (2) Test

## Unit (2) Test

## 1 Complete the following sentences:

- a ..... and ..... are two ways for connecting electricity.
- b ..... and ..... are some precautions should be taken while dealing with the electricity.
- c The simple electric circuit consists of ..... , ..... and .....
- d ..... , ..... and ..... are examples of the electric insulating materials.
- e In the case of connecting the lamps in ..... the lighting of the lamps decreases with their increase in number.

## 2 Correct the underlined in the following sentences:

- a The electric lamp converts the electric energy to the kinetic energy.
- b The filament of the light bulb is made of carbon.
- c While connecting the lamps in parallel, the lamps are connected one after the other.
- d There are three connecting points at each end of the light bulb ends.
- e The elelctric fire occurs due to the passage of the elelctric current through the human body.
- f The electric lamp are connected in the house in series.
- g The lamps in the electric circuit continue to work when connected in series if a lamp is damaged.
- h The glass bulb of the electric lamp contains hydrogen gas.
- i Wood is considered a good conductor of electricity.

## 3 Write the scientific explanation to each of the following:

- a The swelling of the electric lamp contains an inert gas instead of air.
- b Not placing metal things inside the socket.
- c There are connecting point at the ends of the fluorescent lamps.
- d Not placing flammable materials too close to the electric machines that generate heat.



**4 Compare between each of the following:**

- a Connecting electric lamps in series and connecting in parallel.
- b The light bulbs and the fluorescent lamp in respect to structure.
- c The conducting materials of electricity and the non-conducting materials.

**5 Write the term of each of the following:**

- a Materials allowing the electric current passing through it.
- b Fires occur due to the increase in the temperature of the electric wires.
- c Materials not allowing the electric current passing through it.
- d The way that the electric lamps are connected one after another, and the intensity of the light of the lamps decrease with the increase in their number.
- e The way to convert the electric energy to light energy.
- f The way that the lamps are connected through branching routes and the light of the lamps are not affected with the increase in their number.
- g One of the dangers of the electricity occurs due to the passage of the electric current through the human body.
- h One of the dangers of the electricity is that it destroys the tissue of the body.

**6 Write your own paragraph on each of the following:**

- a The electric shock.
- b The electric fires.
- c The electric lamp.
- d The precautions that should be taken to deal with the electricity.

# The Universe



## Unit Objectives

By the end of this unit, you should be able to:

- Identify the phenomenon of the solar eclipse.
- Do activities to explain types of eclipses.
- Identify safety precautions on observing a solar eclipse.
- Identify the phenomenon of the lunar eclipse.
- Do activities to explain types of lunar eclipses.
- Compare solar eclipse and lunar eclipse.



## Unit introduction

The universe consists of galaxies which contain stars and planets. These galaxies move away from each other in the universe with great speed, so the universe does not have a certain size and it expands as a huge balloon and the distances between its components are great and measured in light year units.



- \* What can you see in this picture?
- \* Record your observation.
- \* Share in discussion with you classmates and your teacher.

### Lesson One

## The solar eclipse



### Lesson Two

## The lunar eclipse





# The solar eclipse

## Objectives

By the end of this lesson, you should be able to:

- Identify the phenomenon of the solar eclipse and Their types.
- Do activities to explain types of eclipses.
- Identify safety precautions on observing a solar eclipse.

## Basic concepts

- Total solar eclipse
- Partial solar eclipse
- Annular solar eclipse
- Cone shadow
- Penumbra

We all know the shadow of trees and its importance to man. It hides the direct sun rays and so we feel a moderate temperature or when we use the umbrella on a summer's day.



Light spreads in the shape of straight lines as long as nothing prevents its path. If a dark object like the tree or the umbrella gets in the way, a shadow is formed of this object.

This also happens when the moon passes between the Earth and the sun on one straight line. It hides the sunlight from us and a shadow of the moon is formed. This phenomenon is called the solar eclipse.

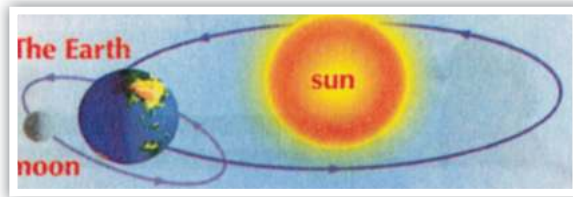
Did you see the sun eclipse? It happens when the sun disappears or part of it during noon time.





## The solar eclipse phenomenon

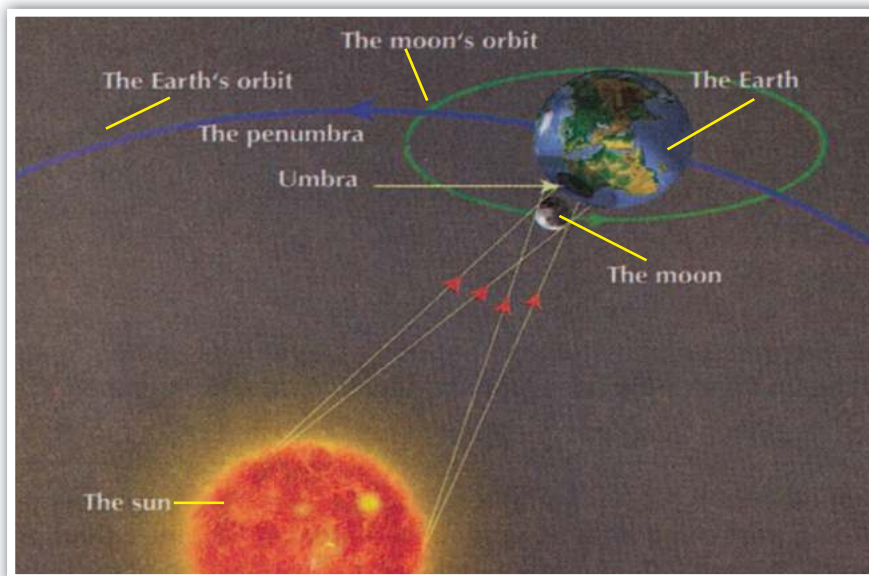
The moon revolves around the earth in a specific orbit. The Earth revolves with its moon in a specific orbit around the sun. As a result, an astronomical phenomenon occurs known as **the solar eclipse**.



**Fig (3-1):** The moon revolves around Earth and they both revolve around the sun.

This phenomenon occurs when the earth, the moon and the sun are nearly on one straight line with the moon in the middle. The moon casts its shadow on the earth hiding the sunlight from a part of the earth.

If we are in a suitable place to see the solar eclipse, we will see the dark circle of the moon pass the lighted circle of the sun.



**Fig (3-2):** The solar eclipse occurs when the moon is located between the Earth and the sun on one straight line.

## How does the solar eclipse occur?.

In order to identify how the solar eclipse occurs when the moon comes in between the sun and Earth in different positions; do the following activities on how objects' umbra and penumbra are formed when they come in the way of the light rays.

# The solar eclipse



## Activity

How is the cone shadow and semi-shadow of a dark object like the moon formed?

- ☉ **What do you need?** Two light sources (one of them is bigger than the other), a screen, a tennis ball, a ball's holder.

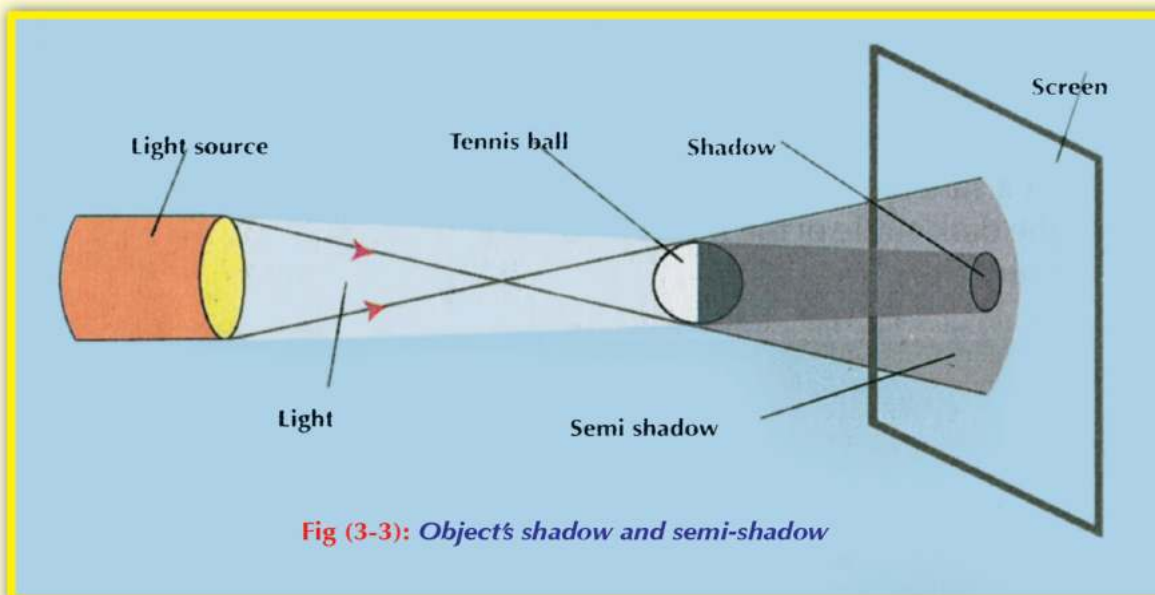


Fig (3-3): Object's shadow and semi-shadow

☉ **What should you do?**

- ◆ Put a tennis ball between the small light source and screen.
- ◆ Move the ball toward and away of screen until shadow area is formed.
- ◆ Repeat the previous activity steps but use a bigger light source in a way that emits a beam. Notice the occurring change. Record and explain your remarks:  
.....  
.....
- ◆ If the light source is bigger (as the sun, lamps,...etc), an area of a semi-shadow appears on the screen between the lighted area and the real shadow area. If we stand in the semi-shadow area and look in the direction of the light source, we will see a part of it.

### Types of solar eclipse

The total solar eclipse is formed in the shadow area of the moon on the Earth (a 250 km radius) in which we can not see the sun completely.



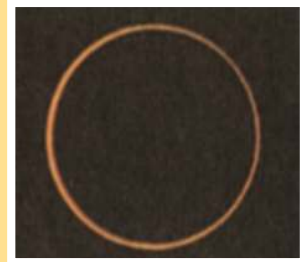
**Fig (3-5):** *Total solar eclipse.*

In the semi-shaded area of the moon, we can see a part of the sun forming what is known as the partial solar eclipse.



**Fig (3-6):** *partial solar eclipse.*

When the moon comes in an orbit higher from Earth as it revolves around it in an oval orbit, the cone shadow does not reach the Earth's surface. So, annular solar eclipse is formed.



**Fig (3-7):** *annular solar eclipse*



**Safety precautions on observing the solar eclipse:**

Doctors warn of direct observation of the sun as its rays harm the eye and it can lead to blindness within a few minutes.

Although the sun glow in the solar eclipse is weak so as to focus looking directly at the sun, it affects the eye in general or the retina. This is because the outer solar corona keeps on emitting a harmful ray to the eye like ultraviolet (UV) ray and the infrared ray. Thus, special glasses are used to observe the solar eclipse.



**Fig (3-9):** *We should not look directly at the sunlight.*

**Think and calculate**

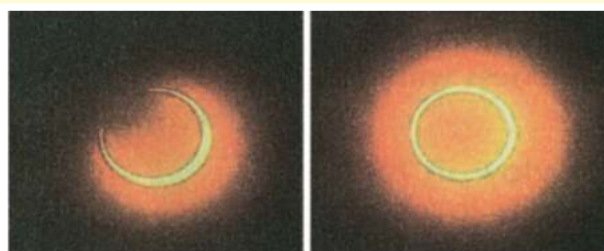
The last solar eclipse that occurred in the Middle East and North Africa was on Wednesday 29th march, 2006.  
We have to wait until August, 2027 to be able to see it again  
What is the time needed for the solar eclipse phase to occur at our region again?

**Do you know**

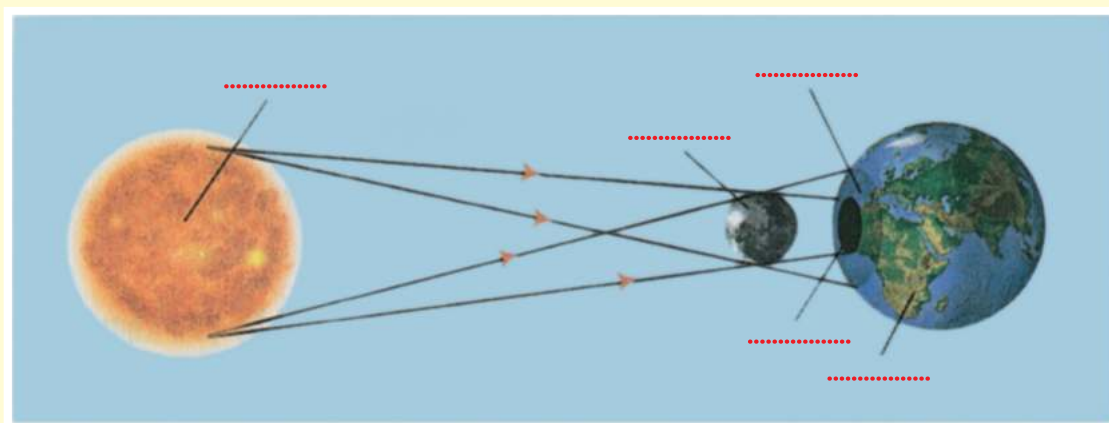
Ancient people from the Babylon age managed to identify the occurrence times of both solar and lunar eclipses tentatively for periods that may last for two years in advance.

### Exercises

- 1 Notice the two cases of the solar eclipse in the opposite figure: identify their types and explain the reasons for their occurrences:

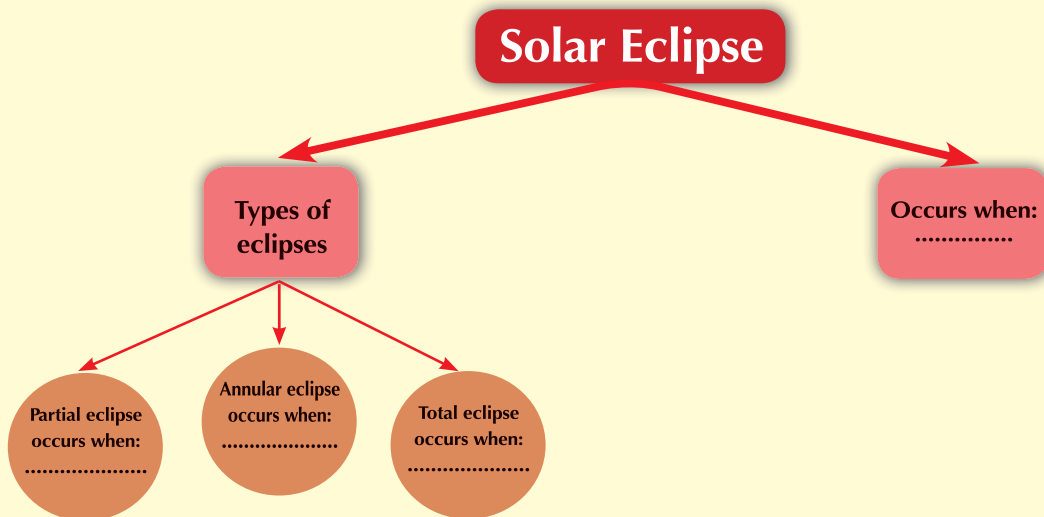


- 2 Notice the following figure: write the labels on the drawing and explain the reason for the occurrence of the solar eclipse.



- 3 Justify:
  - a We should not look directly at the sun with the naked eye.
  - b An annular eclipse occurs when the moon comes in an orbit higher Earth.
  - c The type of solar eclipse differs according to the movement of the moon in front of the sun.

4 Notice the following figure and determine when each eclipse occurs:





# The lunar eclipse

## Objectives

By the end of this lesson, you should be able to:

- Identify the phenomenon of the lunar eclipse.
- Do activities to explain types of eclipses.
- Compare solar eclipse and lunar eclipse.

## Basic concepts

- Lunar eclipse
- Types of lunar eclipse
- Total lunar eclipse
- Partial lunar eclipse
- No eclipse
- Cone shadow
- Penumbra (semi-shadow)

Have you ever seen a lunar eclipse? Is lunar eclipse similar to solar eclipse?



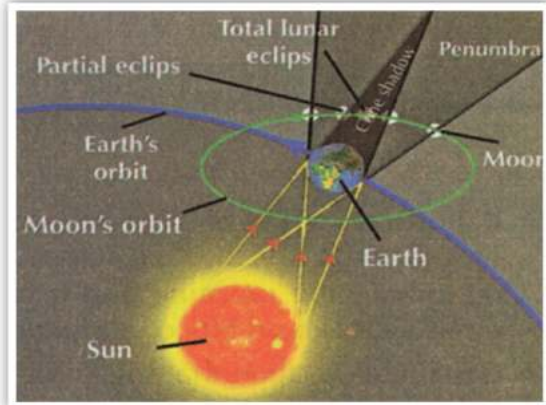
Lunar eclipse occurs when the sun, Earth and the moon are on one straight line and Earth is in the middle. Consequently, the moon enters in Earth's shadow which hides the sun ray from it.

A lunar eclipse can be easily seen from the surface of Earth. It lasts for an hour or two as the surface of the moon gets colored gradually with red and then returns to its original natural color.



### The lunar eclipse phenomenon

The phenomenon of the lunar eclipse occurs in the middle of the lunar month when Earth hides the sunlight or a part of it from the moon at a rate of two lunar eclipses per year.



**Fig (3-10):** Lunar eclipse occurs when the earth hides the sunlight or apart of it from the moon



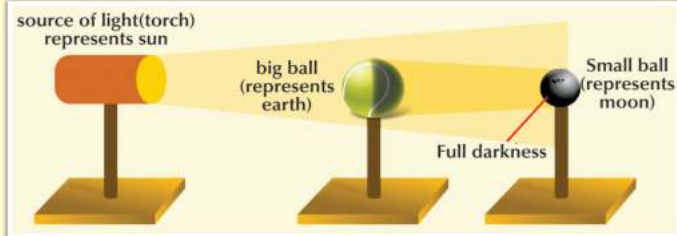
### Activity

#### How does lunar eclipse occur?

- **What do you need ?** A source of light (a torch) - big ball - small ball - 3 holder.

- **What should you do?**

- ◆ Put both the torch and small ball on each holder.
- ◆ Focus the light of the torch on the small ball so that the two on one straight line and notice the ball lighting.
- ◆ Put the big ball on the holder and move it between the torch and small ball , notice the small ball lighting another time.
- ◆ Imagine the source of light (torch) represents the sun, the big ball represents the earth and the small ball represents the moon. Try to explain how the lunar eclipse occur, .....



**( Fig 3 - 13 )** How does lunar eclipse occur?

★ *when the earth comes between the moon and the sun and they are all on one straight line so the earth hides the sunlight from the moon. the total lunar eclipse is formed when the entire moon falls in the shadow of the earth, The lunar eclipse becomes partial if a part of the moon falls in the penumbra area.*

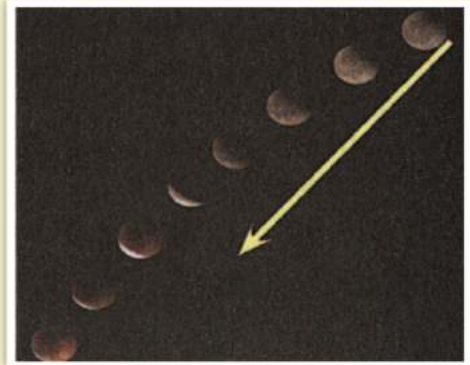
### Activity

#### Observe, describe and calculate



#### ● Notice the opposite figure:

- ◆ It illustrates a part of lunar eclipse phases on 21st February, 2008. It started at three o'clock in the morning and it ended at three o'clock and fifty one minutes at the same day.
- ◆ Calculate the time that this lunar eclipse took: .....
- ◆ Describe and determine types of lunar eclipse that the figure illustrates: .....



**Fig (3-12):** *Phases of Lunar eclipse*





**Fig (3-13): Total lunar eclipse.**

### Types of lunar eclipse:

#### ① Total lunar eclipse:

Total lunar eclipse occurs when the whole moon enters the shadow area of Earth. In this case, a total lunar eclipse occurs.

The sun, the Earth and the moon are on a straight line with the Earth in the middle.

In the start of the total lunar eclipse, the color of the moon tends to be red due to the red ray that can not be absorbed from above the atmosphere to the earth.



**Fig (3-14): Partial lunar eclipse.**

#### ② Partial lunar eclipse:

It occurs when a part of the moon enters the shadow area of the Earth. In this case, a partial lunar eclipse occurs.

But when the moon enters the semishaded area only, the moon light turns to be faint without being eclipse. This case is known as no eclipse.



**Fig (3-15): Moon in the semishaded area**

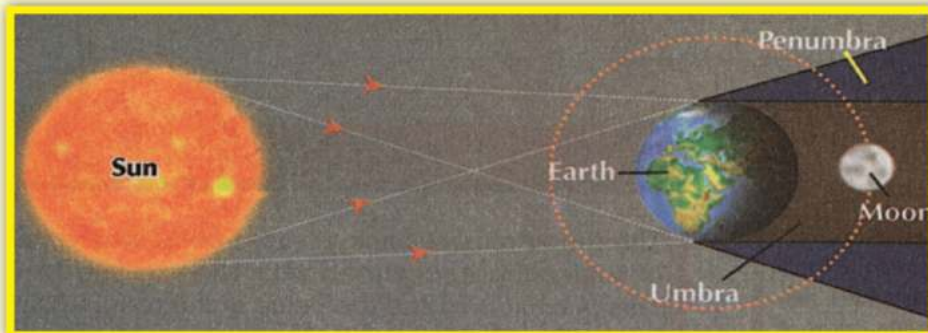
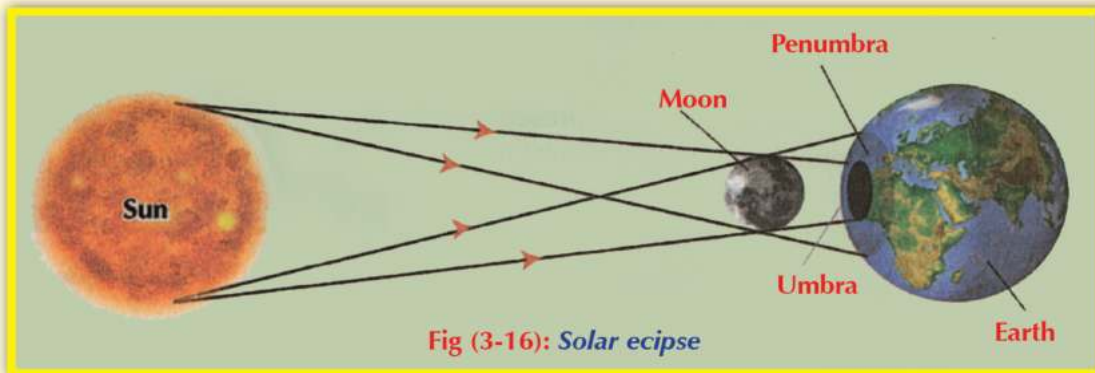


## Activity

### Compare between solar eclipse and lunar eclipse

● Notice the two following figure:

- ◆ Determine aspects of similarities and differences between the two phenomena of solar and lunar eclipses:



- Aspects of similarities: .....
- Aspects of differences: .....

## The lunar eclipse

By comparing the two phenomena of the solar and lunar eclipses, we notice that:

- 1 Lunar eclipse occurs when the Earth comes between the moon and the sun on one straight line whereas solar eclipse occurs when the moon comes between the Earth and the sun on one straight line.
- 2 Lunar eclipse differs from solar eclipse in that it can be seen from any place on Earth when the sun is behind the horizon at night whereas solar eclipse always occurs in the morning.
- 3 Lunar eclipse does not require precautions, warnings or special devices to look at it as in the case of the solar eclipse. This is because the lunar eclipse does not cause any harm to the eye when looking at it whereas the solar eclipse can cause serious harms to the eye on looking directly at it.
- 4 Each of the lunar or solar eclipses represents an astronomical phenomenon which results in the hiding of all or part of each of the sun or the moon from the Earth's population for a period of time.
- 5 The duration of the solar eclipse does not exceed seven minutes and a few seconds whereas the duration of lunar eclipse extends for more than 2 hours.



Fig (3-18): Solar eclipse.



Fig (3-19): Lunar eclipse.

### Do you know?

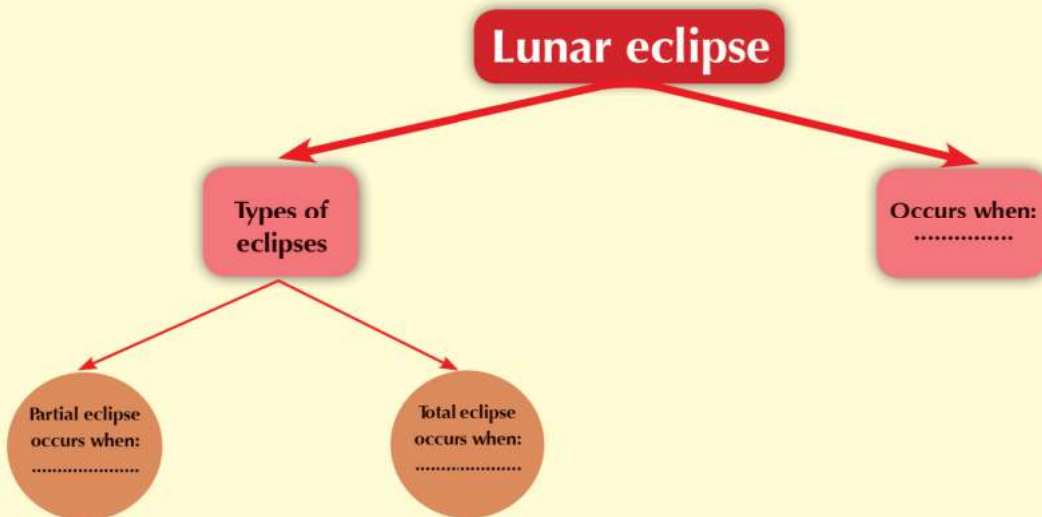


The lunar eclipse phenomenon occurs in the middle of the lunar month when the Earth hides the sunlight or a part of it from the moon at a rate of two lunar eclipses per year. The only time in which the lunar eclipse occurred three times was in 1982.



## Exercises

- 1 Compare between the two phenomena of lunar and solar eclipses.
- 2 Put a (✓) or a (✗) in front of each statements giving a reason:
  - a Although the two phenomena of lunar and solar eclipses attract people's attention, they do not affect life on Earth. ( ).
  - b The two phenomena of lunar and solar eclipses are repeated regularly and can be predicted ( ).
- 3 Draw a diagram that illustrates the lunar eclipse.
- 4 Why is not an annular lunar eclipse formed like the solar eclipses?.
- 5 Examine the following figure and determine when does the lunar eclipse occur.



## Unit (3) Test

**1 Justify:**

- a We should not look at the sun by the naked eye.
- b The type of the solar eclipse differs due to the movement of the moon in front of the sun.
- c No annular lunar eclipse is formed like the annular solar eclipse.
- d We can not see the sun completely during the total solar eclipse.

**2 Complete the following sentences:**

- a The ..... phenomenon occurs continuously when the ..... hides the sunlight during its pass in front of it from a part of the earth.
- b ..... occurs when the ..... comes between the sun ray and a part or whole of the moon.
- c A ..... solar eclipse is formed when the moon is located in an orbit higher than the earth.

**3 Put a (✓) in front of the correct statements and a (✗) in of the false ones and correct the false:**

- a Since the past, man has been observing the stars and planets. He managed to develop some accurate calculations of their movement in space. ( )
- b On the contrary of the solar eclipse, the lunar eclipse can be easily seen from the surface of the Earth by the naked eye. ( )
- c More than one type of solar eclipse can be observed. ( )

**4 Define the following terms:**

- a Cone shadow
- b The penumbra.
- c Total solar eclipse.
- d Partial solar eclipse.
- e Total lunar eclipse.

**5 Compare between each of the following:**

- a Solar and lunar eclipses.
- b Total solar eclipse and annular solar eclipse.

**6 Mention the term:**

- a It occurs to the moon when it completely enters the shadow area of the Earth.
- b It occurs when part of the moon enters the semi-shadow area only.
- c It occurs when the moon comes between the earth and the sun on one straight line.



# Unit 4 Unit

## Structure and Function of Living Organisms



### Unit Objectives

By the end of this unit, you should be able to:

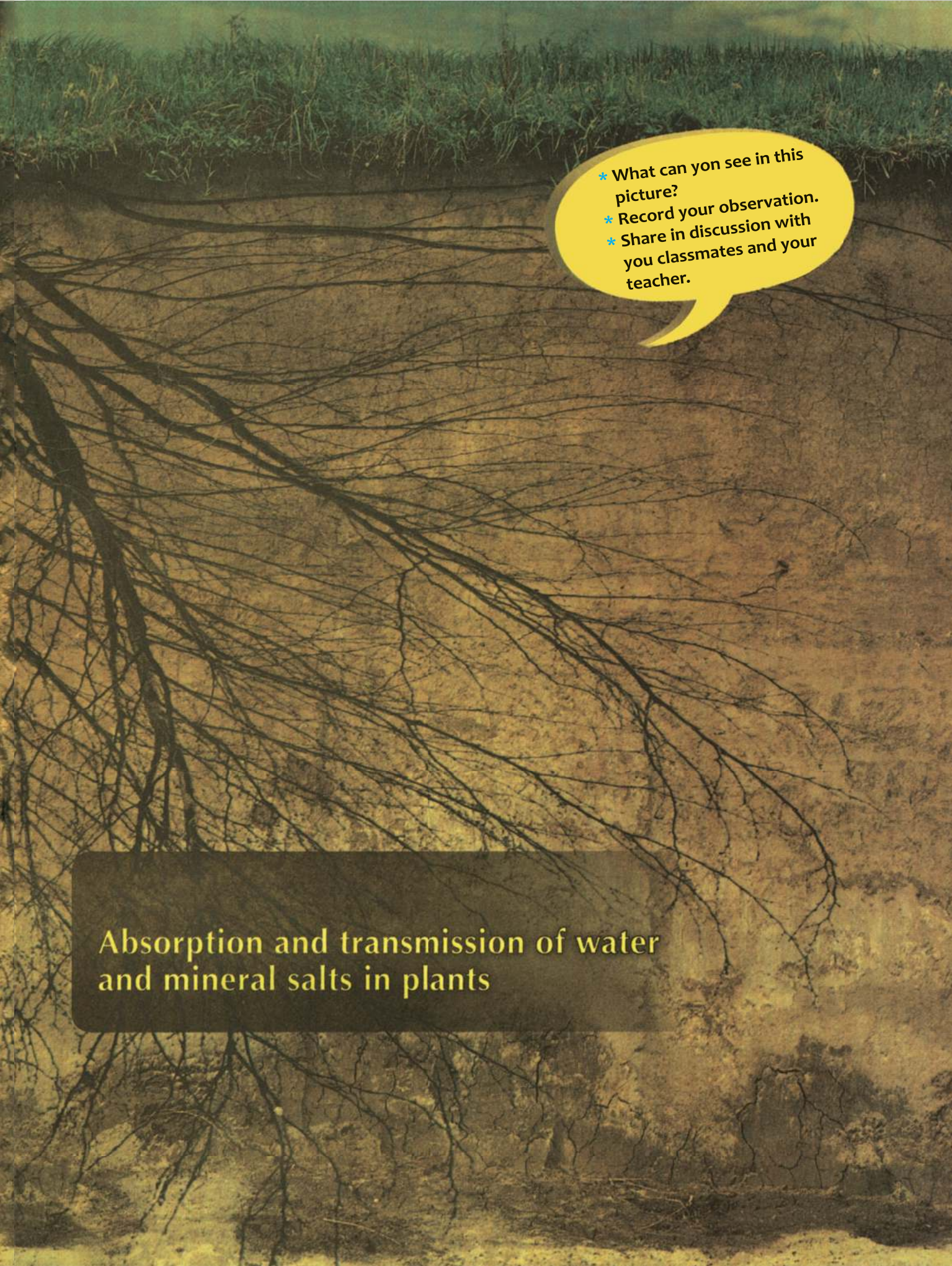
- Identify the role of root hairs in absorption of water and mineral salts from the soil.
- Identify the transmission of water and dissolved substances in plants.
- Identify the transpiration process in plants.



### Unit introduction

Plants perform photosynthesis process in which it requires water, carbon dioxide and sunlight. This unit explains how the plant gets water and necessary mineral salts and the way they rise to different parts of plants.



- 
- \* What can you see in this picture?
- \* Record your observation.
- \* Share in discussion with you classmates and your teacher.

## Absorption and transmission of water and mineral salts in plants



# Absorption and transmission of water and mineral salts in plants

## Objectives

By the end of this lesson, you should be able to:

- Identify the role of root hairs in absorption of water and mineral salts from the soil.
- Identify the transmission of water and dissolved substances in plants.
- Carry out experiment to identify the transpiration process in plant.

## Basic concepts

- Root system.
- Root hair.
- Osmosis.
- Selective Permeability
- Transpiration process.

Read the lesson introduction and notice the new concepts. Record them on a separate paper and discuss them with your colleagues.



Green plants depends on raw materials in their environment to form its food. they take carbon dioxide from the air and water and mineral salts from soil. Through these simple materials and with the presence of light, plant forms its food by the photosynthesis process.

In addition to the mentioned elements, plants need very little amounts of other elements such as phosphorus, magnesium, calcium, nitrogen, zinc.... and others. These elements also are essential for plant's life.

The absorption of water and mineral salts from the soil occurs through root hairs in the roots.



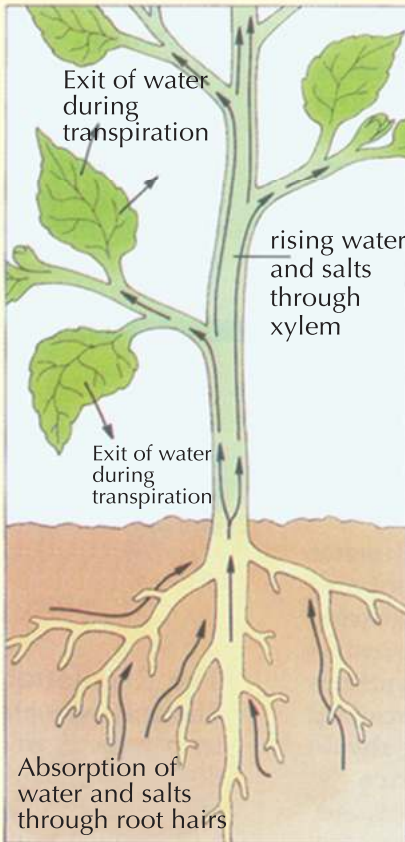
**Fig (4-1):** Green plants depend on raw materials in the environment for their nature.





## Activity

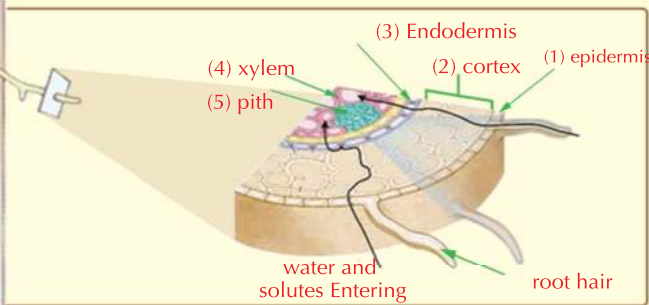
### What is the structure of plant root?



◉ **What do you need?** planter containing implanted plant.

◉ **What should you do?**

- ◈ Remove plant from planter then examine it and define the different parts.
- ◈ Notice the root system .
- ◈ Notice the structure of the root as illustrated by the cross - section in plant's root.
- ◈ Write your observations.



(4-2) The internal structure of plant root

#### ★ From the previous you notice:

- the root consists of many layers of differentiated cells : thin external layer called external epidermis followed by thick layer called cortex, then endodermis ( internal epidermis), then pith and xylem.
- The root system penetrates through the soil particles and performs important function of the plant .
  - ① Fixing the plant in the soil.
  - ② Absorption of water and salts from soil.

## Transmission of water and dissolved salts (solutes) from the root to the rest of the plant.

- The root hair contains a big vacuole. The salt concentration in vacuole is larger than the concentration of the soil solution which helps to transfer water from the soil into the root hair through its semi-permeable membrane by osmosis (Transmission of water from an area with a low concentrated solution to an area with a high concentrated solution) then, it moves to the epidermis which regulates water crossing into xylem where it is raised to reach the stem and other parts of the plant.
- The mineral salts are transported from the soil into the root hair through the semi-permeable membrane, according to the plant's needs of these salts. the plant can identify the elements and allow it to pass through the cell membranes or not which known as selective permeability.

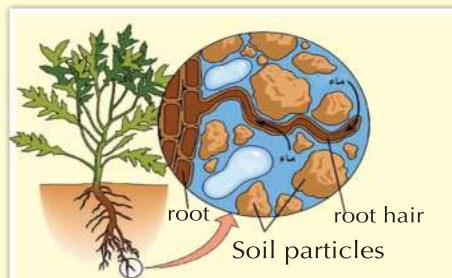


Fig (4-4) Transmission of solutes from soil to root hair

### Activity

#### What is meant by the process of transpiration?

☉ Participate with your colleagues in doing this activity.

☉ **What do you need?** Bell-jar, growing plant in a planter, a glass board, vaseline, fabric.

☉ **What should you do?**

- ◆ Cover the soil and the planter with a fabric coated in vaseline. Tie tightly around the base in order to prevent water loss from soil and planter walls.
- ◆ Put the planter under the bell-jar and over the glass board.
- ◆ Leave the plant for several hours.

☉ **What do you notice?**

- ◆ Do you see water drops formed on the inner walls of the bell?
- ◆ What is the source of these water drops?
- ◆ What is your explanation for that?

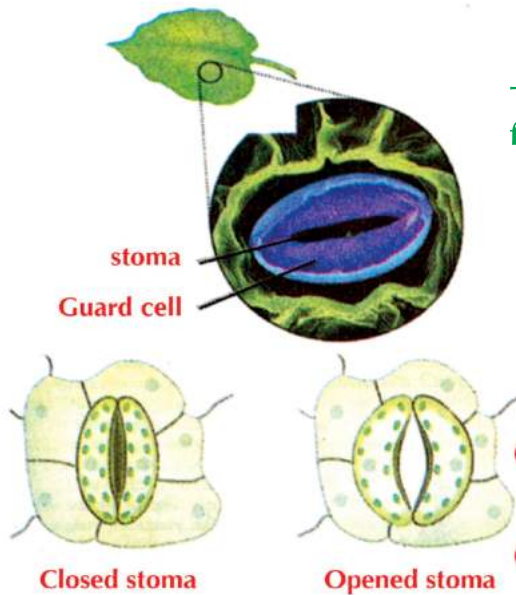


Fig (4-4): Observe the formation of water drops on the inside of bell-jar.

**★ From the previous activity you notice: The condensation of water droplets on the inner surface of the bell-jar which their source is the green parts of the plant. This is due to the vital process of the plants called the process of transpiration.**



# Absorption and transmission of water and mineral salts in plants



**Fig (4-5): A stoma through which plants lose water vapor**

**The process of transpiration and its role in the juice raising from the root to the parts of the plant .**

The plant leaves and the green parts contain tiny holes called “**stomata**” widespread on the lower surface comparing with the upper surface of the leaf. Each stoma is surrounded by two guard cells which help in open and close the stoma.

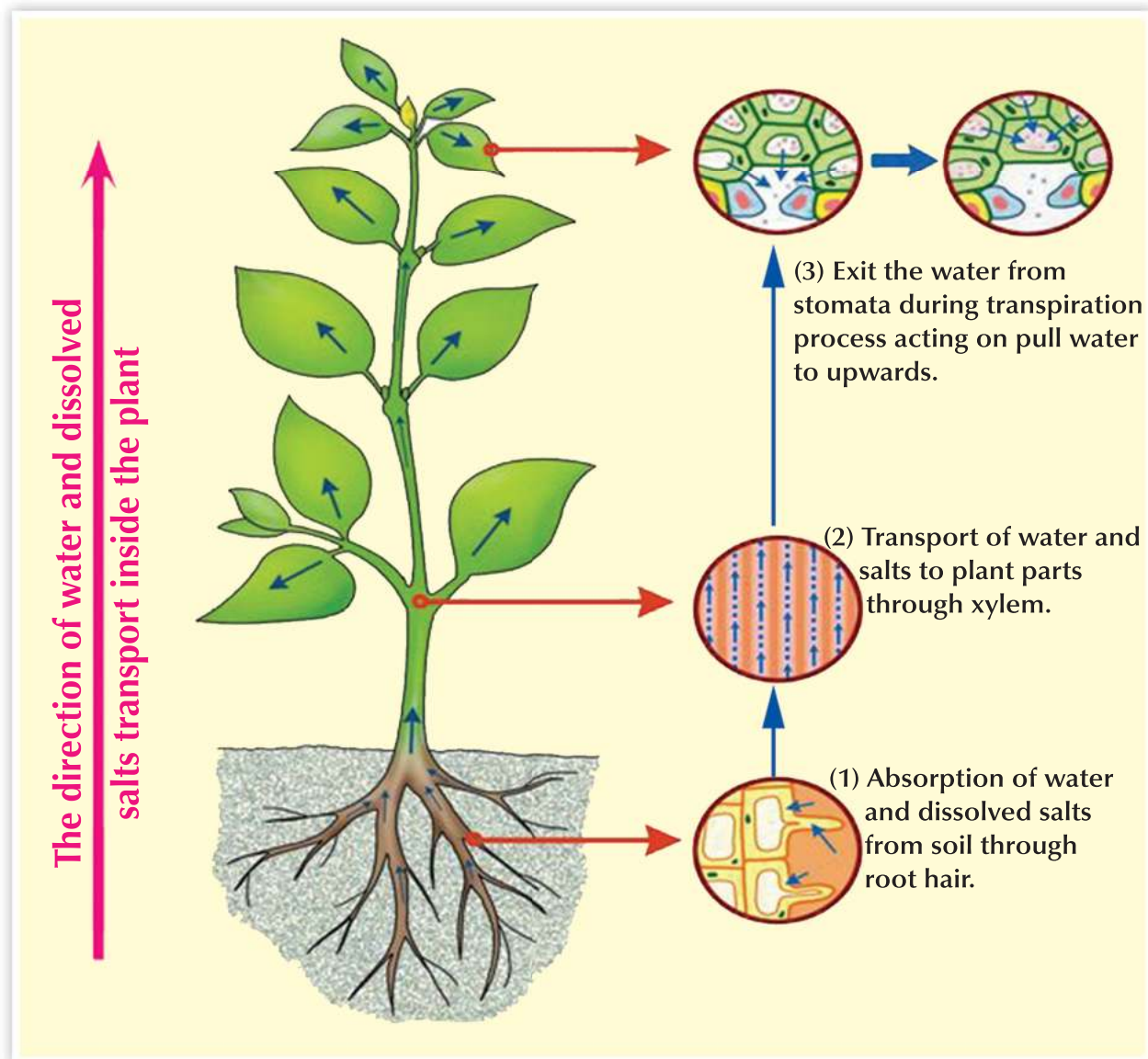
- The two guard cells change its shape to open and close the stoma.
- the stoma is opened to get out the excess water of the plant need in the form of water vapour to the surrounding environment of the plant.



## • The process of transpiration:

The process of transpiration is known as the loss of excess water of the plant needs in the form of the water vapour through stomata which spread on the two surfaces of the leaf and other green parts to the surrounding environment of the plant.

The process of transpiration helps to raise water and solutes to the upper part of the plant, as loss of water during the process of transpiration generates a pulling force that raises the water and solutes to the stem and leaves (Fig. 4 - 7 )



(Fig. 4 - 7 ) The role of transpiration process in raising the juice to upwards.



### Exercises

#### 1 Choose the correct answer:

- a In Plants Stomata are wide spreading on:
- 1 Stem                      2 Leaf upper surface                      3 Leaf lower surface
- b Root hair absorbs most water by:
- 1 Imbibition                      2 Osmosis                      3 Selective Permeability
- c Plant loses water in form of water vapor in ..... .
- 1 Photosynthesis                      2 Transpiration                      3 Evaporation

#### 2 Write the scientific concept of each following statements:

- a Transmission of water molecules through a semi-permeable membrane from an area with a low concentrated solution to an area with a high concentrated solution.
- b A structure extends from root wall which absorbs water.
- c Biological process through which plants lose water in the form of vapor.
- d Structure in plant, water passes through it from root to stem to leaves.
- e Two cells surround the stoma in the plant leaves.
- f The ability of cell membrane of root hair to allow of some salts to run through it according to the plant's need

**3 Re-write the following sentences after Correcting the underlined words:**

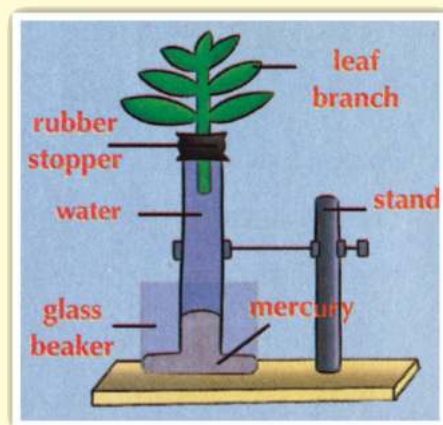
- a Respiration process contributes in water and dissolved substances transmission to top of the plant.
- b Stem extends and penetrates in the soil to increase the absorption surface.
- c Plant loses water in the form of water vapor in photosynthesis.
- d Plant stomata are surrounded by two woody cells.

**4 Put (✓) in front of correct statements and (✗) in front of wrong statements in each of the following and correct the wrong one:**

- a Stem extends and penetrates in the soil to increase the absorption surface ( ).
- b Plant loses water in form of water vapor in photosynthesis ( ).
- c Plant roots are surrounded by two guard cells. ( ).







**5 The following figure represents an experiment you have made during your studies. Which of the following you will notice after several days of experiment start?**

- a Mercury level will reduce.
- b Mercury level will rise.
- c Mercury level will remain the same.



**6 What is meant by each of the following:**

- a Transpiration.
- b Osmosis.
- c Selective permeability

QR	Video title	Unit	
	Types of levers	<b>One</b> Force and motion	1
	Electric lamps	<b>Two</b> Electric energy	2
	Electric lamps		3
	The Solar eclipse	<b>Three</b> The Universe	4
	The lunar eclipse		5
	Absorption and transmission of water and mineral salts in plants	<b>Four</b> Structure and function in living organisms	6



## المواصفات الفنية:

١/٨ (٨٢ X ٥٧) سم	مقاس الكتاب:
٤ ألوان	طبع المتن:
٤ ألوان	طبع الغلاف:
٨٠ جرام أبيض	ورق المتن:
٢٠٠ جرام كوشيه	ورق الغلاف:
٨٤ صفحة	عدد الصفحات بالغلاف:
١٠/٦/٢٢/١٥/٤/١١٠٤	رقم الكتاب:

جميع حقوق الطبع محفوظة لوزارة التربية والتعليم والتعليم الفني



<http://elearning.moe.gov.eg>