



Arab Republic of Egypt
Ministry of Education
Book Sector

Science and Life

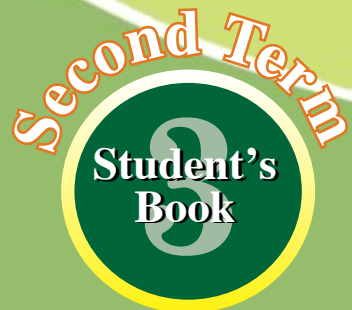
Discover and Learn

Third Preparatory



2015-2016

غير مصرح بتداول هذا الكتاب خارج وزارة التربية والتعليم



Introduction

This book is considered a cornerstone in the third preparatory developed science curriculum, that achieves the objectives of developing curricula in order to cope with the 21st century.

Our curriculum aims to achieve the following educational directions:

- ★ Highlighting the relation between Science and Technology in the science domain and its reflection on the development process.
- ★ Emphasizing the suitable situations that distinguish the effect of the scientific and technological progress in producing knowledge.
- ★ Emphasizing students practicing their active and conscious behaviour toward using the technological outcomes.
- ★ Emphasizing students ability in the scientific thinking methodology, then the possibility for them to move from learning depending on receiving knowledge to learning depending on self-learning in an atmosphere of joy and amusement.
- ★ Students depending on exploring to reach information and gain much experiences through developing the essential thinking skills such as observation, analysis, concluding and reasoning.
- ★ Providing opportunities to students for practicing citizenship through the methods of self-learning and the team work spirit, negotiating and confessing, accepting others and rejecting extremists.
- ★ Enriching students with various life skills, and the practical capabilities through increasing all interests in the practical and scientific domain.

This book contains four integrated units, each one contains a set of integrated lessons achieving the concerned objectives.

We hope that this book may benefit our sons for the favour of our country Egypt.

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Safety in Science

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

Safety Tips

- ✓ Read each experiment carefully.
- ✓ Wear safety goggles when needed.
- ✓ Clean up spills right away.
- ✓ Never taste or smell 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 after you finish an experiment.
- ✓ Wash your hands thoroughly after each experiment.





Second Term - Unit One

Chemical Reactions

Introduction

Biological process inside the human body are a group of biochemical reactions that aim to keep life according to fixed systems. Also, processes performed at factories which aim to produce different materials needed in life are chemical reactions.

So, industrial and agricultural productions, the continuation of living organisms and even the fuel inside Earth are all chemical reactions.

UNIT OBJECTIVES



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

- ✓ Identify the different types of chemical reactions.
- ✓ Distinguish between the reactions of thermal decomposition, simple and double substitution.
- ✓ Identify the concepts of oxidization, reduction, and concepts of oxidizing and reducing agents.
- ✓ Identify the concept of the speed of the chemical reaction.
- ✓ Identify the factors affecting the speed of the chemical reaction.
- ✓ Deduce the effect of both (the nature of reactants, concentration, temperature and catalysts) on the speed of a chemical reaction.
- ✓ Evaluate the importance of chemical reactions in our life.

Included issues



Conservation of resources

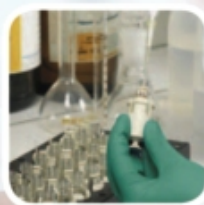
Integrating Sciences



- ◆ Biology : through identifying the role of enzymes.



Lesson 1
Chemical reactions



Lesson 2
Speed of the chemical reaction



Lesson 3
Mixtures

Chemical Reactions



Lesson objectives

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

- ✓ Identify the types of chemical reactions.
- ✓ Distinguish between thermal decomposition, simple and double substitution reactions.
- ✓ Identify the concepts of oxidization, reduction, oxidizing agent and reducing agent.



Lesson terms

- ◆ Thermal decomposition reactions.
- ◆ Simple substitution reactions.
- ◆ Double substitution.
- ◆ Oxidization.
- ◆ Reduction.

Chemical reactions have a great importance in our life. For example, When gasoline is burnt in the car engines, it generates a power which makes move. Another example, plants food is produced by the photosynthesis process which depends mainly on the reaction of carbon dioxide with water.

Different types of medicines, fertilizers and artificial fibers are examples of the chemical products .

Chemical reaction is the breaking up of bonds in reactant molecules and the formation of new bonds in the products molecules .

Are all chemical reactions similar?



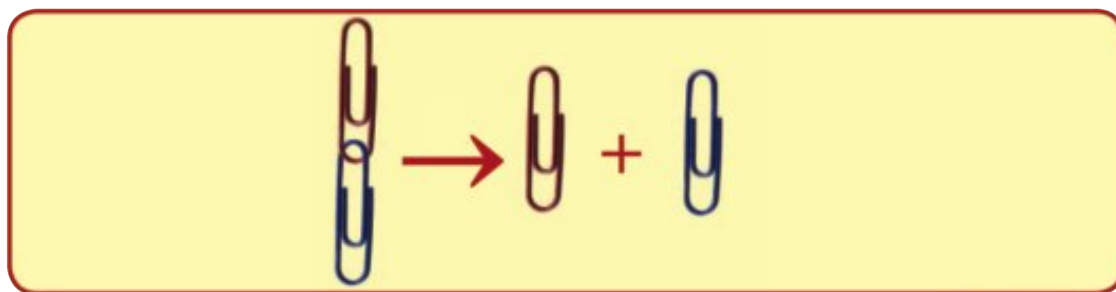
▲ Figure (1) : Chemical reactions occur in many aspects in our life.

Chemical reactions are different and can be classified into many types .

First: Thermal decomposition reactions.

In this kind of chemical reactions, the compound decomposes by heat into its simple components. It may decomposes completely into its simple elements or a more simpler compounds.

Decomposition reactions can be represented using paper clips as in the following figure:



▲ Figure (2) : Representation of thermal decomposition reactions.

Activity

Discover :

Some Substances decompose by heat

Tools:

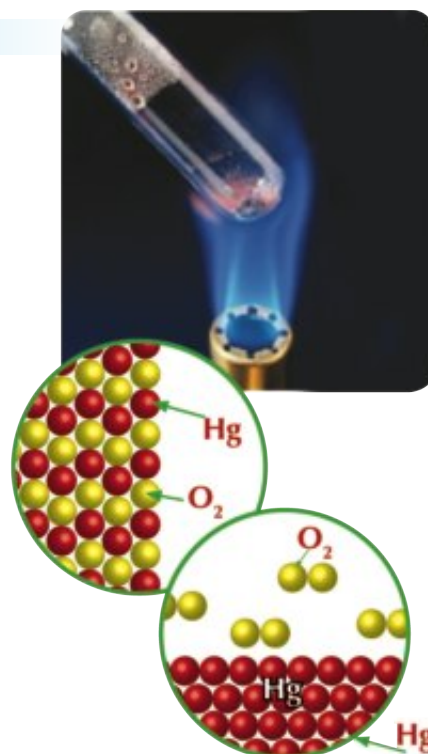
Red mercuric oxide – copper hydroxide – copper carbonate – copper sulphate – sodium nitrate – test tubes – flame – matches-test tube holder .

Procedures:

- 1 Put a little amount of mercuric oxide in a test tube.
- 2 Heat the mercuric oxide.
- 3 Get the lightened stick of matches close to the mouth of the tube.

What do you notice?

- 4 Repeat the previous steps with the other compounds.
- 5 Record your observations about each compound.



▲ Figure (3) : Thermal decomposition of red mercuric oxide

- Some metal oxides decompose by heat into the metal and oxygen. Red mercuric oxide decomposes by heat into mercury (**silvery**) which precipitates at the bottom of the tube and oxygen that **evolves** at the mouth of the tube. This causes the glowing of the match stick.



- Also, some metal hydroxides decompose when heated into metal oxide and water. Blue copper hydroxide decomposes by heat into copper oxide (black) and water vapor.



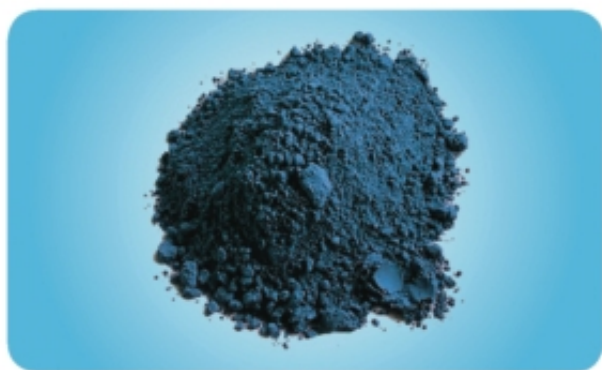
- Most metal carbonates decompose by heat to metal oxide and carbon dioxide. Green copper carbonate decomposes by heat to black copper oxide and carbon dioxide.



- Most metal sulphates decompose when heated to metal oxide and sulphur trioxide. blue copper sulphate decomposes by heat into black copper oxide and sulphur trioxide.



- Some metal nitrates decompose by heat and oxygen gas evolves . White sodium nitrates decompose by heat into yellowish white sodium nitrite and oxygen.



▲ Figure (4) : Copper hydroxide (blue coloured) decomposes by heating into copper oxide (black coloured)

Second: Substitution reactions

Substitution reactions occur when there is an active metal that replaces another less active metal in another compound.

These reactions are identified by knowing the more active elements in the series of chemical activity. The series of chemical activity is an arrangement of the metals in a descending order according to their chemical activity. The element which is more active substitutes the less active one.

All elements above hydrogen in the series replace hydrogen in acid solutions, whereas the elements that follow hydrogen do not replace hydrogen in acids except under certain conditions.

Substitution reactions are classified into two types:

a Simple substitution reactions:

- They are reactions in which an element replaces another one that the substituting element is more active than the substituted one.
- Substitution reactions can be represented by paper clips as follows:

Potassium	K
Sodium	Na
Barium	Ba
Calcium	Ca
Magnesium	Mg
Aluminum	Al
Zinc	Zn
Iron	Fe
Tin	Sn
Lead	Pb
Hydrogen	H
Copper	Cu
Mercury	Hg
Silver	Ag
gold	Au

▲ **Figure (5) : The series of chemical activity**



▲ **Figure (6) : Representation of simple Substitution reactions**

1 A Metal substitutes the hydrogen of water or an acid :

Metals substitute hydrogen of water to produce metal hydroxide and hydrogen evolves .

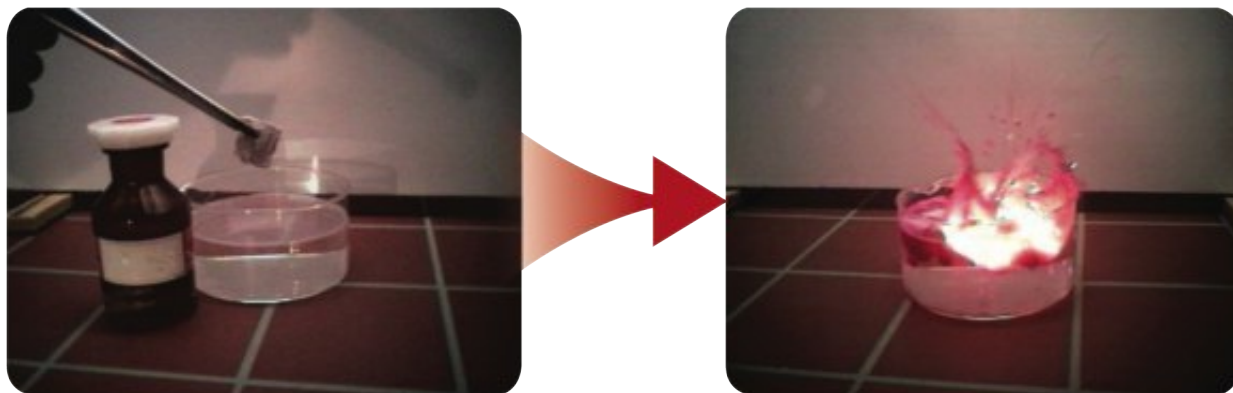
Activity

Discover :

The reaction of water with sodium

Tools:

A small piece of sodium – a glass of water - tongs



▲ Figure (7) : Reaction of water with sodium

Procedures:

- Place the piece of sodium in the glass of water.

What do you notice?

.....

What do you observe?

.....

The reaction equation is :



Metals react with water as they substitute hydrogen of water to produce the metal hydroxide and hydrogen evolves .

Be alert

Important Notice

- Be careful when performing this reaction as this will lead to explosion and ignition. Put a small piece of sodium.

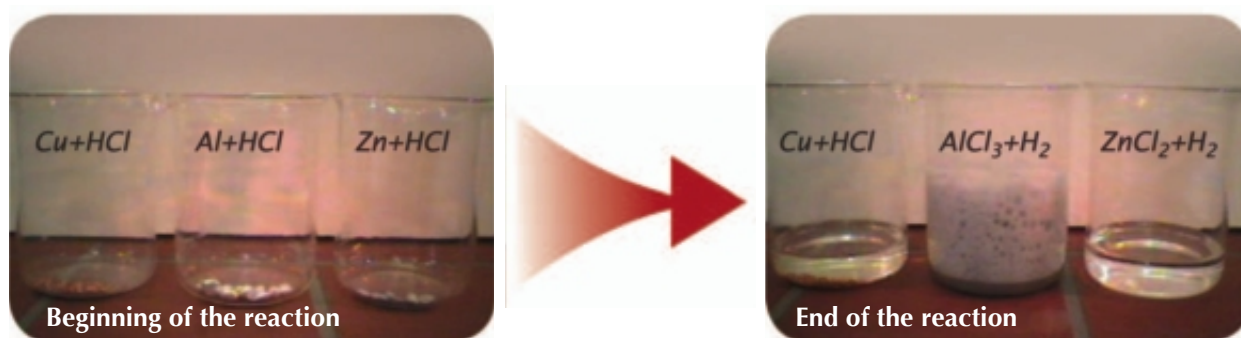
Activity

Discover :

The reaction of water with sodium

Tools:

Diluted hydrochloric acid - 3 beakers - zinc - aluminium turning - copper turning



▲ Figure (8) : Metals react with acids where they substitute acid hydrogen

Procedures:

- 1 Put a little amount of zinc in a beaker, put a few aluminium turning in the second one and a few copper turning in the third one.
- 2 Add a little diluted hydrochloric acid to each beaker.

What do you observe?

- What do you observe in the Zinc beaker ?
- What do you observe in the aluminium beaker?.....
- What do you observe in the copper beaker?

After a while

- What do you observe in the aluminium beaker?
- Does a reaction occur with the copper turning?

On adding dilute hydrochloric acid, it does not react with copper whereas it reacts with zinc immediately composing a salt and hydrogen gas evolves.



After a short time, aluminium started to react forming a salt and hydrogen gas, with the observation that aluminium proceeds zinc in the chemical activity series. Practically, aluminium metal delays in its reaction with hydrochloric acid due to the presence of a thin layer of aluminium oxide on its surface. After this layer separates from the metal, the metal reacts with the acid.



2 A Metal substitutes another metal in one of its salt solution.

- Some metals replace another metals that follows it in the series of chemical activity in one of its salt solution.

Activity

Discover :

Substitution of a material instead of another one in one of its salt solution .

Tools:

Beaker - blue copper sulphate solution - pieces of magnesium

Steps :

- Put the pieces of magnesium metal in the beaker of blue copper sulphate.

Notice changes that occur :

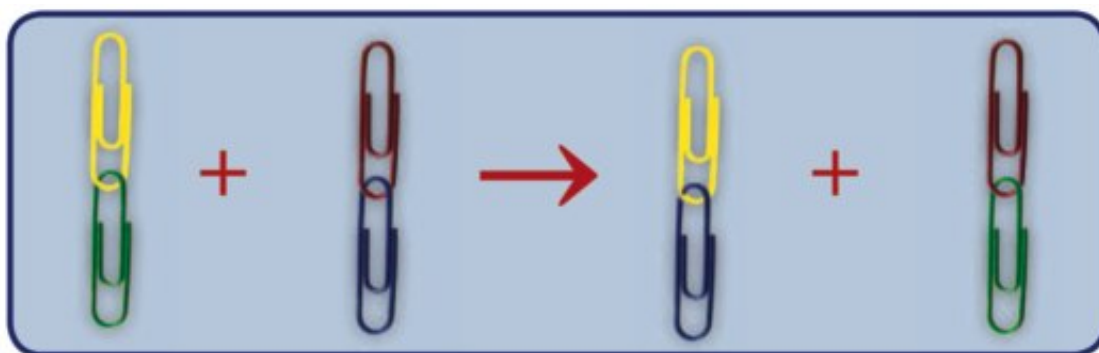
Magnesium is more active than copper. Thus, it substitutes copper in copper sulphate solution. A red copper precipitates in the beaker and the solution turns to magnesium sulphate.



▲ Figure (9) : Substitution of a metal instead of another one in one of its salt

b Double substitution reaction

- It is a reaction where double substitution occurs between the ions of two compounds to form two new compounds. During this reaction, substitution occurs between reactants. Each element replaces the other to form two compounds different from the elements in the reactants.



▲ Figure (10) : Representation of double substitution reaction

Double substitution reactions are classified into:-

1 Reaction between an acid and an alkali (neutralization)

- It is the reaction between an acid and an alkali forming salt and water .



For example, when hydrochloric acid reacts with sodium hydroxide, they produce sodium chloride (salt) and water. On heating the solution, water evaporates and sodium chloride remains.



2 Reaction of an acid with a salt

- Acids react with salts and the resultant depends on the type of both the acid and salt.

Activity

Discover :

The reaction of hydrochloric acid with sodium carbonate

Tools:

Hydrochloric acid - Sodium Carbonate powder - the bottle - a balloon

- Put an amount of hydrochloric acid in a bottle.
- Put some amount of sodium carbonate in a balloon.
- Insert the top of the balloon over the mouth of the bottle.
- Slowly turn over the balloon in a way that makes the amount of sodium carbonate fall into the bottle

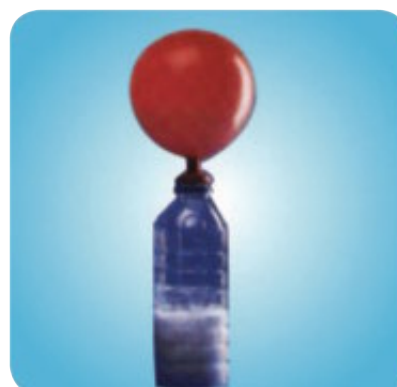
What do you observe inside the bottle?

What do you observe about the appearance of the balloon?

- Carefully close the balloon and take it away of the bottle.
- Pass the gas collected inside the balloon into a clear lime water.

What do you observe ?

Hydrochloric acid reacts with sodium carbonate forming sodium chloride, water and carbon dioxide gas which turbids lime water.



▲ Figure (11) : Reaction of hydrochloric acid with sodium carbonate and CO_2 evolves.

3

Reaction of a salt solution with another salt solution

- Double substitution reactions between salt solutions are accompanied by the formation of a precipitate.
- When we add silver nitrate solution to sodium chloride solution, a white precipitate of silver chloride is formed



G

Oxidization and Reduction

- When hydrogen passes through hot copper oxide, hydrogen takes the oxygen away from copper oxide and water is formed. Copper oxide turns into copper.



- During this reaction, the hydrogen is oxidized because it got united with oxygen. On the other hand, copper oxide was reduced because oxygen is taken away from it.
- We can say that copper oxide is an oxidizing agent because it oxidized hydrogen. But hydrogen is a reducing agent because it reduced copper oxide to copper.

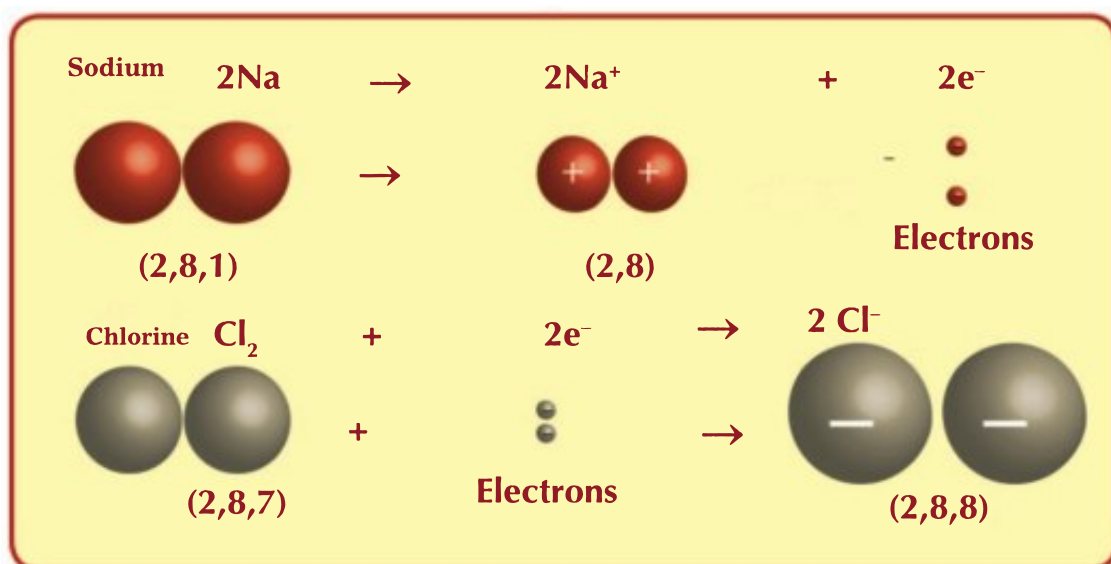
Oxidization	A chemical process which increases oxygen percentage and decreases hydrogen percentage in substance .	Reduction	A chemical process which decreases oxygen percentage and increases of hydrogen percentage in a substance.
Oxidizing agent	It is the substance which gives oxygen or takes away hydrogen during a chemical reaction	Reducing agent	It is the substance which takes away oxygen or gives hydrogen during a chemical reaction

- There are chemical reactions which include both oxidization and reduction processes although the absence of oxygen or hydrogen .
- The reaction of sodium with chlorine includes both oxidization and reduction processes. This reaction gives sodium chloride which is known as table salt.



▲ Figure (12) : Extraction of table salt from water of lakes

You have already learnt that sodium is monovalent because it loses one electron forming a positive sodium ion (Na^+), whereas chlorine is also monovalent because it gains one electron giving a negative chloride ion (Cl^-), so the following equation represents the previous reaction :



Notice that in this reaction, sodium atom turns into a sodium ion, whereas chlorine atom turns into a chloride ion.

The sodium atom lost one electron and turned from a neutral atom to positive ion (+1). This process is called oxidation.



Ions can not remain free, so they move to chlorine atom (gains electrons). and turns into a neutral chloride ion (-1). This process is called reduction.



Oxidation	A chemical process in which the atom loses an electron or more.	Reduction	A chemical process in which an atom gains one electron or more.
Oxidizing agent	It is the substance which gains an electron or more during a chemical reaction.	Reducing agent	It is the substance which loses one or more electrons in a chemical reaction.

Notice that the two processes of oxidation and reduction are concurrent processes.

Lesson 1 Exercises

1 Complete the following sentences:

- a Oxidization is a chemical process in which the atom an electron or more.
- b The agent is the substance which gains one electron or more during a chemical reaction.
- c During reactions, the compound decomposes by heat into its simple components.
- d The is the reaction between an acid and an alkali to form salt and water.
- e The is the substance which gives oxygen and takes away hydrogen.

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

- a The breaking up of bonds of the molecules of the reactants and the formation of new bonds.
- b A chemical process in which the atom gains one or more electrons.
- c It is the substance which loses an electron or more during a chemical reaction.
- d A reaction where an element substitutes another one.

3 Illustrate by equations the following reactions:

- a The reaction between hydrochloric acid and sodium hydroxide.
- b Adding silver nitrate solution to sodium chloride solution.
- c The effect of heat on red mercuric oxide.
- d The reaction of zinc with diluted hydrochloric acid.
- e The effect of heat on sodium nitrates.

4 Identify the process of oxidization, reduction, oxidizing agent and reducing agent in the reaction of sodium with chlorine to form sodium chloride NaCl:

Na : Atomic number (11) and electronic configuration

Cl : Atomic number (17) and electronic configuration

level element	K	L	M
Na	2	8	1
Cl	2	8	7

5 Complete the following equations:

- a $\text{NaCl} + \text{AgNO}_3 \rightarrow \dots + \dots$
- b $\text{Cu(OH)}_2 \xrightarrow{\Delta} \dots + \dots$
- c $2\text{NaNO}_3 \xrightarrow{\Delta} \dots + \dots$
- d $2\text{HgO} \xrightarrow{\Delta} \dots + \dots$

Speed of Chemical Reactions



Lesson objectives

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

- ✓ Identify the concept of the speed of a chemical reaction.
- ✓ Determine the factors which affect the speed of a chemical reaction.
- ✓ Deduce the effect of the nature of reactants, concentration, temperature and catalyst on the speed of chemical reactions.
- ✓ Aware that foods spoil by oxidation when left exposed.



Lesson terms

- ◆ Speed of chemical reaction.
- ◆ Reaction temperature.
- ◆ Catalyst.

A chemical reaction is a process in which a chemical substance turns to another one.

Chemical reactions differ in the time they take to occur. For example, some reactions take very short time like fireworks. Some reactions are a relatively slower like the reaction of oil with caustic soda. there are some reactions are slowest and need several months to take place such as the formation of the iron rust. Other reactions may take tens or hundreds of years like those which occur inside the Earth to form oil.

What is the speed of chemical reaction?

What are the factor affecting it?



▲ Figure (13) : Iron rust is a very slow chemical reaction



▲ Figure (14) : A firework is a fast chemical reaction

The definition of the speed of chemical reaction

To identify the meaning of the speed of a chemical reaction, we will study the following equation:

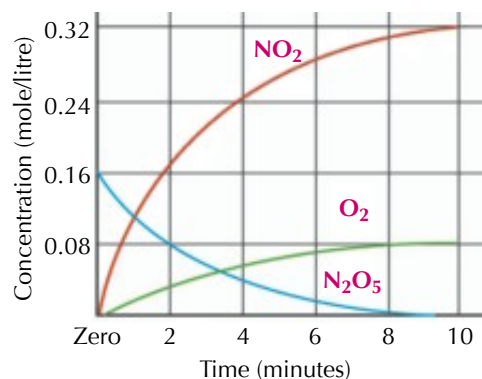
Nitrogen pentoxide breaks up into nitrogen dioxide gas and oxygen gas according to the following equation:



Oxygen atoms are collected together to form molecules that rise. The following graph illustrates the breaking up of nitrogen pentoxide with time. The concentration (mole/litre) is represented on the vertical axis while time (minute) is represented on the horizontal axis :

- * The blue graphical line represents the change in the concentration of nitrogen pentoxide gas.
- * The red graphical line represents the change in the concentration of nitrogen dioxide gas.
- * The green graphical line represents the change in the concentration of oxygen gas.

We notice that at the start of the reaction, the concentration of nitrogen pentoxide is 0.16 mole/litre, i.e. 100%, while the concentration of both nitrogen oxide and oxygen is zero%. As time passes, the concentration of nitrogen pentoxide starts to decrease whereas the concentration of both nitrogen dioxide and oxygen starts to increase. By the end of the reaction, the concentration of nitrogen pentoxide becomes zero mole/litre, i.e. zero%, whereas the concentration of the both nitrogen dioxide and oxygen increases, i.e. 100%. The following graph illustrates the breaking up of nitrogen pentoxide across time.



▲ Figure (15) : A graph that illustrates the breaking up of the nitrogen pent oxide

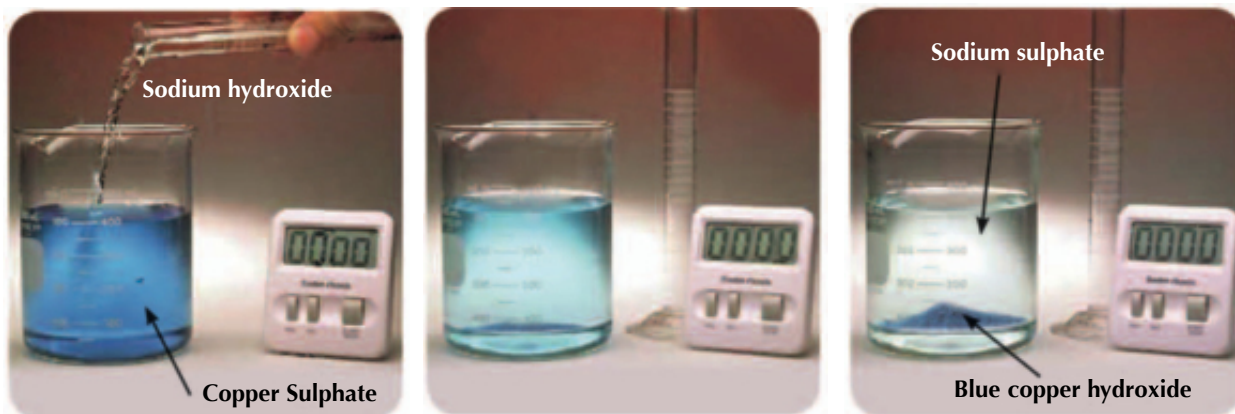
Examine the graph carefully and complete the following table:

Time (minute)	The concentration of reactants (mole/litre)	The concentration of products (mole/litre)	
	N_2O_5	NO_2	O_2
Beginning of the reaction			
After two minutes			
After four minutes			
After eight minutes			
At the end of the reaction			

The speed of a chemical reaction can be defined as follows:

“The change in the concentration of the reactants and resultants at a time unit”

The speed of chemical reaction can be practically measured by the rate of disappearance of a reactant or the rate of appearance of a resultant .



▲ Figure (16) :What happens to the color of solution as time passes ?

On adding sodium hydroxide to blue copper sulphate, colorless sodium sulphate forms and a blue precipitate of copper hydroxide is formed. The speed of this reaction is measured by the disappearance rate of copper sulphate color or the appearance rate of the precipitate.

Factors affecting the speed of chemical reaction

The speed of chemical reaction depends on many factors:

- The nature of reactants.
- The concentration of reactants.
- The temperature of the reaction .
- Catalysts.

a The nature of reactants

- The first factor which affects the speed of a chemical reaction is the nature of reactants. The nature of reactants includes the two following factors :
- The Kind of bonding in reactants.
- The surface area of reactants exposed to reaction.

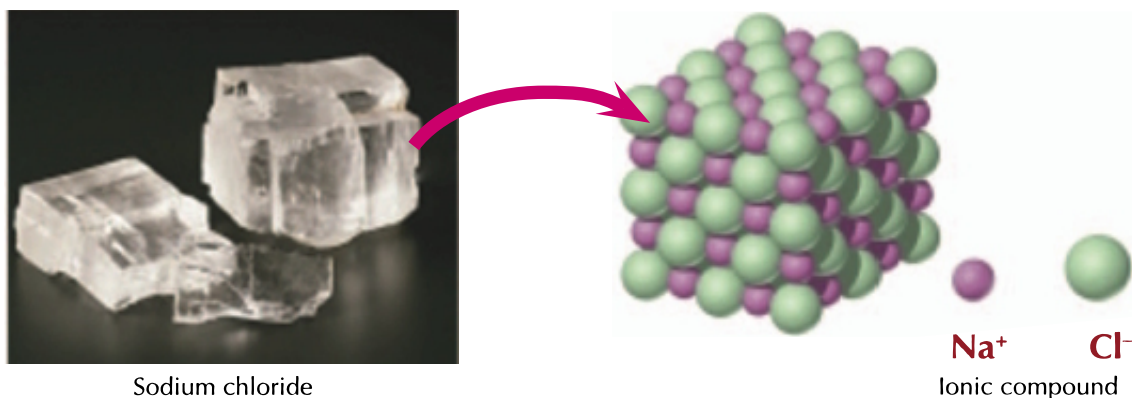
1 Type of bonding in reactants

We find that:

Covalent compounds:

They are slow in their reaction because they do not decompose to form ions. But, the reactions are between molecules of covalent compounds.

Ionic compounds: they are fast in their reaction because they decompose into ions. The reaction take place between the ions such as the reaction of sodium chloride with silver nitrate. Each of the two compounds breaks up into its ions and then the reaction occurs between these ions.

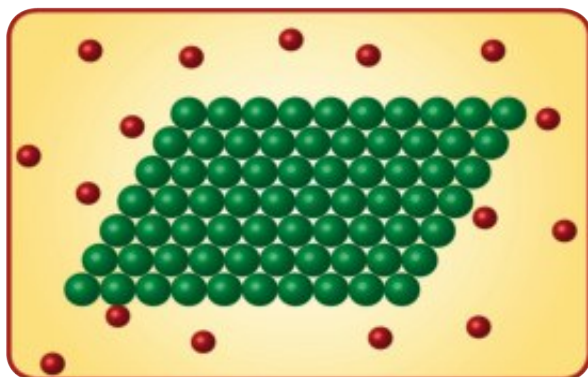


▲ Figure (17) :Ionic compounds decompose into ions.

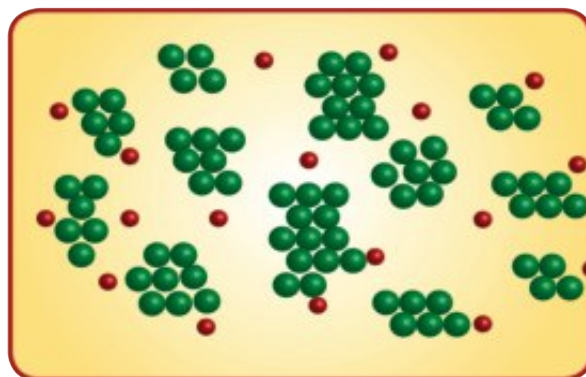
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Surface area of reactants exposed to reaction

The surface area of the reactants exposed to the reaction affects the speed of the chemical reaction. The larger the area exposed to the reaction, the faster the chemical reaction is.



▲ Figure (18) : The surface area exposed to the reaction is small



▲ Figure (19) : The surface area exposed to the reaction is large

The area exposed to the reaction is small. The red colored molecules react only with the molecules of the outer layer and do not react with the molecules inside the bulk of the reactant. (Figure18)

When the reactant decomposes, the surface area exposed to reaction increases, So, the red colored molecules react with most of the molecules of the outer layer as well as that inside the bulk of the reactant (Figure19)

Activity

Discover :

Effect of surface area on the speed of a chemical reaction

Tools:

Two equal amounts of diluted hydrochloric acid – 2 equal masses of iron (one of them is iron **filings** and the other is one piece) – two conical flasks- two syringes

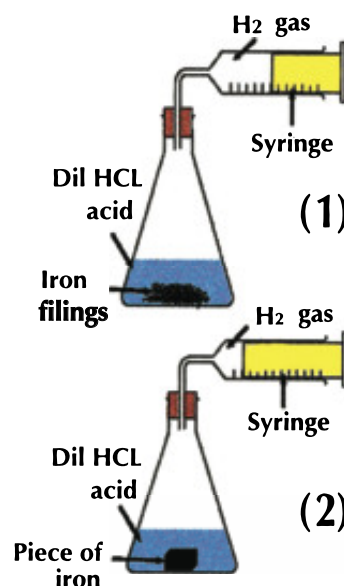
Procedures:

- 1** Put iron **filings** in conical flask (1) and the piece of iron in conical flask (2).
- 2** Put equal amount of diluted hydrochloric acid in both flasks.

What do you observe?

Which reaction is faster?

How can you explain this?



▲ Figure (20)

The rate of the reaction of hydrochloric acid with the iron **filings** is more faster than the piece of iron. This is because the area exposed to the reaction in case of the iron **filings** is more bigger than that in case of piece of iron. Thus, the reaction is completed in case of iron **filings** in shorter time than that of the iron piece.



We can deduce that the larger the area exposed to the reaction is, the faster the reaction is .

b Concentration of the reactants :

- One small spoon of sugar makes a glass of lemon juice sweet but if we add a big spoon, it tastes sweeter. Thus, we can say that in the second glass of lemon the sugar molecules are more concentrated.
- One of the factors that increase the speed of a chemical reaction is the increase in the concentration of reactants. This increases the number of collisions between molecules and consequently the speed of the reaction increases.



▲ **Figure (21) : In a quiet street, the probability of collisions decreases like in the molecules of a substance with a low concentration**



▲ **Figure (22) : In a crowded street, the probability of collisions increases like the molecules of a substance with a high concentration**

Figure (23) illustrates the effect of oxygen concentration on the rate of combustion. Figure (A) the combustion of the steel scoures used for cleaning aluminium in oxygen in the air . Figure (B) the combustion in a jar which contains pure oxygen . The combustion of the steel scoures used for cleaning aluminium in pure oxygen (high concentration) is faster than its combustion in oxygen in the air (less oxygen concentration) .



▲ **Figure (23) : The effect of oxygen concentration on the rate of combustion**

Activity

Discover :

The effect of reactants concentration on the speed of the chemical reaction**Tools:**

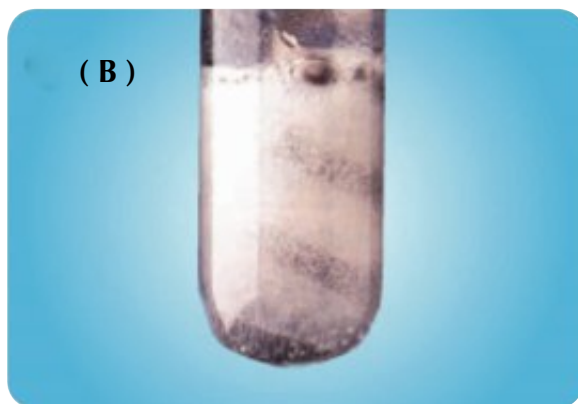
2 pieces of magnesium of the same size - 2 test tubes- diluted hydrochloric acid - concentrated hydrochloric acid - pipette .

Procedures:

- 1** Put an amount diluted hydrochloric acid in tube "A" and an equal amount of concentrated hydrochloric acid in tube "B" by used pipette.
- 2** Put a piece of magnesium in each tube

What do you observe?
.....**Which one contains more bubbles?**
.....**How can you explain this?**
.....
.....

▲ Figure (24) : The reaction of a magnesium ribbon with diluted hydrochloric acid



▲ Figure (25) : The reaction of a magnesium ribbon in with concentrated hydrochloric acid

We can deduce through this activity that the speed of a chemical reaction increases as the concentration of the reactants increases.

C The temperature of the reaction:

- Another factor that speeds the chemical reaction is the increase in temperature. This increases the number of collisions between molecules and consequently the speed of the reaction increases. Most of the chemical reactions speed up when temperature increases.

What do you do to preserve food for a long period of time? What do you do to cook food faster?



▲ Figure (26) : If you want to cook eggs faster, you increase the temperature so as to increase the chemical reaction that helps in cooking food.



▲ Figure (27) : Food gets spoilt quickly if not frozen because of the chemical reactions done by bacteria. Cooling food at low temperature slows down those reactions.

Activity

Discover :

The effect of temperature on the speed of chemical reactions

Tools:

2 similar beakers – 2 effervescent tablets – hot water – cold water

Procedures:

- 1** Fill half of the first beaker (A) with hot water and the second one (B) with cold water.
- 2** Add an effervescent tablet to each of the beakers.

What do you observe?

.....

Which is faster in effervescence?

.....

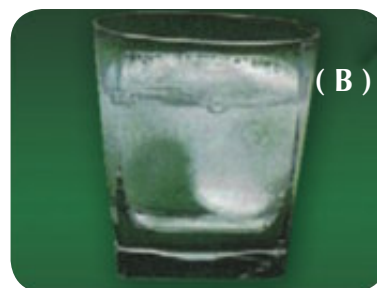
How can you explain this?

.....

We can observe that the speed of a chemical reaction increases when the temperature of the reaction increases.



▲ Figure (28) : Effervescent tablet in a glass of cold water



▲ Figure (29) : Effervescent tablet in a glass of hot water

d Catalysts

- A catalyst is a substance which speeds up the chemical reaction without sharing in it or being used up or changed. Some chemical reactions are so slow but they speed up when a catalyst is added. Most catalysts speed up the chemical reaction and this is called a positive catalysts. Other catalysts are used to slow down a chemical reaction and this is known as a negative catalysts.

Catalysts have some common characteristics which are :

- 1** They change the speed of the reaction but do not affect either its beginning or stopping.
- 2** No chemical changes or decrease in mass occur to the catalyst before or after the reaction.
- 3** They are bonded to reactants but get separated from them rapidly to form the resultants at the end of the reaction.
- 4** They decrease the energy needed for the reaction.
- 5** A small amount of the catalyst is often enough to complete the reaction.

Activity

Discover :

The decomposition of hydrogen peroxide

Tools:

Hydrogen peroxide – manganese dioxide – 2 test tubes.

Procedures:

- 1** Put an equal amount of hydrogen peroxide in the two test tubes.
- 2** Put a small amount of manganese dioxide in one tube of them.

What do you observe?

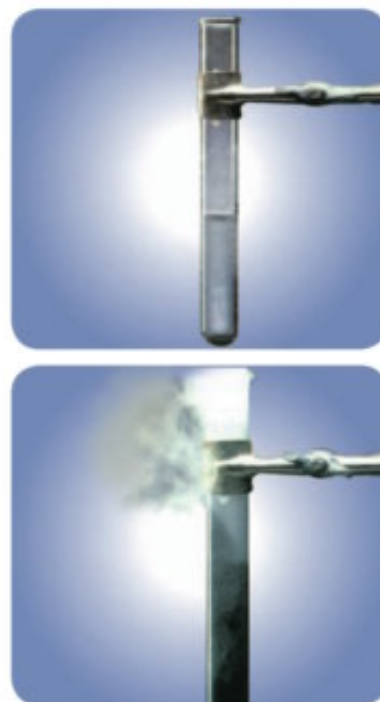
.....

Which release more oxygen bubbles?

.....

How can you explain this?

.....



▲ **Figure (30) : Manganese dioxide helps in the increase of hydrogen peroxide decomposition speed.**

Activity

Discover :

Effect of enzymes on speed of a chemical reaction

Tools:

Hydrogen peroxide – a piece of sweet potato – a glass beaker.

Procedures:

- Fill a half of the beaker with hydrogen peroxide.

What do you observe?

- Put the piece of the sweet potato in the beaker as in fig. (31).

What do you observe?

Which of the two cases produce more oxygen bubbles?

How can you explain this?



▲ Figure (31) : Oxidase enzyme in potato helps in decomposition of hydrogen peroxide.

Integrating

Biology

- The human body contains thousands types of enzymes. Each type has a specific function. Without enzymes, man can never breathe, move, or even digest food.
- A molecule of one enzyme can do its task million times per minute. The reaction occurs in the presence of enzymes is more rapidly than that without their presence - thousands or even millions times.

Lesson 2 Exercises

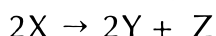
1 Complete the following sentence:

- a At the beginning of the chemical reaction, the concentration of reactants is %
- b The change in the concentration of reactants and resultants in a unit time is known as
- c The increase in concentration of reactants makes the speed of a chemical reaction
- d The reactions of the covalent compounds is
- e Sodium chloride powder reacts than a cube of sodium chloride of the same mass.
- f A substance which increases the chemical reaction without sharing in the reaction is

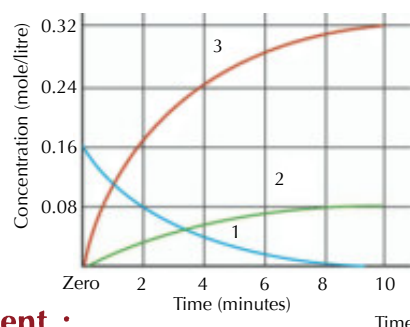
2 Give reasons for:

- a The fridge is used to preserve food.
- b Using divided nickel in hydrating oil instead of pieces of nickel.
- c Reactions between ionic compounds are fast whereas reactions between covalent compounds are slow.
- d The speed of the chemical reaction increases as the amount of the reactants increases.

3 The following equation explains the decomposition of a compound:



The following graph illustrates the change in concentration of reactants and resultants in respect to time. Write the name of compound which is indicated by each number.



4 Illustrate each of the following by an experiment :

- a The importance of a catalyst in a chemical reaction.
- b The effect of the surface area on the speed of a chemical reaction.
- c The effect of temperature on the speed of a chemical reaction.

Mixtures



Lesson objectives

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

- ✓ Compare between types of mixtures in terms of concentration, and homogeneity
- ✓ Identify the economic importance of some common acids, bases and salts.
- ✓ Appreciate the importance of solutions in our life and their role in the vital reactions inside our bodies .



Lesson terms

- ◆ Homogenous mixture
- ◆ Non-homogenous mixture
- ◆ Saturated solution
- ◆ Unsaturated solution
- ◆ Super saturated solution

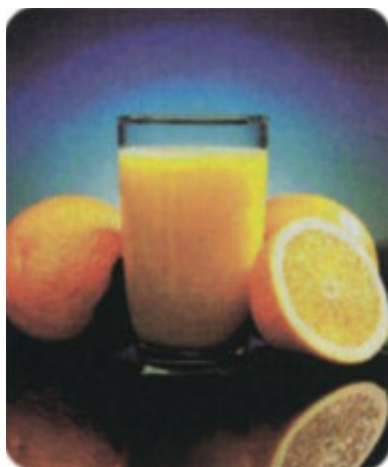
In our life, mixtures exist in every thing. When you make a cup of tea, you make a mixture. In the kitchen, mother makes a lot of mixtures as juices and soup. Blood flowing in our bodies is a mixture and the same goes for perfumes and paints.

What is a mixture ?

What are the types of mixtures ?

What are the properties of mixtures ?

What is the importance of mixtures in our life?



▲ **Figure (32) : Tea and juices are examples of mixtures.**

Types of mixtures:

Mixtures are classified into different types in terms of concentration or homogeneity as follows:

a Types of solutions mixtures in terms of homogeneity

Activity

Discover :

Discover types of mixtures in terms of homogeneity

Tools:

3 glasses - salt - sand -some oil - pure water - a stirring glass rod - spoon



▲ Figure (33) : Types of mixtures according to their homogeneity.

Procedures :

- 1 Put some pure water in each glass.
- 2 Put a spoon of salt in the first glass, a spoon of sand in the second and a spoon of oil in the third.
- 3 Predict which of the previous substances mix or does not mix with water?
- 4 Stir each glass and record your observations.

From the previous activity, mixtures can be classified in terms of homogeneity into a homogenous mixtures and non-homogenous ones.

Homogenous mixture:

It is the mixture in which the solute molecules are regularly distributed in the solvent parts and they can not be distinguished. This solution is characterized by the same appearance in all its parts like the sugar solution and table salt solution.

Non - homogenous mixture:

it is the mixture in which the solute molecules are irregularly distributed in the solvent parts as there is a contrast in the properties of its parts that can be distinguished by the naked eye.

Is each mixture a solution ?

What is a solution?

When you take a spoon of salt and put it in a glass of water and stir well. You find that the salt completely disappears and the water becomes clear. If we take samples of different parts, we will find that they contain the same percentage of the salt weight. This means that the mixture of both the water and salt is homogenous in all its parts and it is called a solution.

The solution : Consists of two or more substances that are not chemically united. The substance with the greater amount in the solution is called the «Solvent» and the other substance or substances with the smaller amount in the solution is called the «solute»



▲ Figure (34) : Solution

b Types of solution in terms of concentration

Activity

Discover :

Discover types of solutions in terms of solute concentration

Tools:

Table salt - a glass beaker – flame – a stirring glass rod

Procedures:

1 Pour 100 ml distilled water in the beaker.

2 Put a little amount of table salt in the glass and stir well .

What do you observe?

What is the solution called in this case?.....

3 Continue in adding more table salt with stirring, so that no more additional amounts of table salt can be dissolved in the water.

What do you observe?

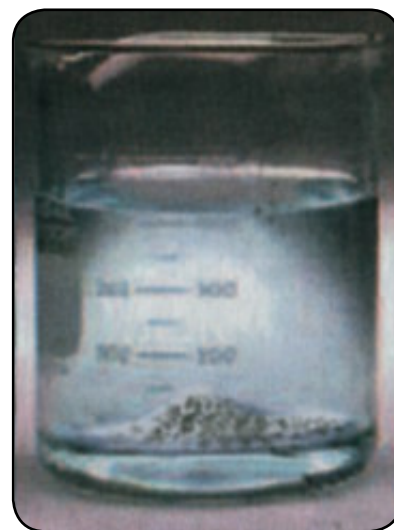
What is the solution called in this case?

4 Heat the beaker and observe what happens to the precipitated table salt?.

5 After checking the dissolution of the precipitated table salt, add additional amounts of table salt and continue in heating.

What is the solution called in this case?.....

6 Get the beaker away of the flame and put a little table salt in the beaker. Record your observations.



Information

Enriching information

- Metal coins are a type of mixtures (a coin is an alloy of copper dissolved in silver in a homogenous form).

From the activity, solutions can be classified in terms of the solute concentration into three types:

Unsaturated solution: It is the solution in which an additional amount of the solute can be dissolved at a certain temperature. (The solvent has the ability of dissolving another amount of the solute).

Saturated solution: It is the solution in which no additional amount of the solute can be dissolved without the changing of temperature.

Super-saturated solution: It is the solution which allows the dissolution of an additional amount of the solute with the increase of temperature (The amount of the solute is greater than that of the saturated solution), as result of expanding and widening of inter molecular spaces between solvent molecules .

Solutions of acids, bases and salts

Acids:

They are substances whose aqueous solutions contain a positive hydrogen ions (H^+) . They turn the blue litmus paper into red . Examples of acids are sulphuric, hydrochloric, nitric and phosphoric acids.

Bases:

They are substances whose aqueous solutions contain negative hydroxide ions (OH^-) and they react with acids giving salt of acid and water . They turn the red litmus paper into blue. It has a soapy feel like sodium and potassium hydroxides.

Salts:

They are chemical compounds resulted from the reaction of acids with alkalis like sodium, magnesium, calcium and potassium chlorides.

Economic importance of some common acids

Acids in the human body

- Acids are important in the human body.
- Stomach acids help in the digestion of proteins.
- During physical exercises, lactic acid is produced in muscles.



Formation of lactic acid in muscles during physical exercises

Acids and food

- Tomatoes ,oranges and guava contain ascorbic vitamin C.
- Green leaves of vegetables contain folic acid necessary for the proper growth of cells.
- Orange and lemon contain citric acid which is used as a preservative substance in some food industries .



Citric acid is present in orange

Acids in the house

- People use diluted acid solutions to clean surfaces. Diluted hydrochloric acid is used in detergents and polishing metal surfaces needed to be painted.



Dilute hydrochloric acid is used in manufacture of detergents

Acids in industry

- Nitric and phosphoric acids are used in the manufacture of fertilizers.
- Sulphuric acid is used in the manufacture of car batteries , fibers and in oil distillation.



Nitric and phosphoric acids are used in manufacture of fertilizers

▲ Figure (35) : Using of acids in different aspects of life

Economic importance of some common bases

Bases and health

Bases like magnesium hydroxide are used in the manufacture of anti-acidity medicines.

Bases in industry

Calcium oxide is used in the manufacture of the cement, in water treatment and the reduction of soil acidity.



▲ Figure (36) : Uses of different bases

Economic importance of some common salts

Salts in the human body

Minerals salts perform important and vital functions to the body such as:

- Building of bones and teeth like calcium and magnesium salts. Also, they contribute to the formation of tissues like phosphorous minerals and transfer of nerve impulses (sodium and potassium).

Salts and food

- Sodium chloride (table salt) is used in salting and preserving food.

Salts in industry

- Calcium carbonate is used in glass and cement manufacture.
- Potassium nitrate is used in the manufacture of explosives and fertilizers.
- Silver nitrate is used in the manufacture of sensitive photographic films.



(a) Potassium nitrate is used in manufacture of explosives



(b) Sodium chloride (table salt) is used in food

▲ Figure (37) : Uses of different salts

Lesson 3 Exercises

1 Complete the following sentences:

- a Orange and lemon fruits contain acid .
- b Nitric acid is used in the manufacture on
- c It is possible to dissolve more solute in the solution.
- d In the stomach, there is that help in the digestion of proteins
- e Mixtures can be classified in terms of homogeneity into and

2 Write the scientific term that corresponds to each of the following:

- a A solution that allows the dissolution of an additional amount of the solute with the increase in temperature.
- b A chemical compound produced from the reaction of an acid with a base .
- c A mixture in which the solute molecules are irregularly distributed in the solvent .
- d A mixture that is homogenous in composition and properties and consists of two or more substances that are not chemically united.
- e A solution in which an additional amount of the solute can be dissolved at certain temperature.

3 Write one economical importance for each of the following:

- a Sulphuric acid.
- b Calcium oxide.
- c Calcium carbonate.
- d Magnesium hydroxide.
- e Sodium chloride.
- f Hydrochloric acid.

4 Compare between each of the following:

- a Acids and bases.
- b Homogenous and non-homogenous mixtures.
- c Saturated and unsaturated solutions.



Science, Technology and Society

Life Applications

The catalytic converter



Most modern cars are equipped with a catalytic converter that helps in the treatment of harmful gases. It is composed of ceramic cells similar to bee cells, but they are covered with thin layer of a catalytic metal as platinum.

The idea of using this converter is based on the exposure of the largest part of the surface of the catalytic substance to the current of the emitted gases from the engine so as to economize the use of these metals .

Air bags



Car air bags are considered one of the most important safety means at emergencies. They are designed in a way that they get inflated at an extreme speed within only 40 mm second on the occurrence of the car crash with another object. Then, they get vacuumed rapidly to ensure both the motorist's clear vision and proper movement. This leads to the decomposition and explosion of sodium azid compound forming sodium and nitrogen that fills the air bag on crashing.



Enriching activity

Usage of sodium bicarbonate in your life

Polishing of a metal

- It is used in polishing silver by using a piece of aluminium foil, while washing so silver restores its shine.
- Any decorative metal pieces made of copper or chrome are rubbed with a cloth wet with water and immersed in sodium bicarbonate



In the Kitchen

- Add a little amount of it in the bottom of a waste basket before putting the bag to prevent the bad odours .
- Soak the legumes in water and add a little amount of sodium bicarbonate to help in decreasing the bloating that accompanies eating legumes.
- Add a little amount of sodium bicarbonate in the kitchen's sink and pour on it boiling water, and notice that the draining of the sink is faster.



legumes

In the garden

- Place sodium bicarbonate without any additives in the places where ants come out, and with time you will notice their disappearance.

Unit 1 Exercises

1 Complete the following sentences:

- a The breaking up of bonds in the molecules of reactants and formation of new bonds is called
- b The speed of chemical reactions due to the increase of temperature.
- c In the non-homogeneous mixture, the molecules of the solute are distributed through out the solvent .
- d Oxidation and reduction are two processes.
- e Tomatoes, orange and guava fruits contain acid .

2 Correct the underline words :

- a The increase in the concentration of the reactants increases the number of collisions between molecules so that the speed of reaction decreases. ()
- b Calcium oxide is used to decrease the acidity of the stomach . ()
- c Most metal carbonates decompose on being heated into metal and carbon dioxide. ()
- d The reactions of ionic compounds are slower than that of the covalent compounds. ()
- e Nitric acid is used in making car batteries. ()

3 Write the equations for the following:

- a Chemical reactions in which the compound is decomposed by heat into simple components.
- b The solution that allows the dissolution of an additional amount of the solute with the increase of temperature.
- c The change in the concentration of reactants and resultants in the time unit.
- d A substance that increases the speed of the chemical reaction without interfering in it or being consumed.
- e A chemical process in which an atom of the element gains one or more electron.

4 Write the balanced equations for the following:

- a** The reaction of water with sodium.
- b** The decomposition of sodium nitrate by heat.
- c** Placing of a piece magnesium ribbon in a solution of copper sulphate.
- d** The reaction of hydrochloric acid with sodium hydroxide.

5 Explain the following

- a** The occurrence of effervescence on putting a piece of aluminium in diluted hydrochloric acid.
- b** The rate of the reaction of hydrochloric acid with iron
- c** Preservation of food in the freezer.

6 Mention an economic importance for each of the following:

- a** Calcium oxide.
- b** Calcium carbonate.
- c** Magnesium hydroxide.
- d** Enzymes in the human body.

7 Compare between each of the following:

- a** Simple substitution and double substitution reactions.
- b** Heating of both the metal oxide and metal hydroxide .
- c** Saturated and unsaturated solutions.

The Second Term - Unit two

Electric Energy and Radioactivity

Introduction

Electricity is a hidden energy that can not accurately described. Yet, we identify it through its various effects and features. It is the light in the electric lamp that illuminate our nights. It is the heat of electric heaters and irons. It is the mechanical energy of engines. It is the sounds in the radio, cassette recorder and telephone. It is the waves that do different tasks. It is rays like the X-ray used in medical diagnosis. This is in addition to so many usages that Allah Almighty creates to serve man in life. Besides, it is a clean energy that does not pollute the environment.



UNIT OBJECTIVES

By the end of this unit, will be able to :

- ✓ Identify the concepts of current intensity, potential difference and the electric resistance.
- ✓ Identify the instruments used for measuring the current intensity, potential difference and electric resistance.
- ✓ Identify the units for measuring the current intensity, potential difference and electric resistance.
- ✓ Identify some of the sources of the electric current.
- ✓ Compare between the alternating-current and direct-current.
- ✓ Compare between the methods of connecting the electric cells in electric circuits.
- ✓ Identify the phenomenon of radioactivity.
- ✓ List examples of radioactive elements.
- ✓ Identify the safe uses of the nuclear energy.
- ✓ Identify the harmful effects of radioactive pollution and the method of protection.
- ✓ Appreciate the importance of electric energy in our life through its multiple applications.

Included issues

- ◆ Peaceful uses of energy.
- ◆ Protection from radiation.



Lesson 1

Physical properties of the electric current



Lesson 2

Electric current and electric cells



Lesson 3

The radioactivity and the nuclear energy

Physical Properties of the Electric Current



Lesson objectives

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

- ✓ Identify the concepts of the current intensity, the potential difference, and the electric resistance.
- ✓ Identify the instruments used for measuring the current intensity, the potential difference, and the electric resistance.
- ✓ Determine the units for measuring the current intensity, the potential difference, and the electric resistance.



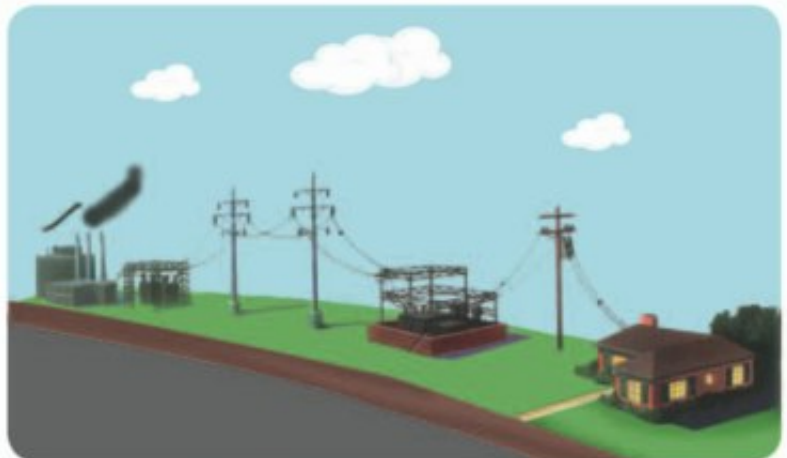
Lesson terms

- ◆ Electric current.
- ◆ Current intensity.
- ◆ Potential difference.
- ◆ Electromotive force.
- ◆ Electric resistance.

There is no doubt that you cannot live in your house without electricity. The electric appliances are around you everywhere. You will not be able to read this book at night unless you switch on the electric lamp, and you will not be able to switch on the radio and hear the news unless there was electric current. The same goes for all aspects of life.

You might know that the electric current is generated in electric power stations that are away from your house by hundreds or thousands of kilometers.

**What is meant by the electric current ? How is it generated?
How does it reach your house?
What are its properties?**



▲ Figure (1) : Connecting electric power from the electric power station to the houses

How is the electric current generated? What is meant by the electric current ?

You have previously studied the composition of the atom and knew that the protons are present in the nucleus while the electrons revolve around the nucleus in outer orbits affected by an attraction force (resulting from the attraction between positively charged protons and negatively charged **electrons**). In the absence of this attraction force, the electrons **will** leave the atom and become free. On connecting a wire with an electric source, an electromotive force is generated and electrons move in the wires (conductors) creating the electric current.

Therefore, we can define the electric current as the flow of electric negative charges (the electrons) in a conducting substance (as a metal wire).

Question

for thinking

If you pass an electric current in a circuit and the lamp lights up, is the intensity of light determined by the number of electrons passing in the wire?



▲ Figure (2) : The flow of electrons in the electric wire

Physical properties of the electric current:

There are several physical concepts of the electric current as the current intensity, potential difference, and resistance.

1 Current intensity:

It is the quantity of electricity in coulomb or the electric charges flowing through a cross - section of the conductor in one second.

How to measure the current intensity ? what are its measuring units?

It is measured by using instrument called an Ammeter that is symbolized by the sign $\text{---}(\text{A})\text{---}$ when drawing electric circuits. The measuring unit of the current intensity is known as Ampere. We can define Ampere as a quantity of charge of 1 coulomb passing through any cross - section of the conductor in one second.



▲ Figure (3) : Ammeter

$$\therefore \text{Current intensity} = \frac{\text{Quantity of charge (coulomb)}}{\text{Time (second)}}$$

Example :

- Calculate the current intensity due to the flow of 5400 coulombs through a cross - section of a conductor for 5 minutes.

Solution: Time in seconds = $5 \times 60 = 300$ s

$$\text{Current intensity} = \frac{\text{quantity of charge}}{\text{time}} = \frac{5400}{300} = 18 \text{ Amperes}$$

Activity**Discover :****How is the Ammeter used? Why ?**

- 1 Make a circuit as shown in figure (4).
- 2 Close the key of the circuit.

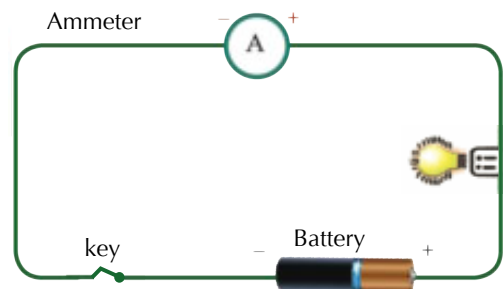
Observe:

What do you observe on the pointer of the ammeter

.....

What does the reading of the pointer of the ammeter indicate?

.....



▲ **Figure (4) : The Ammeter connected in an electric circuit**

2 The electric potential difference:**What is meant by electric potential of a conductor ?**

It is the state of an electric conductor that shows the transfer of the electricity from or to it ,when it is connected to another conductor.

In order to understand what the potential difference means, and how does electricity move from one conductor to another, try to understand the following example:

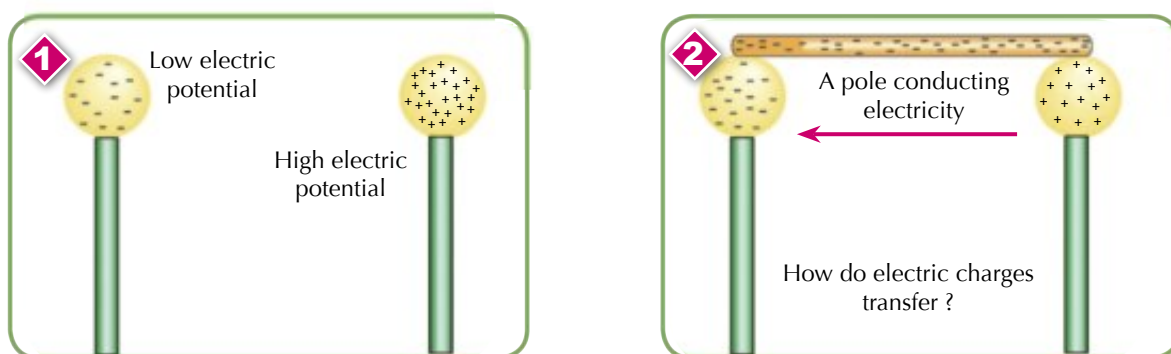
Heat transfers from a hot object (A) to a cold object (B) when they are connected with a metal rod (Figure 5), and it continues to transfer until the temperature of both objects becomes equal. The transference of heat does not depend on the size of the two objects, but on the difference in their temperatures. The temperature difference determines the transference of heat to and from an object.



▲ **Figure (5) : Heat transference by conduction**

Similarly, for electricity:

The potential difference between two conductors determines the transference of the electric charges to and from an object when it is conducted to another conductor. If two charged conductors touch and the electric potential of one conductor is higher than the electric potential of the second (Figure 6) then the electric current will flow from the first conductor to the second conductor until their potential becomes equal. The transference of the charges does not depend on their amount, but on the conductor potential in comparison to the other conductor.



▲ Figure (6) : Flow of electric current depending on the potential difference between 2 conductors

We can define the potential difference between the two poles of a conductor as follows:

It is the value of the work done to transfer a quantity of electric charges of one joule between the two poles of this conductor.

$$\therefore \text{Potential difference} = \frac{\text{Work (joule)}}{\text{Charge (coulomb)}} = (\quad) \text{ in volts}$$

A joule is defined as the amount of work done by a force of one newton moving an object through a distance of one meter.

Example :

- If the work done to transfer an electric charge of 300 coulombs between two points is 33300 Joules, calculate the potential difference between the two points .

$$\text{The potential difference} = \frac{\text{work}}{\text{charge}} = \frac{33300}{300} = 111 \text{ volts}$$

The coulomb is the charge transferred by a constant current of intensity one ampere in one second.

How to measure the potential difference? What is its measuring unit?

The Voltmeter (Fig.7) is used to measure the potential difference between two poles of a conductor.

Its symbol is $\text{---}\text{V}\text{---}$ when drawing electric circuits. The measuring unit of the potential difference is known as the Volt. Volt is the potential difference between the two poles of a conductor on doing a work of 1 joule to transfer a quantity of electricity (1 coulomb).



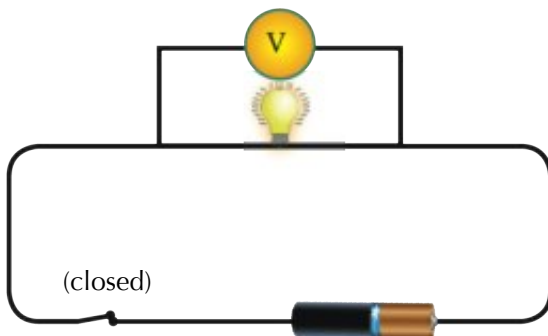
▲ Figure (7) : Voltmeter

How is the Voltmeter connected in a circuit?

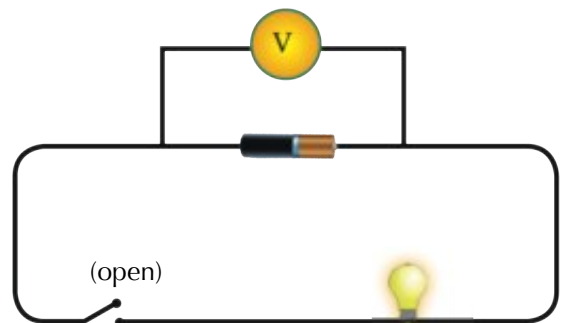
It is connected in parallel.

Electromotive force (e.m.f):

- The Voltmeter is also used to measure the potential difference between the two poles of a battery, which is known as the electromotive force (e.m.f) which can be defined as the potential difference between the two poles of the battery when the electric circuit is open. Hence, no electric current passes through. E.m.f is measured in volt.



▲ Figure (8) : Measuring the potential difference between the 2 ends of an electric lamp



▲ Figure (9) : Measuring the potential difference of a battery or (e.m.f)

③ The electric resistance:

- During the flowing of an electric current through conductors (the wires), it faces an obstruction. The electric resistance can be defined as: the opposition that the electric current faces during its passage through a conductor.
- How to measure the electric resistance? What are its measuring units?
- An instrument known as the **Ohmmeter** is used to measure the electric resistance. The electric resistance measuring unit is known as the ohm.

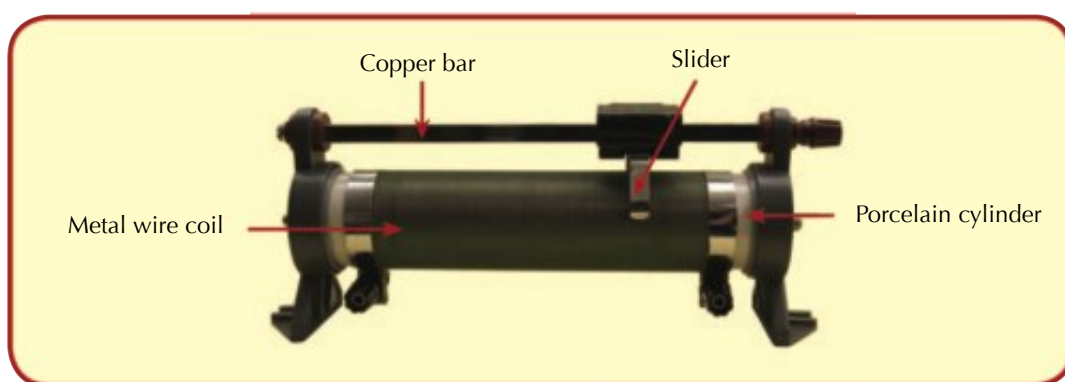
The Ohm is the resistance between two points of a conductor when a constant potential difference of 1 volt, applied to these points, produces a current of 1 ampere in the conductor.

Types of electric resistance :

- 1** Constant, (it's symbol in an electric current is ~~~~~)
- 2** Variable (Figure 10), it's symbol in an electric current is ~~~~~

The variable resistance (The Sliding Rheostat):

It is a resistance that you can change it's value in order to adjust the value of the current intensity and potential difference in the different parts of the circuit.



▲ Figure (10) : The variable resistance (The Sliding Rheostats)

Components of the variable resistance :

- 1** Metal wire of high resistance, coiled around a cylinder made of an insulating substance as porcelain.
- 2** Thin copper sheet is touching the wire and can slide over it for the whole length of the cylinder and known as the slider.

Variable resistance idea of work:

Through the sliding of the flexible sheet on the wire coil, you can control the resistance the current will face while passing in the wire, and that is by controlling the length the wire that enters the circuit where the current passes and thus control the current in the circuit. Hence, if the length the wire increases, the resistance increases and the current intensity decreases.

Information

Enriching information

- Inside the fuel tank of a car, there is a buoy connected to a changeable resistance that controls the flow of the electric current in the car's fuel scale. When the level of the fuel is low, an electric current flows in a circuit causing the deviation of fuel pointer indicating that the car needs to the fuel.

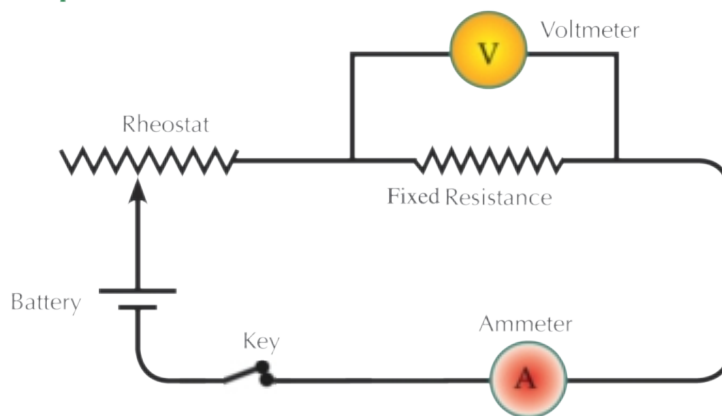
The relationship between the current intensity and the potential difference (Ohm's law):

Is there a relationship between the intensity of a current passing through an electric conductor, and the potential difference between its poles? To answer this question conduct the following experiment:

Activity

Discover :

Discover the relation between current intensity and potential difference :



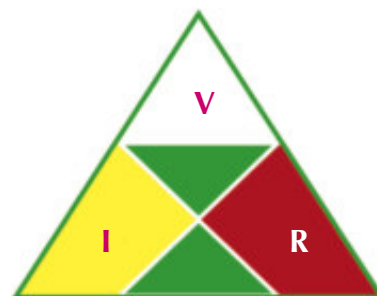
▲ Figure (11) : verification of ohm's law

- 1 Connect an electric circuit (Figure 11) consisting of a battery, variable resistance (rheostat), ammeter (connected in series), voltmeter (connected in parallel with a small resistance), and a key, and all are connected in series.
- 2 Switch On electric current to the circuit through an On/Off key and observe the current intensity in the circuit (reading of the ammeter in amperes) (I), and the potential difference (reading of the voltmeter in volts) (V).
- 3 Change the resistance by using the Rheostat; therefore, the values of (I) and (V) will change. Record their values?.
- 4 Repeat the above steps several times by changing the resistance each time. Find the values of (I) and (V) each time.
- 5 Find the result of dividing $\frac{V}{I}$ in each time.
- 6 Record your results in the following table:

Current intensity (I) in Amperes	Potential difference (V) in Volts	$(\frac{V}{I})$

What do you observe about the results you have obtained?

- Dividing $\frac{V}{I} = \text{constant value}$.
- This constant value equals the conductor's resistance and its symbol is (R) and its unit is (Ohm).
- Therefore, $V/I = R$ and this relationship is known as Ohm's law.
- i.e. the potential difference between the two ends of a conductor is directly proportional to the intensity of the current passing through this conductor when the resistance is constant.



▲ Figure (12) : A triangle that illustrates the relationship between the potential difference and current intensity

Ohm: It is the resistance of a conductor which allows the passing of an electric current its intensity is one ampere and the potential difference between its two terminals is one volt.

Ampere: It is the current intensity passing through a conductor whose resistance is one ohm and the potential difference between its poles is one volt.

Volt: It is the potential difference between the two poles of a conductor whose resistance is one ohm and the intensity of the current passing through it is one ampere.

Ohm's Law:

The electric current intensity passing through a conductor is directly proportional with the potential difference between its ends when the temperature is constant.

$$V = \text{constant} \times I$$

In other words:

$$V = R \times I$$

Therefore, resistance = Potential difference (V)/current intensity (I)

From this relationship, resistance can be defined as the ratio between the potential difference of the two ends of a conductor and the current intensity passing through it.

Example: If an electric current of 20 amperes passes through an electric heater and the potential difference between its two ends is 220 Volts , calculate the heater's resistance .

Solution: Resistance = Potential difference (V)/current intensity (I) = $220/20 = 11 \text{ Ohm}$

History**Scientists with a history**

- George Simon Ohm is a german scientist who discovered the quantitative properties of electric currents. He discovered a law in electricity that was named after him. The measurement unit of the electric resistance was also named after him.

Question**for thinking**

- Companies producing electrical appliances write the value of potential difference and current intensity or the resistance and potential difference on the equipment. Do you know that by knowing only two characteristics of the three ones enables you to determine the third! **How can you do this?**

Lesson 1 Exercises

1 Complete the following sentences:

- a The potential difference between the two terminals of a conductor is proportional to the intensity of the current passing through it at constant temperature .
- b The is used to measure the current intensity in units known as
- c is measured by using the voltmeter and has a measuring unit known as
- d The is used to measure the electromotive force of a battery in units known as the
- e On connecting two charged conductors, the electric current passes from the conductor with potential to the conductor which has potential.

2 Choose the correct answer for each of the following statements:

- a The is used to measure the electromotive force of a battery.
(Voltmeter–Ohmmeter–Ammeter)
- b The sliding Rheostat are used to change and in the electric circuit.
(The current intensity and potential difference – the resistance and potential difference – current intensity and resistance).
- c The Ammeter is used to measure in the electric circuit.
(The potential difference – the current intensity – the resistance)
- d The unit of measuring the electric resistance is
(Ampere – Volt – Ohm)
- e The unit of measuring the current intensity is
(Ampere – Volt – Ohm)

3 Write the scientific term corresponding to each of the following statements:

- a The obstruction the electric current during its flow in the conductor.
- b The flow of electric negative charges in a conducting material (metal wire).
- c The quantity of electric charges that flow through a conductor in a time of one second

Electric Current and Cells



Lesson objectives

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

- ✓ Identify some sources of the electric current.
- ✓ Compare between the alternating- current and the direct-current.
- ✓ Compare between the methods of connecting the cells in electric circuits.
- ✓ Appreciate the importance of using batteries in facilitating more important applications in our life.



Lesson terms

- ◆ Direct current.
- ◆ Alternating current.
- ◆ Connecting electric cells in series.
- ◆ Connecting electric cells in parallel.

Electricity plays an important role in our everyday life.

In the previous lesson you knew what electric current means. Do you know some of its sources and types?

Some sources of the electric current:

There are two ways to generate the electric current:

- Converting the chemical energy to electric energy in electrochemical cells (batteries or dry cells) the electric current produced is known as the "direct current " .
- Converting the mechanical energy to electric energy by using the electric generator (dynamo). The electric current produced is called the "alternating current " .



▲ Figure (13) : Some sources of the electrical energy

Types of the electric current

There are two types of electric current:

1 The direct electric current:

- It's an electric current with constant intensity. It flows in one direction through the electric circuit, since the electrons flow from one pole of the electro chemical cell passing through all the components of the circuit , to the other pole .
- This current is produced from electrochemical cells as the dry cell .
- The direct current can only be transported for short distances.
- It is used in electroplating and in operating of some electric appliances.

2 The alternating electric current:

- It's an electric current with variable intensity and direction . It flows in two opposite directions, where the electrons flow in one direction at the beginning, then starts to flow in the opposite direction . This cycle is repeated many times with high speed .
- This current is produced from the electric generators as the dynamo.
- The alternating current can be transported to short and long distances.
- It is used in lightening houses, streets and operating electric appliances.
- It can be converted to direct current that cannot be converted into an alternating current.



▲ Figure (14) : Graphic representation of the electric current types

Now you can compare between the direct current and the alternating current using the following table:

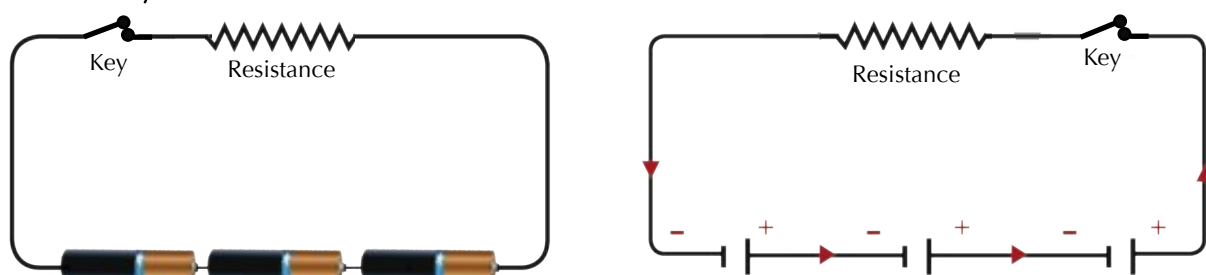
Aspects of comparison	Direct current	Alternating current
Direction
Intensity
Source
Transport
Uses
Conversion to one another

Methods of connecting the electric cells in a circuit


To obtain batteries, the electric cells are connected in different ways, such as:

1 Connection in series:

- It is done by connecting the negative pole of the first cell to the positive pole of the second cell with a copper wire, then connecting the negative pole of the second cell to the positive pole of the third cell and so on. The positive pole of the first cell and the negative pole of the last cell are considered the two poles of the electric battery.

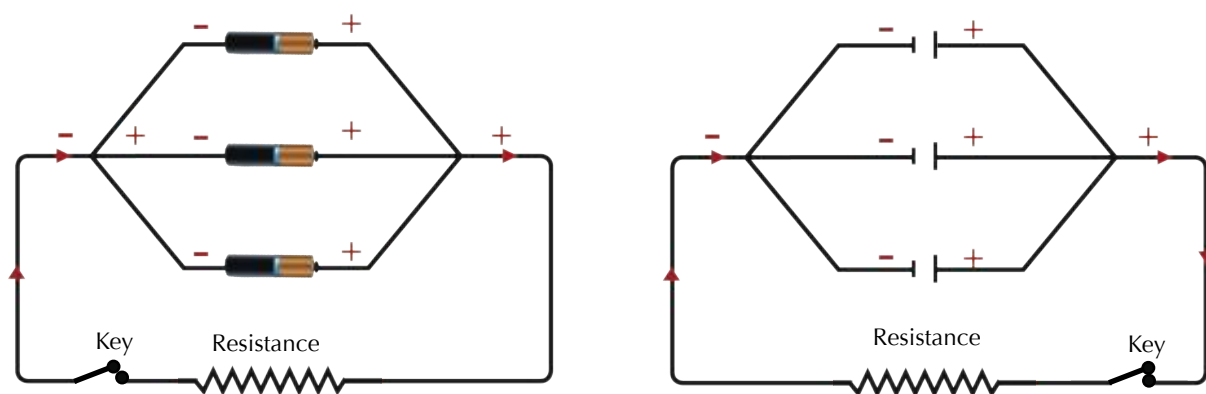


▲ **Figure (15) : Connection of electric cells**

- Electric cell is represented in the drawing by () and they are two straight parallel lines . The longer line represents, the positive pole and the shorter one represents the negative pole.

2 Connection in parallel:

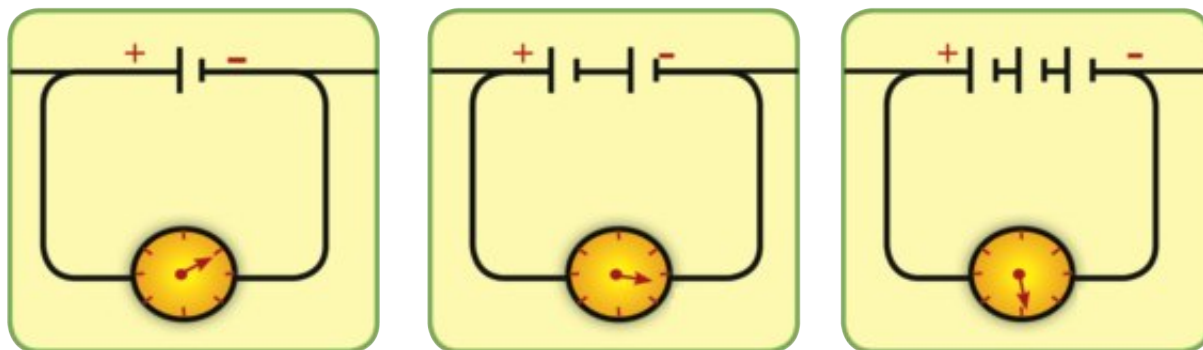
- It is done by connecting the positive poles of all electric cells together, and connecting the negative poles of all cells together with copper wires. Therefore, there'll be one positive pole and one negative of the battery .



▲ **Figure (16) : Connection of electric cells**

Activity

Discover :

Measuring the electromotive force (e.m.f) of cells
connected in series :

▲ Figure (17) : Measuring the e.m.f of several electric cells connected in series.

- 1** Make an electric circuit consisting of one cell and a voltmeter. Determine e.m.f reading in the voltmeter (E_1).
- 2** Connect another electric cell similar to the first cell in series. Determine e.m.f reading (E_2).
- 3** Connect another similar cell in series with the other two cells. Let us assign the e.m.f reading in this case be (E_3).

What do you observe about the three values of e.m.f ?
What's your conclusion?

- 1** The e.m.f in the second case is twice the emf in the first case, i.e. (E_2) is twice the value of (E_1).
- 2** The e.m.f in the third case is three times the emf in the first case, i.e. (E_3) equals three times the value of (E_1).

Conclusion:

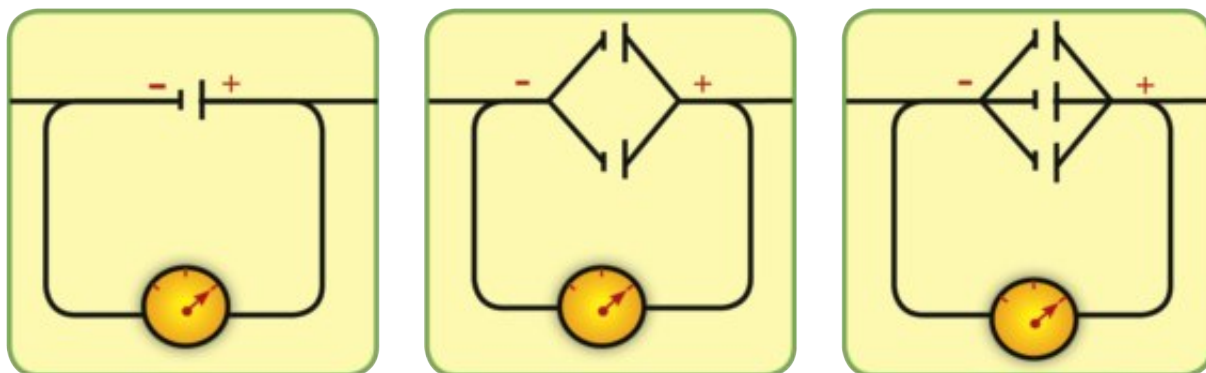
- e.m.f of a battery made up of cells connected in series = the sum of e.m.f.s of these cells
i.e. $E = E_1 + E_2 + E_3$
- e.m.f of a battery made up of similar cells connected in series :
e.m.f of the battery = e.m.f of one cell $\times n$
where "n" is the number of similar cells .

Activity

Discover :

Measuring e.m.f of electrodes connected in parallel :

- Repeat the previous experiment but connect the cells in parallel and let e.m.f reading in each step be (E_1) , (E_2) , and (E_3) .



▲ Figure (18) : Measuring the e.m.f of several electric cells connected in series.

What do you observe about the three values of e.m.f ? What's your conclusion?

Observation:

- The reading in the third case is the same as in the second case and the same in the first case, i.e. $E_1 = E_2 = E_3$.

Conclusion:

- The e.m.f of several similar cells connected in parallel equals the e.m.f of one electric cell.
- i.e. e.m.f of the battery = e.m.f of one cell.

Example :

A battery consists of three electric cells, the e.m.f of cell each cell is 3 volts, calculate the electromotive force when the cells are connected : (1) in series (2) in parallel

Solution :

- Cells connected in series: e.m.f (battery) = e.m.f (one cell) \times n (number of cells) = $3 \times 3 = 9$ volts.
- Cells connected in parallel: e.m.f battery = e.m.f one cell = 3 volts

Lesson 2 Exercises

1 Complete the following sentences:

- a** The electric current is generated from a dynamo due to converting energy to energy.
- b** Electric cells produce current while the dynamo produces..... current.
- c** There are two types of electric current which are , and.....

2 Choose the correct answer in the following:

- a** The direct current is used in
(lightening houses and streets – operating appliances - all the previous)
- b** In the electric cell,energy is converted into electric energy
(kinetic - magnetic - chemical)
- c** One of the properties of the direct current is
(change value – change direction- constant value and direction)

3 Put (✓) or (x) in front of the following statements and correct the false ones

- a** The electromotive force of several cells connected in series equals e.m.f of one cell. ()
- b** The dynamo produces alternating electric current. ()
- c** In electric cells and batteries, chemical energy is converted into electric energy . ()

4 You have three similar cells, the electromotive force of each is 1.5 volt, explain by using diagrams how you can connect them to obtain an e.m.f of:

- a** 1.5 volts
- b** 3 volts
- c** 4.5 volts

Radioactivity and Nuclear Energy



Lesson objectives

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

- ✓ Identify the phenomenon of radioactivity.
- ✓ List examples of radioactive elements.
- ✓ Identify the peaceful usages of the nuclear energy.
- ✓ Identify the harmful effects of radioactive pollution and means of prevention.
- ✓ Give an opinion about the importance of nuclear energy use in the peaceful aspects of human.



Lesson terms

- ◆ Radioactivity.
- ◆ Nuclear Energy.

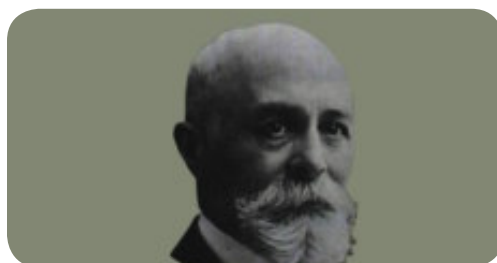
You previously knew that the elements consist of atoms and the atom's mass is concentrated in the nucleus . Also, you knew that the composition of the atom is responsible for the chemical and physical properties of the element.

The atom's nucleus is considered as energy store. This energy originates due to a force that binding the nucleus components and overcoming the repulsion force between the positively charged protons that found inside the nucleus.

These forces are the source that gives the atom its tremendous force which is known as the (nuclear energy).

Discovering the radioactivity phenomenon:

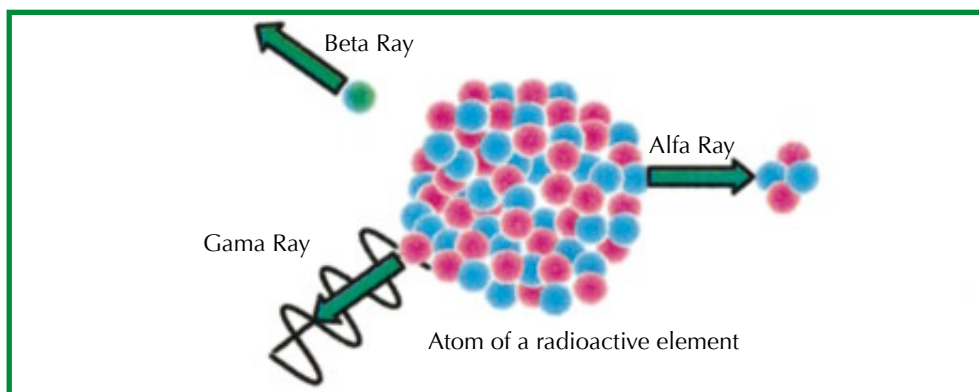
The radioactivity was known for the first time by the French scientist "Henry Becquerel" who discovered the emission of an unseen rays from the uranium element that has the capacity to penetrate through solid objects.



▲ Figure (19) : The scientist Henry Becquerel

What is meant by the radioactivity phenomenon?

The radioactivity phenomenon is defined as the spontaneous decaying of the atom's nuclei of some elements that are present in nature in an attempt to achieve a more stable composition, where the atom nuclei of these elements contain a number of neutrons more than the number required for its stability. Therefore, it is unstable due to its excess energy. These elements are known as radioactive elements. Some of the examples of these radioactive elements are radium, uranium, cesium polonium, rubidium, selenium and zirconium.



▲ Figure (20) : Radioactivity

Types of Radioactivity:

Natural radioactivity :

It is the radiation produced from the radioactive elements present in nature.

Artificial radioactivity :

It is the radiation or nuclear energy that is either released during nuclear reactions that can be controlled and which are done in nuclear reactors (peaceful uses) or that can not be controlled in the case of nuclear bombs (military uses).

History

Scientists with a history

- Dr. Aly Mostafa Moshrafa is an Egyptian scientist who was described by Einstein that he is one of the greatest physicists in the world. He has great theories in the fields of atom and radiation. Basics of manufacturing the atomic bomb were based on his theories. He gave his objection to this matter and called for the necessity of exploiting the atom and radiation for the benefit of humanity.



Dr. Aly Mostafa Moshrafa

The peaceful uses of nuclear energy

The scientists were interested in finding beneficial uses of the nuclear energy. And that was by controlling the amount of energy released from the nuclear reactions conducted in nuclear reactors, therefore, can be used in peaceful uses in a lot of fields as:

- 1 In the medical field:** To treat and diagnose diseases like cancer.
- 2 In the agricultural field:** To eliminate pests and to improve of some plant races.
- 3 In the industrial field:** To convert sand to silicon sheets which is used in manufacturing computer processors and programmed electric circuits that are used in electric appliances and also used to discover the defects in manufactured products.
- 4 In the electricity generation field:** The temperature produced from the nuclear energy is used to heat water till boiling . The water steam produced is used to operate the turbines to generate electricity.
- 5 In the space exploration field:** It is used as a nuclear fuel used by rockets that fly in space.
- 6 In the drilling field:** Used in the drilling for petroleum and underground water.



In the space exploration field



In disease diagnosis field



In industry

▲ Figure (21) : Some uses of nuclear energy

Risks and harmful effects of radioactive pollution and means of protection:

There are two sources of radioactive pollution:

1 Natural sources:

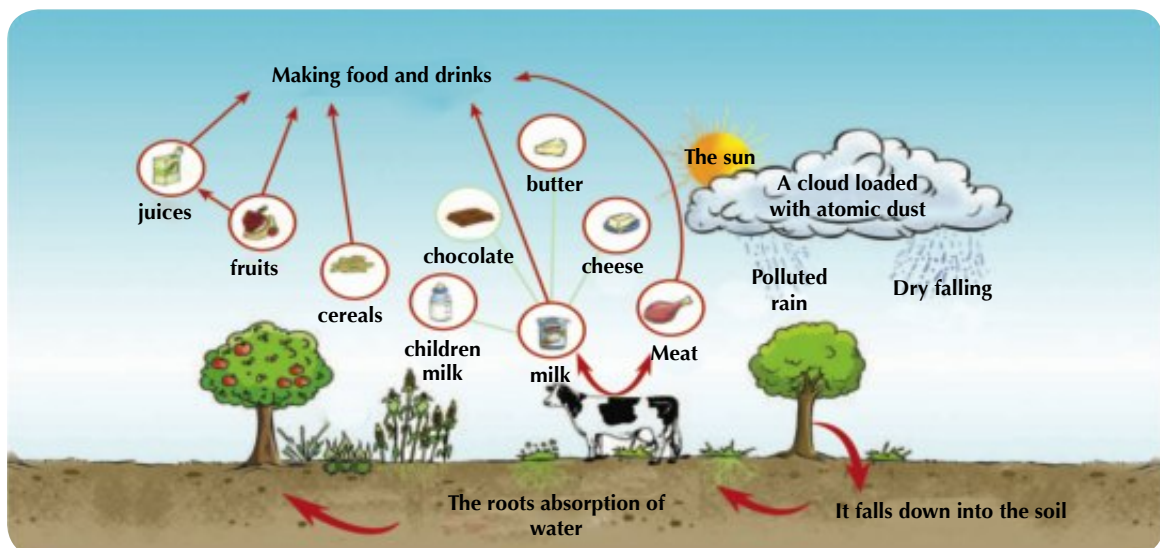
- They are represented by the natural radiation sources found on the surface of earth and in the cosmic radiation that comes from outer space.

2 Artificial sources:

- They take place as a result of the explosion of nuclear bombs that some countries experiment every once in a while . They are also due to nuclear reactors. All this leads to raising the amount of radiation and its varieties in the environment surrounding , which leads to radioactive pollution of the environment .
- The Chernobyl accident resulted in the pollution of food products by radioactive elements. On the 26 of April 1986, an explosion occurred in the Russian reactor as a result of an error in operation. This resulted in the melting of the reactors core which lead to a nuclear explosion and consequently the release of many of the radioactive elements forming an atomic cloud that was carried by the wind to most of the countries in eastern and western Europe. The peak of the pollution was when rain fell in May of the same year carrying the radioactive elements with it to the surface of earth.



▲ Figure (22) : Inside a nuclear reactor



▲ Figure (23) : An image that illustrates the way by which food is polluted by radioactive elements

In the previous figure, We notice that pollution from the clouds loaded with the atomic dust reaches earth either by dry falling or by falling with rain to earth. Therefore, the plants and soil are polluted by the fallen radioactive isotopes and thus herbivores as cows and sheep. Thus their milk products and meat will all be polluted by radiation.

What are the radioactive isotopes (isotopes are atoms that contain the same number of protons and different number of neutrons) which are found in polluted food?

It has been known that the elements that are found in the polluted food after the Chernobyl accident are iodine and cesium isotopes. They are elements produced from the decay of the nuclear fuel (uranium – 235) when absorbing the neutrons and carried by the clouds and wind as an atomic radioactive dust.

The radiation effects on the human body

The radiation effects on the human body differs with the duration of the exposure to the radiation. This effects can be divided in two groups:

1 The effects of exposure to a large dosage of radiation for a short time:

- This will lead to the damage of the bone marrow, spleen, the digestive system and the central nervous system. The bone marrow forming the blood cells is affected by radiation. This will reduce the number of red blood cells which causes the feeling of being sick, having a sore throat accompanied by nausea, vertigo and diarrhea.

2 The effects of exposure to small doses of radiation for a long period of time:

- If a person is exposed to small doses of radiation for a long time (months or years), the most important effects are:

a - Physical and genetic effects :

The changes that appear on a living organism as a result of exposure to radiation are called physical changes. The radiation could result in genetic changes as it causes changes in the sex chromosomes composition which results in abnormal births.

b - Cellular effects :

Radiation causes changes in the cells composition. The chemical composition of the hemoglobin changes and it becomes incapable of carrying oxygen. Thus, exposure to large doses of radiation destroys the cells.



▲ Figure (24) : Exposing to radiation causes genetic changes

Means of protection from radiation pollution

- 1** Not to be exposed to the maximum safe doses of nuclear radiation which should not exceed 5 Rem for humans in a day (rem is the measuring unit for absorbed radiation).
- 2** Those who work with radioactive elements in laboratories and hospitals should wear radiation protective gloves and clothes.
- 3** Follow the following precautions while dealing with radioactive wastes:
 - ◆ These radioactive wastes should be away from underground water's path so it will not get polluted.
 - ◆ The area chosen for storing the radioactive wastes should be a steady one and not exposed to earthquakes or volcanoes.
 - ◆ The area chosen for storing the radioactive wastes should be away from the animals that live in caves so it will not be exposed to the danger of radiation produced by the wastes and in turn this danger reaches other living beings.
- 4** The nuclear wastes are disposed in various ways according to the intensity of the radiation they produce. The wastes of weak and medium radiation are surrounded by a cement layer or rocks and placed deep inside the ground . The wastes of strong radiation are placed in water to cool down and then deeply buried in the ground away from inhabited areas.
- 5** Place laws for nuclear stations to cool the hot water before throwing it in the seas and lakes.



▲ Figure (25) : Wearing gloves and protective clothes to protect against radiation



▲ Figure (26) : Some wastes are placed deeply inside the earth after surrounding it with a layer of cement or rocks

Lesson 3 Exercises

1 Choose the correct answer for each sentence:

- a The radioactive phenomenon was discovered by the scientist
.....
(Ohm – Becquerel – Ampere)
- b The effects of radiation is a result of changing the sex
chromosomes of the cells.
(physical – genetic– cellular)
- c Human beings should not be exposed to radiation in amounts more than
..... rem.
(5 - 8 - 10)
- d is a nonradioactive element
(radium – uranium – iron)
- e The measuring unit of absorbed radiation is the
(curie – rem – roentgen)

2 Give reason:

- a The areas chosen for storing radioactive wastes should be more steady.
- b Radiation has genetic effects.
- c After the Chernobyl accident, radioactive isotopes were found in the food
products.
- d Radioactivity has natural sources and also artificial ones .
- e Some elements are called radioactive elements.

3 Write the scientific term that corresponds each of the following statements:

- a The process of spontaneous decaying of atoms of some elements present
in nature to reach a more stability.
- b The radiation and nuclear energy emitted during nuclear reactions that
can be controlled and carried out at nuclear reactors.
- c The changes that take place to the living organism due to its exposure to
radiations.
- d The measuring unit of the absorbed radiation.



Science, Technology and Society

Enriching activity

Make a lemon battery (in series and in parallel):

Tools and materials used:

Fresh ripe lemons – small ribbons of copper – 4 small ribbons of lead – copper wires for connection – paper clips – two small electric lamps.

Procedures:

- 1** Cut the lemons into halves.
- 2** Fix ribbons of both copper and lead and fix the wires as in the figure .
- 3** Connect the free ends of ribbons together and with a small electric lamp .

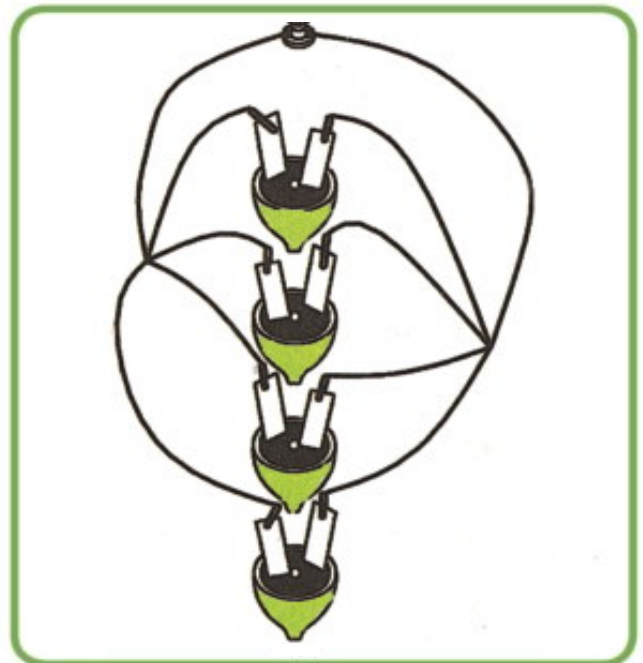
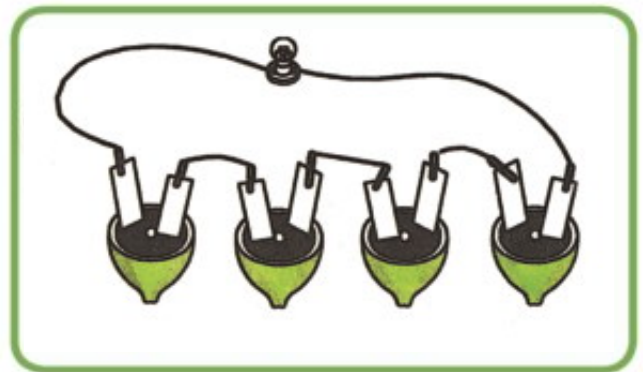
Record your observations.

.....

.....

Analyze your conclusions:

- Which battery has its cells connected in series? Which battery has its cells connected in parallel?
- Which battery caused the lighting of the lamp with greater intensity?
- How can you improve the lighting of the lamp connected to the battery that caused the lamp to light with less intensity?

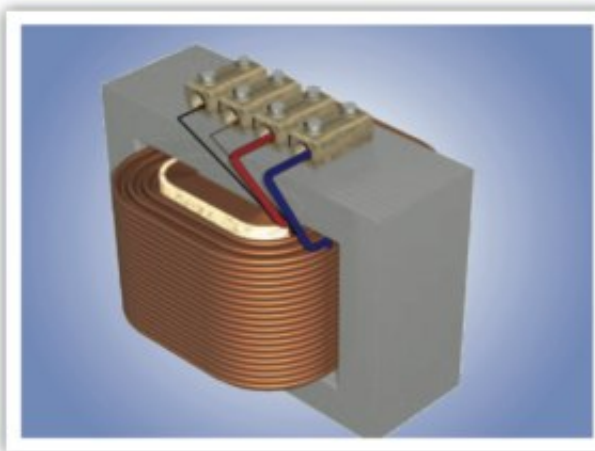


Technological application

The electric potential at home and in electric equipments:

- You may know that the electric voltage at home is 220 Volt. But, what if you get a device operated by voltage of 110 Volt? Of course you know that if you connect the device directly at home, it will break down. You should use a device known as “The electric transformer” by which you get the required voltage

(110 Volt out of 220 Volt (a step down transformer that reduces voltage). Search for the types of the electric transformers using the school library and the internet. Write a report to be attached to your portfolio.



Electric transformer

Can you store the electric current at home?

- Have you ever heard about a device used to store the electric energy for a long or short period of time? This device provides the electric devices with the electric current so as to continue operating when there is no current at home. This type of electric devices is called “uncut electric charger”.



Uncut electric charger device

Unit 2 Exercises

1 Write the scientific term that responds to each of the following statements:

- a The flow of electric charges in a conductor.
- b The electric current of constant intensity and direction.
- c The resistance of a conductor that allows the passing of an electric current of 1 Ampere through it when the potential difference between its two ends is 1 Volt.
- d The intensity of the electric current flowing in an electric circuit when an electric charge of 1 Coulomb passes within the conductor's cross-section in 1 second.
- e The device used to measure the intensity of the electric current passing in a conductor.
- f The electric state of a conductor that shows the transference of electricity from and to it.
- g The measurement unit of the electromotive force of the electric cell.
- h The measuring unit of the absorbed radiation.
- i The natural decaying of the atoms of some elements in nature as an attempt to reach a more stable composition.

2 Choose the correct word:

- a Direct current can be produced form
(electrochemical cells – electric generators – electric power stations)
- b Theis the measuring unit of the electric charges .
(coulomb – ampere – volt)
- c Theis the measuring unit of the electromotive force .
(coulomb – ampere – volt)
- d The..... is used to measure the electric resistance.
(ammeter – voltammeter – ohmmeter)
- e The is the measuring unit of the current intensity.
(coulomb – ampere – ohm)
- f The mathematical relation of Ohm's law is
($R = V/I$, $I = RV$, $R = V \times I$)
- g You should not be exposed to radiation more than
Rem daily.

(5 - 15 - 25)

3 Give reasons for the following:

- a** It is better to use the alternating current rather than the direct current.
- b** The voltmeter is connected to both poles of the battery in the electric circuit.
- c** Rheostat is used in some electric circuits.
- d** Some cells are connected in the electric circuit in series.
- e** Some cells are connected in the electric circuit in parallel.
- f** The electromotive force of a battery whose cells are connected in series is greater than that one whose cells are connected in parallel.
- g** Some elements are called "the radioactive elements".
- h** Radiation has genetic effects.

4 Calculate the potential difference between the two ends of a vacuum cleaner whose resistance is 22 Ohms and the current intensity passing through it is 10 Amperes .

5 You have 4 similar electric cells. The potential difference of each one is 1.5 Volt. Illustrate by drawing how you connect them to get batteries of e.m.f of:

- a** 6 Volt.
- b** 4.5 Volt.
- c** 3 Volt (in two ways).
- d** 1.5 Volt.

The Second Term - Unit Three

Genetics

Introduction

Genetics explains to us the existence of the similarity between you and your brothers or sisters as well as the differences in some external traits.

This is because genetic traits transfer from a generation to another according to basics and laws that geneticists reached.

Genetic traits transfer through the reproduction. In the asexual reproduction, the offspring are exactly similar because they are produced from one parental cell. In the sexual reproduction, there are similarities and differences between offspring as they are resulted from the mating of two individuals.



UNIT OBJECTIVES

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

- ✓ Identify the difference between the hereditary and acquired traits.
- ✓ Explain why Mendel chose the pea plant for his experiments.
- ✓ Identify Mendel's laws of heredity.
- ✓ Identify the concept of the dominant and recessive traits.
- ✓ Determine the dominant and recessive traits in Mendel's experiments on the pea plant.
- ✓ Identify some of the dominant and recessive traits in the human being.
- ✓ Identify the concept of gene.
- ✓ Identify the different types of mutations.
- ✓ Appreciate the efforts of geneticists in discovering how traits are transferred through generations.

Included issues

- ◆ Preserving the resources.



Lesson 1
The main principles
of heredity



Lesson 2
Genes

The Main Principles of Heredity



Lesson objectives

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

- ✓ Determine the difference between the hereditary and acquired traits.
- ✓ Explain why Mendel chose the pea plant for his experiments.
- ✓ Identify Mendel's two laws of heredity.
- ✓ Identify the concept of the dominant and recessive traits.
- ✓ Determine the dominant and recessive traits in Mendel's experiment of the pea plant.
- ✓ Determine some of the dominant and recessive traits in the human being.



Lesson terms

- ◆ Hereditary traits
- ◆ Acquired traits.
- ◆ Dominant traits.
- ◆ Recessive traits.

Thousands of years ago, Man has observed that some traits are transmitted from one generation to another and scientists have called them "**hereditary traits**" like the color of the hair, the color of the skin, the numbers of fingers and the blood groups. Some traits are not transmitted from one generation to another and they are called the "**acquired traits**".

Now, you might wonder:

How hereditary traits are transmitted from one generation to another and why some traits of the parents appear in the offspring?

The experiments by Mendel placed the basics for the scientific studies of heredity. According to the results reached by Mendel and over the years, heredity scientists have gathered a lot of information on the reasons why the living beings have the forms they have, or behave the way they do. How did Mendel start his experiments and what are the results that he reached?



▲ Figure (1) : The scientist Mendel (The founder of heredity)

Experiments of Mendel

Mendel chose the garden pea plant to conduct his research and his choice of this plant was due to the following reasons :

- 1** It is easy to plant the pea plant and it grows fast.
- 2** The life cycle of the pea plant is short.
- 3** The flowers of the pea plants are hermaphrodite, and thus it can self pollinate.
- 4** It can easily be artificially pollinated (human intervention).
- 5** Pea plant produces large numbers of offspring in a generation.
- 6** There are several types of peas that have pairs of contrasting traits that can be recognized easily. Some of the plants are long stemmed and others are short stemmed. The flowers of some of the plants are white and others are red. The pods of the peas could be green in color or yellow and so on.

Question















for thinking

- If one of the parents learns a specific skill like playing football, is this skill transmitted hereditary to the offspring? Why?



▲ Figure (2) : The pea plant

Despite the numerous different traits of the pea plant, Mendel chose seven main traits to conduct his experiments and the following figure shows these traits:

Seed Shape	Seed Color	Pod Shape	Pod Color	Flower Color	Flower Position	Stem Height
						
Smooth	Yellow	Swollen	Green	Red	Side	Tall
						
Wrinkled	green	Sinuous	yellow	white	end	Short

Mendel studied the inheritance of each pair of the contrasting traits separated by following specific scientific steps. To explain that, we follow these steps in studying the seed color trait of the plant:

Mendel's experiment to study the seed color of the pea plant:

- 1** Mendel planted a pea plant that produces yellow seeds and a pea plant that produces green seeds for several generations to make sure of the purity of these traits. Thus, the yellow seeds produced yellow seeds plants generation after another, and the same goes for the green seeds plants. Mendel was able to do that by self pollination of these plants for several generations.
- 2** After making sure of the purity of the yellow and green seeds traits of the plants, he planted the seeds of these plants (parents) . When plants were produced carrying flowers, Mendel removed the stamens of their flowers before the another becomes mature.

Why did Mendel remove the stamens from the flowers of the plants?

.....

- 3** By means of cross pollination, Mendel pollinated the flower of the plants that produces yellow seeds with pollen from a plant that produces green seeds. He also pollinated the flower of the plants that produces green seeds with pollen from a plant that produces yellow seeds , then he covered the stigmas of the pistils.

Why did he covers the stigmas ?

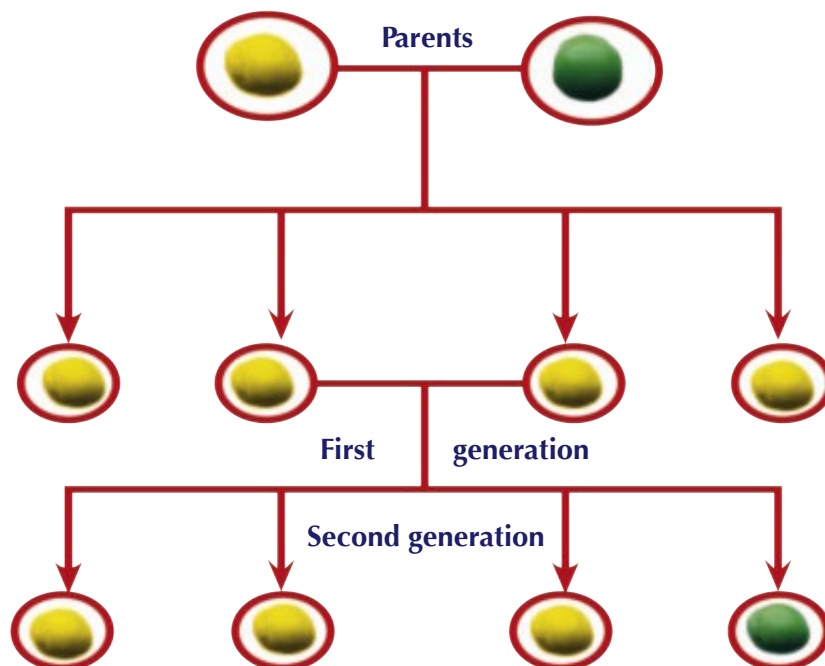


Figure (3) : The inheritance of the seed color in the pea plant

Mendel observed that all the plants produced only yellow seeds and the green color of the seeds disappeared completely in the plants of first generation. Mendel named the trait of yellow color of the seeds the “dominant trait” that is it dominates the other trait. He named the trait of the green color of the seeds the “recessive trait”

- 4** Mendel let the first generation plants self pollinate, then planted the resulting seeds swollen and got the second generation plants, some with green seeds representing only a quarter of the produced plants, but the plants with yellow seeds represent three quarters of the second generation.

The principle of complete dominance

Mendel repeated the same experiment for the seven other traits of the pea plant and got the same results. He found out that the long-stem trait dominates the short - stem trait, the red color of the flower dominates the white color, the side position of the flower trait dominates the end position, the smooth seed trait dominates the wrinkled one, the swollen pod shape trait dominates the sinuous, and the green pod color trait dominates that of the yellow color. He observed that one of each pair of traits disappears completely in the first generation then the two contrasting traits appear in the second generation in a ratio of approximately 3:1.

Mendel named the trait that appears in all individuals of the first generation as "the dominant trait" and named the other trait that disappears in the individuals of the first generation as "the recessive trait".

The principle of complete dominance : is the appearance of a dominant hereditary trait in the individuals of the first generation when two individuals are crossed over, one of them carries a pure trait contrasting the trait carried by the other individual.

What did Mendel deduce from the previous experiment?

Mendel deduced the following :

- 1** The color of the seed depends on (factors) present in the plants transmitted from one generation to another by means of gametes. There is a factor that determines the yellow color of the seed and another factor that determines the green color of the seed.
- 2** When these factors meet in the first generation, the yellow color factor is dominant over the green color factor that is recessive and this leads to the production of only yellow seeds in the first generation.
- 3** When the gametes in the first generation are produced by meiosis, these factors separate (segregate) from each other, then they meet again on the production of the second generation.



▲ Figure (4)



Figure (5)

- 4** If the yellow color factor meets with the green color factor another time, the result is a yellow seed, but if the green color factor meets with another green colour factor the result is a green seed.

Mendel's first law: The law of segregation:

Mendel made several assumptions to explain the appearance of the dominant trait and the disappearance of the recessive trait in the first generation in the experiments of the pea plant that he studied, and these assumptions are:

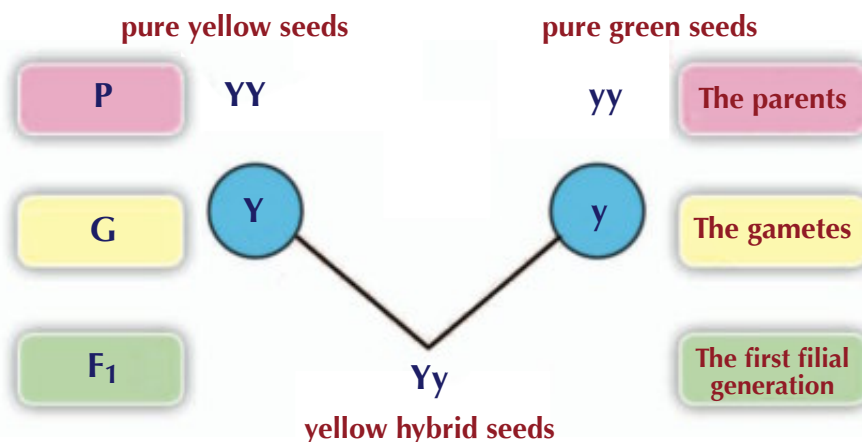
- The hereditary traits are transmitted from the parents to the offspring by means of hereditary factors which are now known as the genes.
- In a living organism, every hereditary trait is controlled by two hereditary factors (one from the father and the other from the mother). These factors are similar or homozygous if the trait is pure and not similar (different) if the trait is impure or heterozygous and the living organism that carries an impure trait is called a hybrid.
- The two hereditary factors in every trait separate when the gametes are formed, where each gamete carries one factor for each hereditary trait.

Mendel has summarized the previous assumptions in a law known as Mendel's first law or the law of segregation as he named it, and it states:

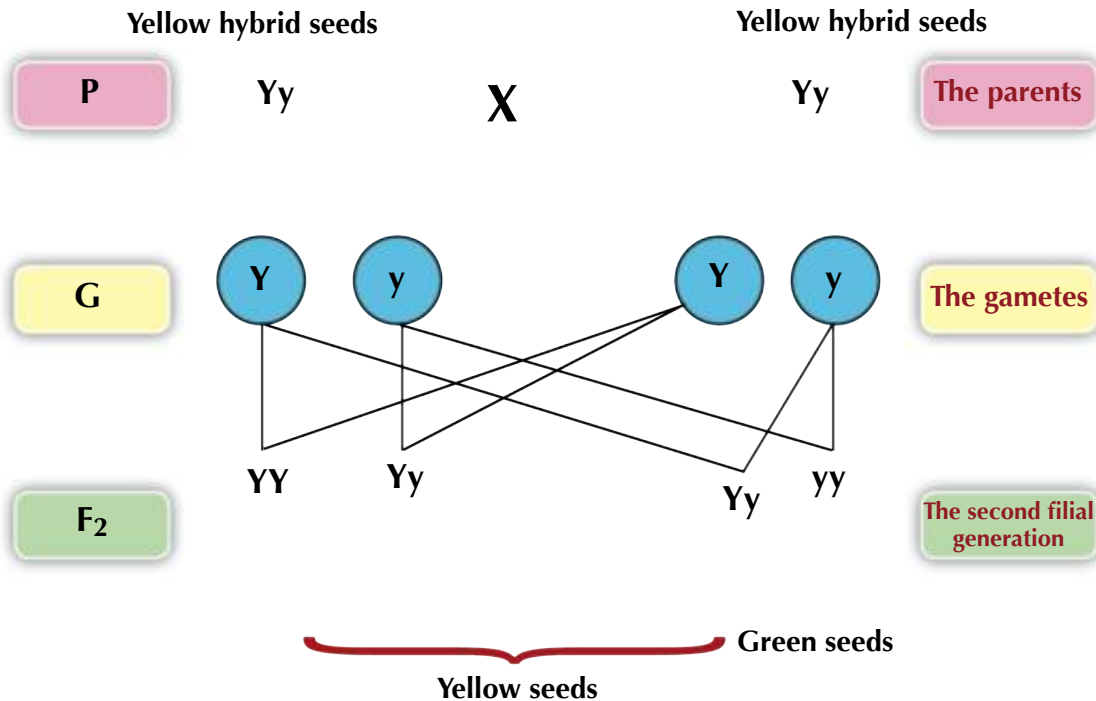
When two individuals of any pair of hereditary traits are different from each other, only the dominant trait appears in the first generation, while the two traits appear in the second generation in ratio of 3 dominant : 1 recessive.

Using symbols to represent the results of the experiment:

If we choose a symbol to represent the color of the seeds in the plant and we symbol the dominant color (yellow) by the letter (Y) and we symbol the recessive color (green) by the symbol (y), therefore the pea plant with pure yellow seeds becomes (YY) and the pea plant with pure green seed becomes yy and we can represent the crossing-over between the two plants by using the symbols as follows:



When the experiment continues and we let the plants of the first generation self pollinate, we get the second generation that we symbol as follows:



Activity

Discover :

Discover the results of pollinating two pea flowers that are different in colour

The following figure represents the results of crossing-over between two different color flowers of the pea plant. By referring to what you have learned, answer the following questions:

The contrasting traits are

The dominant trait is

The recessive trait is

Explain your answers

.....

If the flowers resulting from the first generation are self pollinated, express by drawing and symbols the results of the second generation.



Mendel's second law: The law of independent assortment of hereditary factors.

Mendel continued his experiments on the pea plant by studying how two pairs of contrasting traits are inherited. He conducted a mixed pollination between two pea plant where one carries two pure dominant traits (tall stem and red flowers) and the other carries two recessive traits (short stems and white flowers).

Mendel observed that all the first generation plants had tall stems and red flowers and when he left the first generation plants to self pollinate to produce the second generation individuals he got the following plants:



▲ Figure (6)

9	3	3	1
Tall stem, red flowers	Tall stem, white flowers	Short stem, red flowers	Short stem, white flowers

From the previous results, observe the following:

- In the first generation all the plants had tall stems and red flowers, thus the two dominant traits appeared.
- In the second generation the ratio of the number of red flower plants (dominant) to white flowers (recessive) was 12 : 4 thus 3 : 1, and the ratio of the number of tall stem plants (dominant) to short stem plants (recessive) was 12 : 4 thus 3 : 1.

And from this Mendel deduced his second law (independent assortment of the hereditary factors) which states :

When two individuals bearing a pair or more of alternative (contrasting) traits are crossed, the trait of each pair is inherited independently of the others and appears in the second generation at a ratio of 3 : 1.

Information

Enriching information:

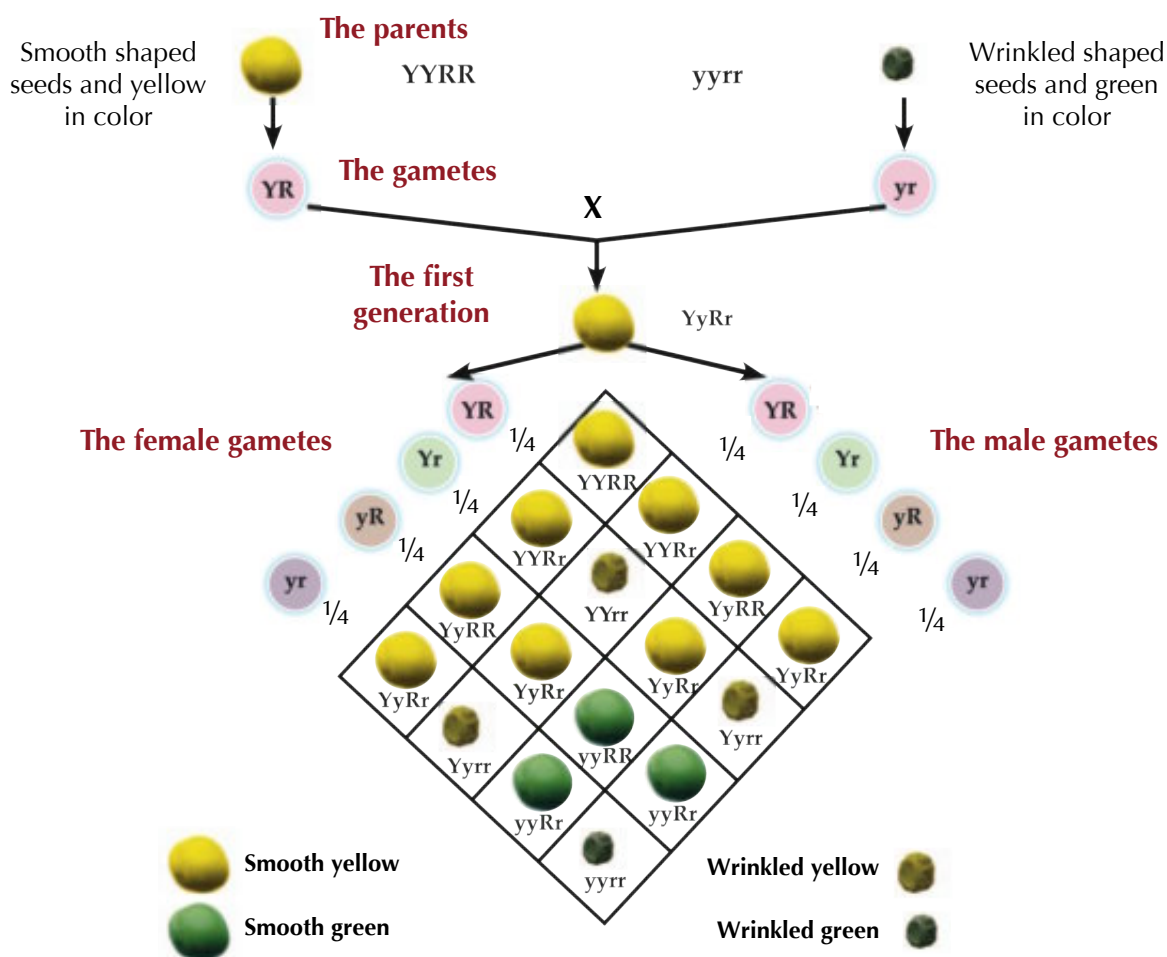
- At the beginning of the present century, many experiments were conducted to apply Mendel's laws of heredity on a number of traits in the animals and the plants. The results showed that inheriting some traits followed Mendel's laws, but there were cases that did not completely follow Mendel's laws, and it was agreed to name them the non-Mendelian heredity.

Activity

Discover :

Discover the inheritance of two pairs of the contrasting traits

The following figure shows the results of the mixed pollination between two pea plants where one carries two dominant pure trait, the smooth seeds and yellow colored seeds, and the other carries two recessive traits, the wrinkled seeds and green colored seeds.



Observe the figure and answer

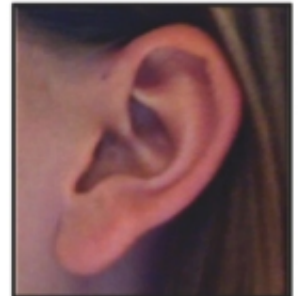
- What are the traits that appeared in offspring of the first generation?
- Are they dominant or recessive traits?
- How many types of gametes produced in individuals of the first generation?
- Describe the second generation plants.
- What is the ratio of the green seeds to the yellow ones in the second generation?
- What is the ratio of the smooth seeds to the wrinkled ones in the second generation?

The dominant and recessive traits in the human being

Many human hereditary traits follow the Mendelian heredity where the trait is controlled by one pair of genes. It can be dominant or recessive. The individuals who receive at least one dominant gene from either parent will have the dominant trait, and those who receive a recessive gene from both parents will have the recessive trait. Observe the following figures to identify some of the traits that follow the complete dominance principal in the human being:



▲ Figure (7): The ability to roll the tongue is one of the dominant traits in the human being



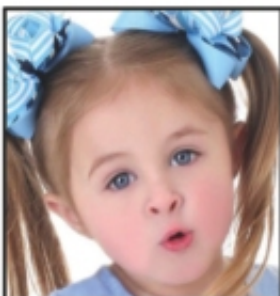
▲ Figure (8): The free ear lobe trait dominates the attached ear lobe trait.



▲ Figure (9): The curly hair trait dominates the straight hair trait



▲ Figure (10): The wide eyes trait dominates the narrow eyes trait



▲ Figure (11): The presence of cheek dimples trait dominates the no dimples trait



▲ Figure (12): The absence of freckles in the face trait is the dominant trait and the presence of freckles is the recessive trait



Lesson 1 Exercises

1 Mention the scientific term:

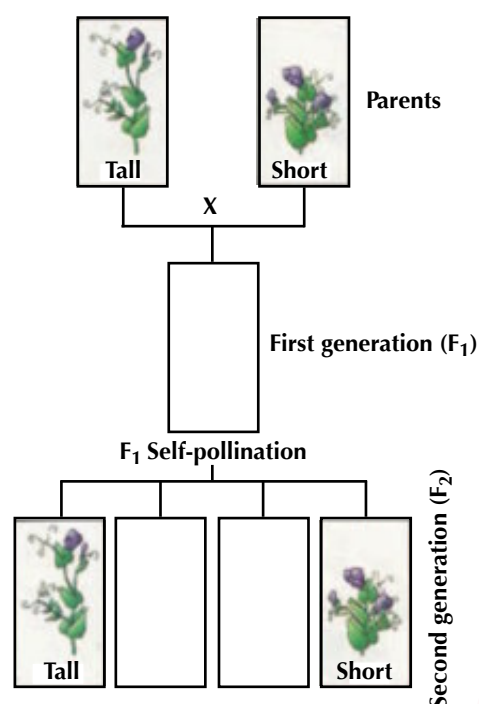
- a A science that researches the transmission of the hereditary traits from one generation to another by the studying the similarities and differences between the parents and their offspring.
- b The characters ready to be transmitted from one generation to another.
- c The trait that appears in all individuals of the first generation in Mendel's experiments.
- d The appearance of a hereditary trait in the individuals of the first generation when two individuals are crossed one of them is carrying a pure hereditary trait contrasting the trait carried by the other individual.

2 Explain:

- a Mendel's selecting the pea plant to conduct his experiments.
- b When a pure yellow pod pea plant is pollinated with a pure green pod pea plant, they produce plants that are all with green pods.
- d The ability of rolling the tongue is a dominant trait in the human being.

3 The figure illustrates the mixed pollination between the flowers of the short pea plant and another tall one, determine :

- a The individuals of the first generation.
- b Complete the missing individuals of the second generation and describe the individuals of the second generation.
- c Use symbols while expressing in the previous experiment.



Genes



Lesson objectives

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

- ✓ Identify the concept of the gene.
- ✓ Identify the role of the genes in determining the traits of the living organisms.
- ✓ Identify the concept of the mutation.
- ✓ Explain the mutation as a source of genetic variation.
- ✓ Appreciate the scientists role in discovering the nucleic acids structure and their role in genetics.



Lesson terms

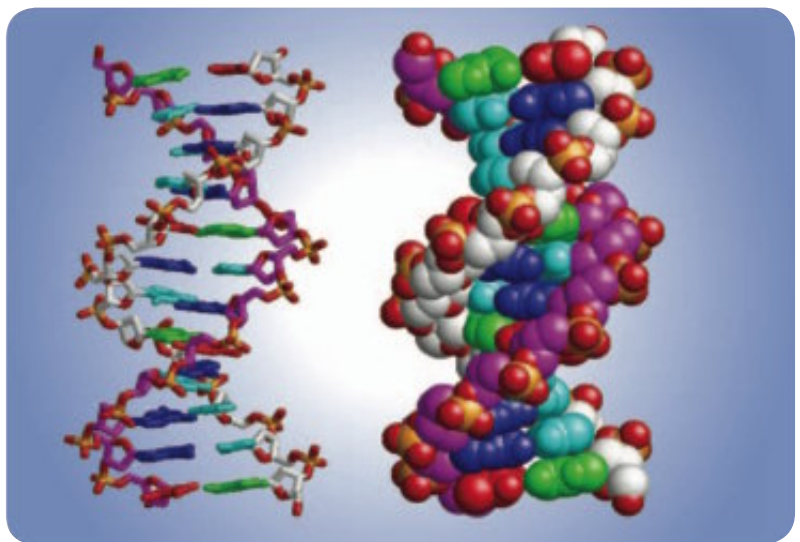
- ◆ The gene
- ◆ The mutation

You have previously studied that the scientist Gregor Mendel has found out that the hereditary traits are transmitted from the parents to the offspring by means of hereditary factors. The scientists later called them the genes.

What is the gene?

What is its composition?

And how does it control the traits of the living organisms?

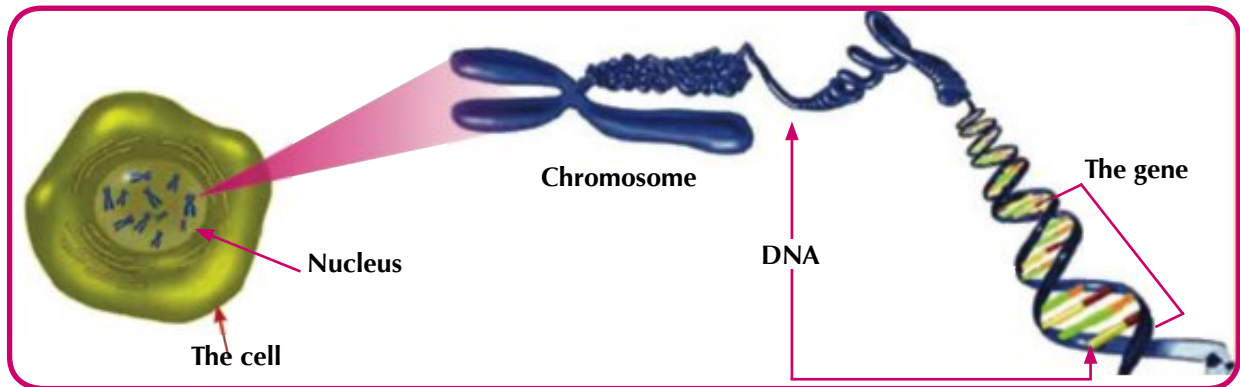


▲ Figure (13) The DNA model

The genes

What are the genes?

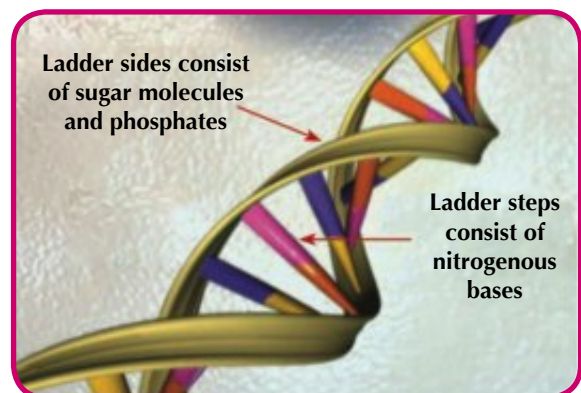
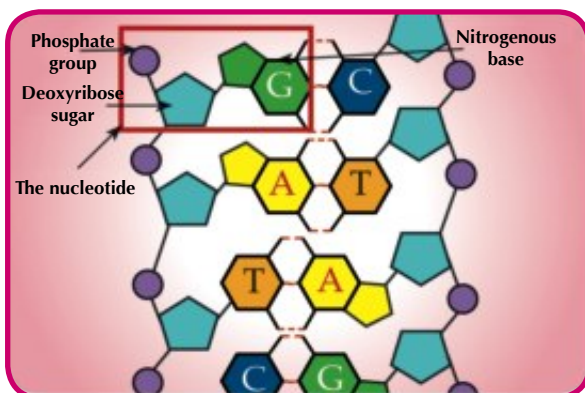
You know that the chromosome is chemically consisted of a nucleic acid called DNA bind with the protein. The nucleic acid is what carries the hereditary traits of the living organism. Scientists have found that the genes are DNA parts present on the chromosomes.



▲ Figure (14) The hereditary material inside the nucleus of the cell.

The scientists Watson and Creek made a model for the DNA molecule. This model is composed of two strands coiled around each other like the spiral ladder (it is called the double helix) The sides of this ladder are consisted of sugar molecules and phosphate groups, and its steps are consisted of nitrogenous bases. There are four types of nitrogenous bases that form the steps of the ladder and they are: adenine (A), thymine (T), cytosine (C), and guanine (G), where the adenine is paired to thymine ($A = T$) and the guanine is paired to cytosine ($C \equiv G$).

The gene is the nucleic acid DNA building block, and consists of more smaller blocks called the nucleotides. Each nucleotide consists of a phosphate group, deoxyribose sugar and a nitrogenous base, as shown in figure (15)



▲ Figure (15) The DNA consists of small consecutive units called nucleotides and each consist of a group of phosphate group, deoxyribose sugar and a nitrogenous base

How do you inherit your genes?

Genes are found inside the nucleus of every cell of your body . You inherit half of your genes in the nucleus from the mother and the other half from the father and that is when fertilizing the egg of the mother with the sperm of the father. After fertilization, the zygote is formed and divided many times to form the cells, tissues, and the body organs of the fetus, where each cell carries a complete set of genes responsible for the appearance of the hereditary traits.

What type of cellular division that occurs in the zygote to form a fetus?

.....

How do the genes perform their functions?

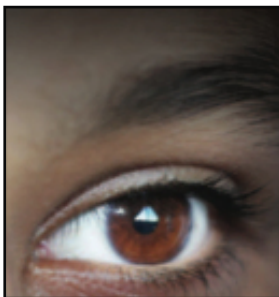
The genes control the body growth, features and functions. The scientists Badel and Tatum discovered the means of how the gene controls the appearance of a trait, where they found that every gene gives a special enzyme. This enzyme is responsible for the occurrence of a reaction resulting in a protein showing a specific hereditary trait. The two scientists received for that a Nobel Prize in the year 1985.

Let us take an example for the inheriting the trait of eyes colour, If you inherit one gene from one of your parents and it is responsible for the brown color of eyes trait which is the dominant trait, then the gene works on forming a protein where this trait appears on you.

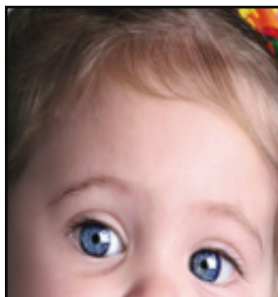
Information

Enriching information

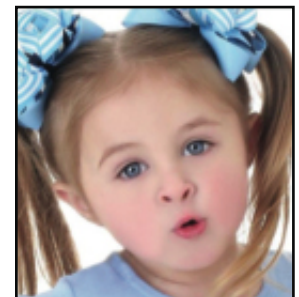
- The Danish scientist Johansen used the term gene instead of the hereditary factor and introduced the term the "genotype" for the gene structure in the living organism, and the term "phenotype" for the hereditary trait that appear on the living organism.



▲ Figure (16): The brown eyes trait is dominant over the colored eyes



▲ Figure (17): The Black hair is dominant over the light colour hair.



Mutations

Mutation is a change in the nature of the hereditary factors that control the traits of the living organism, which results in a change in a trait of this living organism. Mutation are varied in type according to many factors as:

Site of occurrence: The mutation could be gene or chromosomal mutations.

Its inheritance: The mutation could happen in the somatic cells of the body, thus affects the individual and is not transmitted to the offspring. It also could happen in the reproductive cells and is transmitted to the offspring.

Its origin: The mutations could naturally originate or induced by the human being.

In order to understand what is meant by the genetic mutation, we have to remember that the gene consists of small blocks called nucleotides that contain nitrogenous bases . So if there is any change occurring in of these nitrogenous bases (if for example base A is replaced with base C) or in their sequence .This in turn causes the protein that shows the hereditary trait not to be formed, or a protein of another type is formed, and as a result the appearance of a new trait. Gene mutation means changing the chemical composition of one or more genes. This leads to changing the hereditary trait resulting from this gene. So, a new trait appears that never appeared in the parents. This change could be transmitted from one generation to another.



▲ Figure (18): The grey mice have melanin pigment but the white mice do not have this material due to the change in the gene composition responsible for this trait (mutation)

Question

for thinking

- Compare between the mutation that occurs in the reproductive cells of a living organism and that occurs in the somatic cells, in respect to its transmission from one generation to another.

Most of the mutations result in the appearance of undesirable traits like birth deformations in the human and the animal or sterilization in plants. The changes that lead to desirable changes are rare.

The mutation origin

The spontaneous mutation

The spontaneous mutations occur without the interference of the human being and its percentage is very low. It could be due to the influence from the surrounding environment like exposure to radiation as the x-ray, atomic rays or exposure to chemical substances. Also the exposure to high or very low temperatures could result in the occurrence of mutations. The spontaneous mutations that appear in the genes is the reason for the natural variation between the genera and species of the animals and various plants, where the new traits that are produced from the occurrence of the mutations are inherited across the successive generations. This produces new individuals with different traits.

The induced mutation

Its occurrence is controlled by the human being to obtain desirable traits in specific living organisms especially in the plants like inducing the production of fruits larger in size, better in taste, and free of seeds.



▲ Figure (19): Products resulting from the occurrence of the induced mutations.

Lesson 2 Exercises

1 Define each of the following :

The gene – mutations

2 Put (✓) or (X) in front of the following statements and correct in the false ones:

- a** The gene mutation occurs as a result of the change in the nitrogenous bases of the gene.
- b** Genes are parts of DNA found in the cytoplasm of the cell.
- c** Mutation in the somatic cells is transmitted to offspring.

3 Write the scientific term that corresponds to the following statements:

- a** It is chemically consisted of a nucleic acid called DNA combined with protein.
- b** They are parts of DNA on the chromosomes and control the hereditary traits of the individual.

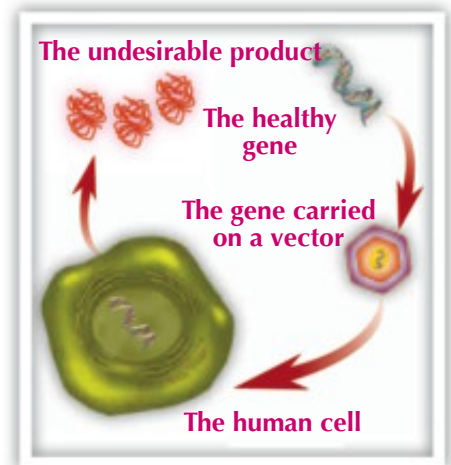


Science, Technology and Society

Enriching activity

Collaborate with a group of your colleagues in gathering information and writing a report on the treatment with the genes. Refer to the following summary:

Gene therapy is meant to replace the damaged genes that are responsible for the disease with a healthy one to treat this disease, or introducing healthy genes carrying desirable hereditary information to the inside of the cell, and the gene in this case is considered as a medicine. The treatment by genes presents the opportunity for the human body itself to provide the capability to create some of the materials (the medicine) and in the appropriate time with the possibility of continuing the treatment all its life.



Refer to the following sites :

www.islamonline.net/servlet/Satellite?c

news.bbc.co.uk/hi/arabic/sci_tech

ar.wikipedia.org/wiki/%D8%B9%D9%84%D...

www.doctorqari.com/index.php?option=co...

Technological application:

The bio-technology collaborating with the traditional ways to combat malnutrition:

Around 500,000 people every year are affected by losing their sight, and this is due to the deficiency in vitamin (A). It is one of the important elements of nutrition that its deficiency leads to malnutrition. Deficiency in vitamin (A) is widespread in those who depend on eating rice. The rice does not contain pro-vitamin (A) or what is known as carotene (a substance which is converted into vitamin A in the body). Solving this problem is done by producing rice that contains pro-vitamin (A), and it depends on changing the genetic structure of the rice crop. This is done by inserting the genes that result in the creation of the pro-vitamin (A) compound inside the tissue that stores the starch in the plant seeds.

Life application

The human genome project

This project started in October 1990 with the aim of discovering all of the human inheriting factors (the genes). The project also aims to discover and determine the complete sequence of all the 3 billion pair of nitrogenous bases. The scientists have called the twenty first century the hereditary century due to the importance of this discovery.

The scientists decided to work hard to obtain a detailed very precise map for the sequence of the nitrogenous bases, and predicted that drawing this map will help to a great extent to understand the human biology and identify the single differences in the genome between one person and another. They discovered that although more than 99% of the DNA is similar in humans, the single difference could affect to a great extent the acceptance of the individual to the harmful environmental effects like bacteria, viruses, poisons, chemicals, medicines and various treatments.

Scientists believe that drawing a map will help them to identify the genes responsible for the various diseases like cancer, diabetes, vascular diseases, mental diseases, and to identify the various hereditary functions to the human. The project also is interested in the effect of the various mutations on the function of the genes.



The human chromosomes

Unit 3 Exercises

1 Place the mark (✓) or (X) in front of the following sentences and correct the mistakes:

- a** The acquired traits are transmitted from one generation to another
- b** The mutation that occurs in the reproductive cells is transmitted to the offspring.
- c** The induced mutation leads to the biological variation.

2 Mention the scientific term:

- a** The appearance of a hereditary trait in the individuals of the first generation after the mating between two individuals, where one carries a pure hereditary trait that contrast the trait that the other individual carries.
- b** The traits that are not transmitted from one generation to another.
- c** Parts of the DNA that are present on the chromosomes and carry the hereditary traits of the individual.
- d** Change in the nature of the hereditary factors that control the traits of the living organism, which results in a change in the traits of this living organism.

3 Mendel placed a group of assumptions to explain the appearance of the dominant trait and the disappearance of the recessive trait in the first generation in the experiments that he carried with the pea plant. Explain these assumptions.

4 Explain:

- a** An experiment to explain the law of independent assortment of the hereditary factors.
- b** The model of Watson and Creek of the DNA structure .
- c** How the genes perform their functions.

5 Compare between the following :

- a** The dominant trait and the recessive one with giving examples.
- b** The inherited traits and the acquired traits .
- c** The spontaneous mutation and the induced mutation .

6 Explain

- a Mendel chose the pea plant in conducting his experiments.
- b When you pollinate a pure tall stem pea plant with a short stem pea plant, it produces plants all are tall stems.
- c The free ear lobe is dominant over the attached ear lobe.



The Second Term - Unit Four

Hormones

Introduction

The human body contains a group of organs known as endocrine glands that excrete chemical substances known as hormones that collaborate in their functions to achieve the homeostasis in human body.



UNIT OBJECTIVES

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

- ✓ Identify the concept of the hormone.
- ✓ Mention some hormones and their function in human body.
- ✓ Identify the role of hormones in homeostasis in human body.
- ✓ Identify some diseases results from hormone disorder in human body.

Included issues

- ◆ Preventive health.
- ◆ Homeostasis.
- ◆ Hormone disorder.



Lesson 1 Hormones in the human body

Hormones in the Human Body



Lesson objectives

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

- ✓ Identify the concept of hormone.
- ✓ Mention some hormones and their function in human body.
- ✓ Identify the role of hormones in homeostasis in human body.
- ✓ Identify some diseases results from hormone disorder in human body.



Lesson terms

- ◆ Hormones
- ◆ Endocrine glands.

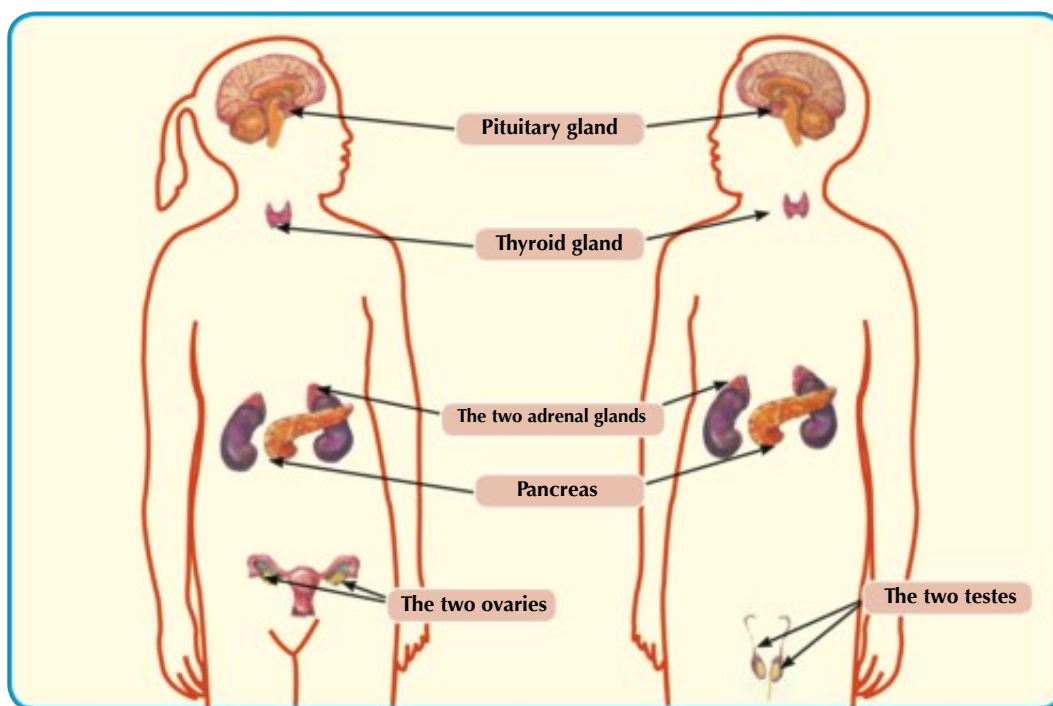
As you have learned, the function of the nervous system is to organize and coordinate both the activities and functions of the organs of living organisms. However, scientists' experiments and researches proved that there is another form of organizing and coordinating these activities and functions. This form is performed by chemical substances secreted by special cells in the body. These secretions, known as hormones, work in collaboration with the nervous system to do this task.

The concept of the hormone

The hormone is a chemical substance (or a chemical message) that controls and organizes most of the vital activities and functions in the bodies of living organisms.

- Hormones are secreted in the body by some organs called endocrine glands or ductless glands (figure 20) as they secrete their hormones directly in the blood stream without passing in ducts. These glands secrete more than 50 hormones in the human body.
- Cells that the hormone affects are almost located away from the endocrine gland that secretes them. So, blood is the only way for the hormone to reach its site of action or what is known as the target cells .

The most important endocrine glands in the human body



▲ Figure (20): Endocrine glands in the human body

Pituitary gland:

Below the brain, there is a small gland in the size of a pea seed which is called the pituitary gland. In spite of its small size, it is called the “master gland” or the “main gland” because it secretes hormones that regulate the activities of most of the other endocrine glands. It consists of two lobes; each one secretes various types of hormones.

Among these hormones secreted by the pituitary, there is what is known as “growth hormone” that controls the speed rate of the growth of your muscles, bones and other organs of your body. This hormone determines the height that you will reach when you become a grown up person.

In addition to growth hormone, the pituitary secretes a group of hormones. Some of these hormones activate the thyroid and the two adrenal glands. Others activate the sexual glands (the two testes and the two ovaries) when the person is about to reach adulthood and others activate the mammary glands to secrete milk.

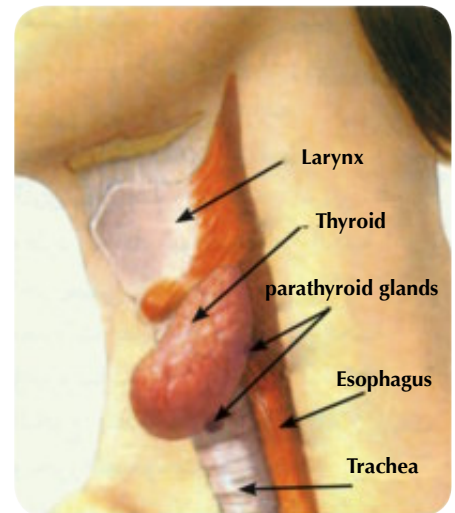
Science

technology & society

- Why do the vocal cords of females make voices louder than those of vocal cords produced by males? This occurs because the sex hormones in the mature male body cause an increase in the thickness of the vocal cords. So, the thin vocal cords in a female's larynx vibrate faster than the thick vocal cords in a male's larynx.

Thyroid gland

It consists of two lobes located in the front surface of the neck on both sides of the trachea and linked together by a small part. Thyroid secretes a hormone called or thyroxin that plays a main role in the food assimilation processes in the body. It liberates the necessary energy of the human body from food. Thyroid also secretes the hormone “calcitonin” that controls the level of calcium in the blood.



▲ **Figure (21): Thyroid and parathyroid glands**

Pancreas :

You previously studied the role of pancreas in the digestion process. Determine the position of the pancreas in figure (22). In addition to the role of pancreas in the digestion process, it is considered an endocrine gland as well. It secretes a hormone called “insulin”. This hormone helps the sugar transporting from blood to the body’s cells as it can be used to release energy. So, this hormone reduces the level of sugar in the blood.

Also, pancreas secretes a hormone called “glucagon” whose function contradicts the function of the insulin hormone. It raises the level of sugar in the blood through stimulation the liver to convert the stored glycogen into glucose that release into the blood stream to be available to the body’s cells.



▲ **Figure (22): Pancreas**

Some hormones of endocrine glands and their functions

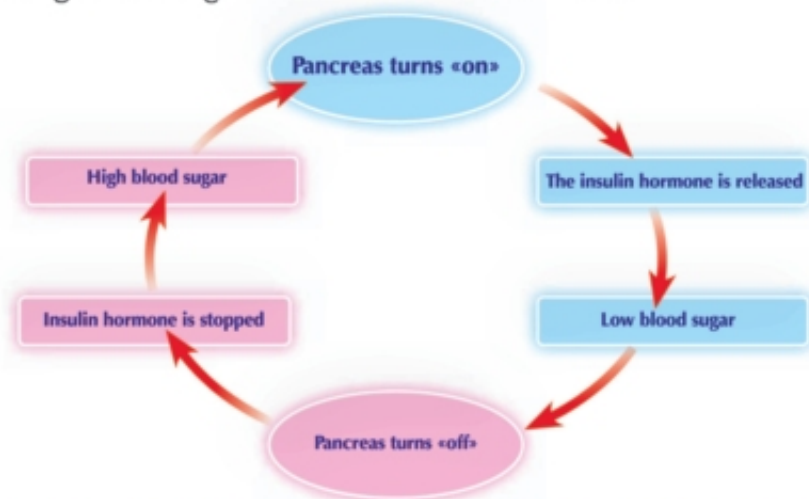
Gland	Hormones	Function
Pituitary	Growth hormone	Regulate the growth of the body as a whole
	Thyroid stimulating hormone	Stimulate thyroid to secrete its hormones
	The activating hormone of sexual glands	Affects the development of sex organs prior to adulthood
Thyroid	Thyroxin	Librates the energy necessary for the body from food
	Calcitonin	Controls the calcium levels in the blood
adrenal glands	Adrenalin	Stimulates body's organs to respond to emergencies
Pancreas	Insulin	Stimulates the storage of glucose sugar in liver.
	Glucagon	Stimulates the release of glucose sugar from the liver
The two ovaries	Estrogen	Appears female secondary sex characteristics
	Progesterone	Promotes the growth of endometrium
The two testes	Testosterone	Appears the male secondary sex characteristics

The role of hormones in the homeostasis of the human body

Hormones work on maintaining the homeostasis of the internal environment in the human body. This is achieved through a mechanism called feedback whose task is similar to the mechanism of the thermostat of different domestic appliances. This mechanism makes the machine start or stop working at a specific temperature pre-assigned by the thermostat. This means that the thermostat maintain the balance of the machine between operating and stopping work.

To understand how hormones maintain the homeostasis of the human body, let's identify this mechanism through the following example:

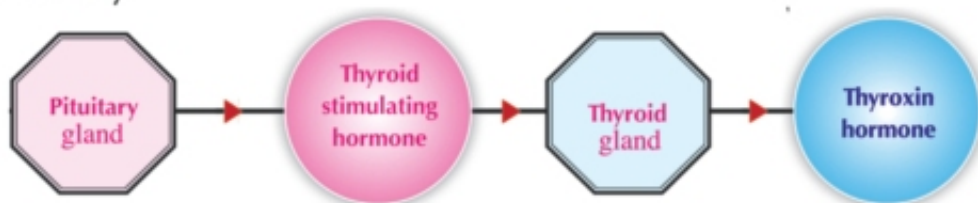
Look at the following figure that illustrates how the feedback mechanism controls the level or concentration of the blood sugar in the internal environment of the human body; an act which maintains its homeostasis. When the level of glucose sugar gets lower than its normal level in the blood, pancreas responds by secreting the glucagon hormone in the blood stream. This affects the liver to increase the conversion rate of the glycogen stored inside it to glucose sugar that releases into the blood.



▲ Figure (23): The feedback mechanism to control the concentration of the blood glucose in the internal environment of the human body

When the level of glucose sugar increases in the blood, pancreas secretes the insulin hormone that stimulates the body's cells to absorb glucose from the blood; an act which causes the decrease of glucose sugar level again and accordingly, pancreas responds once more. Therefore, the glucose sugar level is controlled in the internal environment of the human body through these two hormones; an act which makes the internal environment of the body balanced.

Can you use the following figure to clarify the role of the thyroxin hormone secreted by thyroid gland in achieving homeostasis (the balance of the internal environment) of the human body?



▲ Figure (24): The relation between the secretion of the thyroid stimulating hormone and the thyroxin hormone

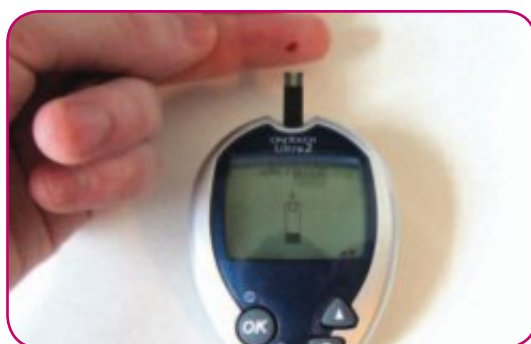
Notice that the increase of secreting the thyroid stimulin hormone causes the increase of secreting the thyroxin hormone which, on the increase of its level in the blood, causes the decrease of secreting the thyroid stimulating hormone . How do these two hormones play a role in maintaining the balance of the internal environment (homeostasis) of the human body?

Some diseases resulted from the hormone disorder in human body

There is a state of an accurate balance among the endocrine glands. However, one of these glands does not sometimes work properly. Consequently, the balance of these glands gets disturbed and Man has a state of a hormone disorder in his body. The result is one of the hormone disorders as shown in the following table:



▲ Figure (25): The goiter disease resulting form the enlargement of thyroid



▲ Figure (26): Measuring the concentration of sugar blood (glucose) for persons suffer from diabetes.

Some diseases resulted from the hormone disorder in the human body

Disease	Description	Reason
Dwarfism	The body stops growing so the person becomes a dwarf.	Decrease of secretion in the growth hormone at the childhood.
Gigantism	A continuous growth in the limbs' bones so the person becomes a giant.	Increase of secretion in the growth hormone at the childhood.
Simple goiter	Enlargement of thyroid gland and the neck.	Decrease of secretion in the thyroxin hormone due to the lack of iodine in food as it enters in the hormone's structure.
Exophthalmic goiter	Enlargement of thyroid gland accompanied by loss of weight, tension and exophthalmoses.	Increase of secretion in the thyroxin hormone with large amounts.
Diabetes	Feeling very thirsty and multiple urination times.	Due to the decrease in the secretion of the insulin hormone, the cell's are unable to use glucose.

Science

technology & society

- In the past, scientists did not know why some persons do not grow to the normal size and stay as dwarfs. Then, it was discovered that pituitary gland in the bodies of those dwarfs secretes extremely small amounts of the growth hormone. Through this discovery, scientists treated some of these cases by injecting the human growth hormone extracted from newly dead corpses in the children's bodies whose pituitary gland do not produce enough amount of the growth hormone. The amounts of the growth hormone that they could get were extremely small and not enough in addition to the possibility of containing some microbes that may cause infection by various diseases.
- In 1979, scientists succeeded in manufacturing sufficient amounts of the human growth hormone by genetic engineering technology. They managed to insert a human gene (that carries instructions for the formation of a human growth hormone) into DNA nucleic acid of the bacterial cells. In this way, they were able to produce and collect large amounts of the human growth hormone by great numbers of bacteria (in which this gene was inserted). Then, this hormone was refined and experiments and researches conducted on it proved its validity for the human use in 1985. This hormone succeeded in treating children of limited growth.

Lesson 4 Exercises

1 Complete the following sentences:

- a Hormones are directly secreted into the blood stream by
- b A chemical substance that controls and regulates the of functions of the most of body organs is known as
- c Thyroxin is a that regulates food assimilation in your body .
- d When the secretion of the growth hormone decreases at the childhood,man suffers from the
- e When the amount of glucose decreases in the blood, pancreas secretes of.....hormone.
- f When the amount of iodine decreases in the food ,the secretion of thehormone decreases fromgland.
- g The.....hormone is secreted when the rate of glucose sugar increases in the blood

2 Write the scientific term that corresponds to each of the following statments :

- a A chemical message that controls and regulates the activites and functions of the most of body organs .
- b Organs secreting hormones in the human body .
- c Mechanism with which hormones act to achieve the homeostasis in the human body
- d The result when one of the endocrine glands does not act properly .
- e A gland secrets a hormone that regulates the growth of the human sexual organs .

3 Put a (✓) or (x) in front of the following statements and correct the false ones :

- a Thyroid secrets a hormone that organizes the growth and development of sexual organs in the human body . ()
- b The calcitonion hormone controls the level of calcium in the human body . ()
- c The glucagon hormone is secreted by pituitary gland . ()
- d Feedback is the mechanism with which hormones act in the human body. ()
- e The iron element shares in composing thyroxin hormone. ()

4 Give reasons:

- a The height of some persons may reach 2 meters .
- b The two adrenal glands have an important role when man is exposed to emergency.
- c Pancreas is a double-function gland .
- d Thyroid gland plays an important role in controlling the level of calcium in the blood.
- e Pituitary gland is called the « master gland »
- f The height of some persons may reach less than half meter .

5 Choose the right answer in each of the following statements:

- a Thehormone librates the needed energy from the food stuff .
(growth – esterogen – thyroxin)
- b The hormone responsible for the appearance secondry sexual male characteristics is the..... hormone . (progesterone - testosterone - adrenalin)

General exercises on the Second term

Answer the following questions :

1) Choose the correct answer for each statement of the following :

1- On heating copper hydroxide, we obtain

- a- copper carbonate and water
- b- copper oxide and water vapour
- c- copper and hydrogen
- d- copper oxide and hydrogen

2- Substitution reactions take place on replacing

- a- less active element with more active one.
- b- less active compound with more active one.
- c- more active element with less active one.
- d- more active compound with less active one.

3- The intensity of electric current passing through a circuit can be measured by using apparatus .

- a- pyrometer
- b- barometer
- c- voltmeter
- d- ammeter

4- For measuring the potential difference between two terminals of a conductor, we use apparatus .

- a- pyrometer
- b- barometer
- c- voltmeter
- d- ammeter

5- The value of the resistance of an electric conductor in an electric circuit is changed on changing

- a- dimensions of the conductor.
- b- electric current intensity passing through it.
- c- potential difference between its terminals.
- d- other electric circuit components.

Exercise (1)

General exercises on the Second term**2) Give reasons for each of the following:**

- 1- Iron fillings with a certain mass reacts faster with acids than a piece iron has the same mass.
- 2- The steel scourer used for cleaning aluminium burns in a cylinder full of oxygen faster than burning in air.
- 3 - Mendel covered the stigmas of pea plants on studying the colour seed trait.
- 4- A red precipitate is formed on adding magnesium to copper sulphate solution.

3) Compare between each pair of the following:

- 1- Oxidation and oxidizing agents (in terms of their meaning)
- 2- The two testes and ovaries (in concern of their hormones and functions)
- 3- The dominant and recessive traits (in according to their genes)

4) Complete the following statements:

- 1- On passing hydrogen gas over hot copper oxide, copper oxide is converted into
- 2- On adding silver nitrate solution to sodium chloride solution, a white precipitate of is formed
- 3- Chemically ,the chromosome consists of the nucleic acid bonded with protein.

5) Chemical reactions are classified into different types, write the type of each reaction of the following between brackets.

- 1- $\text{H}_2 + \text{CuO} \rightarrow \text{Cu} + \text{H}_2\text{O}$ (.....)
- 2- $\text{KOH} + \text{HCl} \rightarrow \text{KCl} + \text{H}_2\text{O}$ (.....)
- 3- $2 \text{Na} + 2 \text{HCl} \rightarrow 2 \text{NaCl} + \text{H}_2 \uparrow$ (.....)

6) Define each of the following :

- | | |
|-------------------------------|------------|
| 1- Electric current intensity | 2- Ammeter |
| 3- Electric potential | 4- Volt |

General exercises on the Second term

5- Electric resistance

6- Ohm

7- Acquired traits

8- Radioactivity

9- Mutation

10- Hormone

7) Mention each of the following :

- 1- Two precautions needed on dealing with radioactive wastes.
- 2- Three ways of protection from radioactive pollution.
- 3- Mendel's first law (law of segregation)
- 4- The disease results due to insulin hormone deficiency
- 5- Radioactive phenomenon.
- 6- Ohm's law.

8) If the potential difference between the two terminals of a conductor is 6volts, and the electric current of intensity 0.5 ampere is passed through it. Calculate the intensity of the electric current passing through this conductor if it is connected with a voltage source of 12 volts.

9) Calculate the quantity of electricity that pass through a conductor of resistance 1000 ohms for 30 minutes, given the potential difference between its two terminals is 220 Volts.

10) You have four electric cells each of emf 1.2 Volt . Show by drawing the method of connecting them to obtain each of the following:

- 1- A battery of emf 1.2 Volt.
- 2- A battery of emf 4.8 Volt.
- 3- A battery of emf 2.4 Volt.

Exercise (1)

General exercises on the Second term

11) Choose from (B) and (C) what suits with (A).

A	B	C
1 - Electric current intensity	- Ohm - Coulomb	- Voltmeter - Ammeter
2 - Potential difference	- Volt - Ampere	- Wattmeter - Ohmmeter
3 - Resistance	- Joule	

12) “ Nuclear energy is used in peace purposes”

Mention their most important uses in each of the following fields.

- | | |
|-------------|---------------------------|
| 1- Medicine | 2- Agriculture |
| 3- Industry | 4- Generating electricity |

13) What are the reasons of the spontaneous mutation ?

14) Draw a diagram representing each of the following:

- 1- An electric circuit used to verify Ohm's law
- 2- Alternating current.

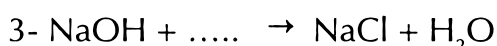
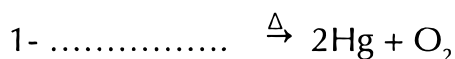
15) Compare between the industrial uses of bases and salts.

16) Write a balanced chemical equation that represents each of the following:

- 1- Replacing the hydrogen of an acid by a metal
- 2- Replacing a metal by another metal in one of its salt solutions
- 3- Double substitution reaction
- 4- Neutralization process.

General exercises on the Second term

17) Complete the following chemical equations:



18) Write scientific explanation for each of the following :

- 1- Ionic compounds reactions are faster than that of covalent ones.
- 2- The rate of chemical reaction is increased by increasing the temperature.
- 3- Dwarfism phenomena in humans

19) Compare between direct electric current and alternating electric current in terms of:

- 1- Their definition
- 2- Their uses

20) Mention one application for each of the following:

- 1- Scientific uses of nuclear energy in medicine and agriculture.
- 2- The use of chemical bases in industry.

21) Complete the following table:

Substance (acid - base - salt)	Economic importance of common acids, bases and salts
.....	Digestion of proteins
.....	Manufacture of glass and cement
Magnesium hydroxide
.....	Manufacture of explosives and fertilizers
Silver nitrate

Exercise (2)

General exercises on the Second term

- Answer the following questions:

1) Complete the following sentences:

1- Ammonium nitrate is decomposed by heat into
and

2- $\text{CuCO}_3 \xrightarrow{\Delta} \dots + \dots$

3- $\text{Cu}(\text{OH})_2 \xrightarrow{\Delta} \dots + \dots$

4- $2\text{Al} + \dots \longrightarrow \text{AlCl}_3 + \dots$

5- Mixtures are classified according to homogeneity into ,
.....

6- Nitric acid is used in industry while sulphuric acid is used in
..... industry.

7- Deficiency of hormone causes dwarfism.

2) Write (✓) in front of the correct statement, and (X) in front of the wrong ones :

1- Coulomb is the measuring unit of potential difference.

2- The acid is a solid substance.

3- Exophthalmia goiter is resulted due to thyroxin hormone defeciency.

4- The mutation always arises naturally.

5- In dry cell, magnetic energy is changed to electric energy.

6- Oxidation and reduction reactions take place separately.

7- Oxidation and reduction are two correlative processes and take place
at the same time.

General exercises on the Second term

3) Define each of the following :

- 1- Substitution reactions
- 2- Oxidation
- 3- Reduction
- 4- Oxidizing agent
- 5- Reducing agent
- 6- Rate of reaction
- 7- Reactants
- 8- Products
- 9- Catalysts
- 10- Electric current intensity
- 11- Coulomb
- 12- Electrical potential
- 13- Resistance
- 14- Ohm's law
- 15- Radioactivity
- 16- Mendel's first law
- 17- Mendel's second law
- 18- Mutation
- 19- Gametes
- 20- Gene
- 21- Endocrine glands

Exercise (2)

General exercises on the Second term

4) What would happen in each of the following cases?

- 1- Pollination of peas flowers of hybrid yellow seeds with each other .
- 2- Exposure of human body to high radioactive doses for a short period of time.
- 3- Heating of red mercuric oxide.
- 4- Heating of copper sulphate.

5) Give reasons for each of the following :

- 1- Gold does not react with acids.
- 2- Catalyst is used in some chemical reactions.
- 3- Uranium is one of radioactive elements.
- 4- Mendel chose the pea plant to conduct his experiments.
- 5- Diabetes disease is treated with insulin hormone.
- 6- Pituitary gland is known as “master gland”.

General exercises on the Second term

Answer the following questions:

1) Complete the following:

- 1- The process of losing an electron or more is called
- 2- In reactions, the compound is decomposed into its initial elements by heating.
- 3- Substance that gives oxygen or removes hydrogen is called
- 4- In the beginning of the reaction, the concentration of the reactants is %
- 5- Covalent compounds are in their reactions.
- 6- An excess of the solute cannot be dissolved in solution.
- 7- The rate of chemical reaction is by increasing the temperature.
- 8- The measuring unit of the quantity of electricity is
- 9- The measuring unit of the resistance of a conductor is
- 10- apparatus is used to measure the resistance in the circuit.
- 11- Chromosome is chemically composed of a nucleic acid called which is combined with
- 12- From types of mutation are and
- 13- hormone is secreted, when the percent of glucose sugar in the blood increased.
- 14- The speed of chemical reaction depends on , , and

Exercise (3)

General exercises on the Second term

- 15- Increasing of growth hormone secretion in the childhood stage causes
- 16- Deficiency of insulin hormone secretion causes
- 17- Dry cells produce current, while electric generators producecurrent.
- 18- Electric current is generated in dynamo as a result of change energy into energy.
- 19- Copper hydroxide is decomposed by heat to and
- 20- $\text{CuCO}_3 \xrightarrow{\Delta} \text{.....} + \text{.....}$
- 21- $2\text{Al} + 6\text{HCl} \longrightarrow 2\text{AlCl}_3 + \text{.....}$
- 22- Nitric acid is used in industry while sulphuric acid is used in industry.
- 23- The deficiency of hormone secretion during stage causes the dwarfism.
- 24- From the factors that affect the rate of chemical reaction are , and
- 25- Chemical reaction is in the reactant molecules and in the product molecules.
- 26-acid is produced in human muscles during physical exercises.
- 27- Nuclear energy is used in medicine in and

General exercises on the Second term

2) Choose the correct answer for each of the following:

1- In thermal decomposition reactions, the compound is decomposed into

- a- its simple components
- b- its primary elements
- c- other compounds
- d- all the previous

2- On heating red mercuric oxide, it decomposes into

- a- oxygen
- b- mercury
- c- oxygen and mercury
- d- no correct answer

3- Heating of metal hydroxide produces

- a- metal oxide only
- b- metal oxide and CO_2
- c- CO_2 gas only
- d- no correct answer

4- Copper sulphate is decomposed by heat into

- a- black copper oxide only
- b- sulphur trioxide gas only
- c- sulphur dioxide gas and black copper oxide.
- d- black copper oxide and sulphur trioxide gas.

5- Some metal nitrates are decomposed by heat into

- a- metal nitrite and oxygen gas
- b- metal nitrate and oxygen gas
- c- nitrogen oxide and oxygen gas
- d- no correct answer

6- Blue copper hydroxide is decomposed by heat into

- a- copper oxide and oxygen
- b- copper oxide and water vapor
- c- copper and water vapor
- d- (a and c) are correct

7- The descending arrangement of metallic elements according to their chemical reactivity is called

- a- Chemical activity series
- b- (+ve) ions
- c- (-ve) ions
- d- free atoms

Exercise (3)

General exercises on the Second term

8- Active metals replace hydrogen of water and produce..... and hydrogen gas is evolved.

- | | |
|--------------------|-------------------|
| a- metal hydroxide | b- metal oxide |
| c- metal carbonate | d- metal sulphate |

9- Active metals replace hydrogen of water producing metal hydroxide and gas is evolved.

- | | |
|-------------------|-------------|
| a- carbon dioxide | b- hydrogen |
| c- nitrogen | d- oxygen |

10- Metals replace hydrogen of the acid and gas is evolved.

- | | |
|-------------------|-------------------|
| a- nitrogen oxide | b- carbon dioxide |
| c- hydrogen | d- oxygen |

11- Zinc reacts with dilute hydrochloric acid and salt is formed.

- | | |
|------------------|----------------------|
| a- zinc chloride | b- zinc sulphate |
| c- zinc nitrate | d- no correct answer |

12- Potassium reacts with dilute hydrochloric acid formingsalt.

- | | |
|-----------------------|-----------------------|
| a- potassium nitrate | b- potassium sulphate |
| c- potassium chloride | d- no correct answer |

13- On adding copper turning to dilute hydrochloric acid is produced.

- | | |
|---------------------|---------------------|
| a- copper hydroxide | b- copper carbonate |
| c- copper chloride | d- no reaction |

14- Some metals can replace another one in the solution of these metals which

- | | |
|---|----------------------|
| a- follow it in chemical activity series | |
| b- Precede it in chemical activity series | |
| c- (a and b) are correct | d- no correct answer |

General exercises on the Second term

15- When magnesium replaces copper in its salt solution, a precipitate is formed.

- a- black
- b- red
- c- reddish brown
- d- no correct answer

16- Double substitution reactions are classified into

- a- acid and alkali reaction
- b- reaction of an acid with a salt
- c- reaction of salt with another salt
- d- all the previous.

17- The acid reacts with an alkali producing

- a- salt and water
- b- salt and hydrogen gas
- c- salt and oxygen gas
- d- no correct answer

18- When potassium hydroxide reacts with hydrochloric acid are produced.

- a- potassium chloride and water
- b- potassium sulphate and water
- c- potassium oxide and water
- d- all the previous

19- Hydrochloric acid reacts with sodium carbonate powder forming

- a- sodium chloride and oxygen gas
- b- sodium chloride and CO₂ gas
- c- sodium oxide and water
- d- all the previous

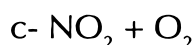
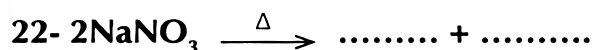
20- Clear lime water turbids on passing gas through it.

- a- nitrogen dioxide
- b- sulphur dioxide
- c- carbon dioxide
- d- (a and b) are correct

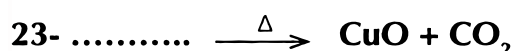
21- $\text{Cu(OH)}_2 \xrightarrow{\Delta}$ +

- a- $\text{CuO} + \text{H}_2\text{O}$
- b- $\text{CuO} + \text{H}_2$
- c- $\text{Cu} + \text{H}_2\text{O}$
- d- no correct answer

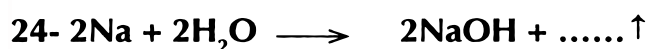
Exercise (3)

General exercises on the Second term

d- all the previous



d- all the previous



26- When sodium chloride solution reacts with silver nitrate solution

a $\dots\dots\dots$ precipitate is formed.

a- red

b- white

c- reddish brown

d- blue

27- On passing hydrogen gas on hot copper oxide, a red precipitate of $\dots\dots\dots$ is formed.

a- copper

b- copper oxide

c- (a,b) are correct

d- all the previous

28- In the reaction of hydrogen with black copper oxide, $\dots\dots\dots$ process takes place to copper oxide.

a- oxidation

b- reduction

c- oxidation and reduction

d- no correct answer

General exercises on the Second term

29- The oxidizing agent is the substance that

- a- gives oxygen
- b- takes hydrogen
- c- (a and b) are correct
- d- no correct answer

30- The reducing agent is the substance that

- a- gives oxygen
- b- takes oxygen
- c- gives hydrogen
- d- (b and c) are correct

31- Reduction is a chemical process in which a decrease in the percentage of gas takes place.

- a- hydrogen
- b- oxygen
- c- chlorine
- d- carbon dioxide

32- Oxidation is a chemical process in which an increase in the percentage of gas.

- a- helium
- b- hydrogen
- c- oxygen
- d- fluorine

33- When sodium atom loses an electron from its outermost energy level, it becomes

- a- oxidized
- b- reducing agent
- c- reduced
- d- (a and b) are correct

34- From the factors that affect the rate of chemical reaction are

- a- concentration of the reactant
- b- nature of the reactant
- c- temperature
- d- all the previous

35- Iron fillings reacts with dilute hydrochloric acid faster than a piece of iron has the same mass due to the

- a- increase in concentration
- b- presence of a catalyst
- c- increase in surface area
- d- no correct answer

Exercise (3)

General exercises on the Second term

36- The rate of chemical reaction is increased by rising temperature due to

- a- increase the number of collisions between reactants.
- b- the presence of covalent bonds.
- c- increase of the surface area.
- d- no correct answer.

37- Catalyst increases the rate of chemical reaction, because it

- a- decreases the energy needed to start the reaction.
- b- combines with reactants then separates away to give the products .
- c- does not chemically change.
- d- all the previous.

38- At the beginning of the reaction, the percentage of the reactants concentration equals

- a- 100%
- b- 0%
- c- 50%
- d- no correct answer

39- The mixture in which solute molecules are distributed regularly through the solvent is called

- a- homogenous mixture
- b- heterogeneous mixture
- c- suspension
- d- no correct answer

40- The solution that an additional amount of the solute can be dissolve in it at certain temperature is called solution.

- a- unsaturated
- b- saturated
- c- suspension
- d- super saturated

41- The solution that no more solute can be dissolve in it without change in its temperature is known as solution.

- a- saturated
- b- unsaturated
- c- super saturated
- d- colloidal

General exercises on the Second term

42- The solution that allows more amount of solute to dissolve in it by increasing temperature is called solution.

- | | |
|--------------------|----------------|
| a- saturated | b- unsaturated |
| c- super saturated | d- suspension |

43- In manufacture of car batteries, acid is used.

- | | |
|---------------|-----------------|
| a- phosphoric | b- hydrochloric |
| c- sulphuric | d- citric |

44- The unit that is used in measuring electric resistance is

- | | |
|---------|------------|
| a- ohm | b- ampere |
| c- volt | d- coulomb |

45- Electromotive force is measured in unit.

- | | |
|---------|-----------|
| a- ohm | b- ampere |
| c- volt | d- joule |

46- The **unit that is used in measuring electric current intensity is**

- | | |
|------------|-----------|
| a- coulomb | b- ampere |
| c- volt | d- joule |

Exercise (3)

General exercises on the Second term

47- The apparatus that is used in measuring electric current intensity is

- | | |
|-------------|----------------------|
| a- ammeter | b- voltmeter |
| c- ohmmeter | d- no correct answer |

48- The apparatus that is used in measuring potential difference is

- | | |
|--------------|-------------|
| a- voltmeter | b- ammeter |
| c- ohmmeter | d- rheostat |

49- The apparatus that is used in measuring electric resistance is

- | | |
|--------------|-------------|
| a- rheostat | b- ammeter |
| c- voltmeter | d- ohmmeter |

50- The apparatus used to control the value of electric resistance in the circuit is

- | | |
|-------------|--------------|
| a- ammeter | b- voltmeter |
| c- ohmmeter | d- rheostat |

51- The mathematical relation of Ohm's law is

- | | |
|----------------------|----------------------|
| a- $R = \frac{V}{I}$ | b- $I = \frac{R}{V}$ |
| c- $R = I \times V$ | d- no correct answer |

52- The unit that is used to measure the quantity of electricity passing through a circuit is

- | | |
|---------|------------|
| a- volt | b- ampere |
| c- ohm | d- coulomb |

53- To generate an alternating electric current, we use the

- | | |
|-------------|-------------|
| a- rheostat | b- dynamo |
| c- ammeter | d- ohmmeter |

General exercises on the Second term

54- To generate a direct electric current, we use the

- | | |
|-------------|-------------|
| a- dry cell | b- dynamo |
| c- ammeter | d- ohmmeter |

55- Alternating current is characterized by

- | | |
|-------------------------------------|-----------------------|
| a- constant intensity | b- variable direction |
| c- variable intensity and direction | d- variable intensity |

56- In dry cell, energy is converted to electrical energy.

- | | |
|-------------|------------|
| a- magnetic | b- kinetic |
| c- chemical | d- light |

57- In dynamo, energy is converted to electric energy.

- | | |
|-------------|------------|
| a- magnetic | b- kinetic |
| c- chemical | d- light |

58- Four similar electric cells, are connected in series ,each one has e.m.f of 1.5 volt so the total e.m.f equals volt.

- | | |
|--------|-------|
| a- 3 | b- 6 |
| c- 1.5 | d- 12 |

59- The scientist who discovered radioactivity phenomena was

- | | |
|-----------|--------------|
| a- Ohm | b- Becquerel |
| c- Ampere | d- Mendel |

60- The measuring unit of the absorbed radiation is

- | | |
|-------------|-----------|
| a- Curie | b- Rem |
| c- Roentgen | d- Ampere |

Exercise (3)

General exercises on the Second term

61- The parts of DNA in the cell nucleus:

- a- gene
- b- gamete
- c- cytoplasm
- d- nor correct answer

62- It is chemically composed of the nucleic acid DNA combined with protein :

- a- cytoplasm
- b- chromosome
- c- gene
- d- no correct answer

63- The two factors of a hereditary trait are similar in the individual.

- a- pure
- b- hybrid
- c- recessive
- d- (a) and (c)

64- The hormone which stimulates body organs to respond for emergencies is

- a- insulin
- b- glucagon
- c- estrogen
- d- adrenalin

65- The hormone responsible for the appearance of the female secondary sex characters is

- a- estrogen
- b- testosterone
- c- parathormone
- d- insulin

66- The hormone responsible for the appearance of the male secondary sex characters is

- a- estrogen
- b- testosterone
- c- insulin
- d- thyroxin

General exercises on the Second term

67- The hormone which its deficiency causes the enlargement of the thyroid gland is

a- estrogen

b- insulin

c- thyroxin

d- glucagon

68- The hormone which stimulates the storage of glucose sugar in liver is the

a- insulin

b- estrogen

c- parathormone

d- thyroxin

69- The hormone which regulates the level of calcium in blood is the

a- calcitonin

b- thyroxin

c- adrenalin

d- progesterone

Exercise (3)

General exercises on the Second term

3) Mention one function only for each of the following :

- 1- Enzymes.
- 2- Refrigerator
- 3- Sulphuric acid.
- 4- Calcium carbonate.
- 5- Calcium oxide.
- 6- Catalyst (in chemical reaction).
- 7- Sodium Chloride.
- 8- Hydrochloric acid.
- 9- Silver nitrate.
- 10- Potassium nitrate.
- 11- Rheostat.
- 12- Radioactive elements in medicine.
- 13- Sodium and potassium salts in human body.
- 14- Voltmeter .
- 15- Adrenalin hormone in the human body.

General exercises on the Second term

4) Write a scientific term for each of the following :

- 1- A substance that loses one electron or more during a chemical reaction.
- 2- Process of breaking down the bonds between the molecules of reactants and formation of new bonds between the molecules of the products.
- 3- Reaction of an acid and a base to give salt and water.
- 4- Reaction involves replacing a metal by another one in its salt solution.
- 5- Change in the concentration of the reactants and products per unit time.
- 6- A substance that accelerates the rate of reaction and not participate in it.
- 7- Electric current intensity is directly proportional to potential difference between two terminals of a conductor at constant temperature.
- 8- An apparatus used to measure electromotive force.
- 9- The state of a conductor that determines the transfer of electricity from or to it.
- 10- The resistance that faces the electric current during its passage in a conductor.
- 11- The unit that is used to measure the absorbed radiation.
- 12- Spontaneous conversion of the atoms of some elements existing in nature, trying to reach a more stable structure.
- 13- Flow the electric charges through a conductor.
- 14- Through which , the hereditary traits are transmitted from parents to offspring.
- 15- When two homozygous individuals differ in one pair of contrasting characters are crossed, only the dominant trait appears in the first generation, and the two traits appear in the second generation by the ratio 3:1.

Exercise (3)

General exercises on the Second term

- 16- A structure consists of pentose sugar, a phosphate group and a nitrogenous base.
- 17- The changing of chemical composition of one gene or more.
- 18- Chemical substance regulates most human activities and functions.
- 19- Organs secrete hormones directly into blood stream.

5) Show by balanced chemical equations each of the following :**A- Effect of heat on:**

- 1- Red mercuric oxide
- 2- Sodium nitrate
- 3- Copper hydroxide

B- Addition of water to:

- 1- Sodium metal

C- Effect of adding hydrochloric acid to:

- 1- Zinc metal
- 2- Sodium hydroxide

6) Rewrite the following statements after correcting the underlined words:

- 1- Rate of chemical reaction is increased by decreasing temperature.
- 2- Nitric acid is used in batteries industry.
- 3- Most of metals carbonate are decomposed into metal and carbon dioxide.
- 4- Electric current intensity is inversely proportional with potential difference at constant temperature.
- 5- The resistance of a conductor that 1 ampere is passed through it when the potential difference between its terminal is 1 volt equals 10 ohm.
- 6- In the electric cell, magnetic energy is converted into electrical energy.
- 7- When two individuals differ in two or more pairs of contrasting characters are crossed, each pair of characters is inherited together, and appear in second generation by the ratio 3:1.

General exercises on the Second term

- 8- The **acquired** traits are transmitted from a generation to another.
- 9- **Insulin** hormone is responsible for appearance of the human secondary male sex characters.
- 10- **Thyroid** gland secretes a hormone regulates the growth of human sex organs.
- 11- The **highfeed** is the mechanism by which hormones do their functions in human body.
- 12- **Iron element** participates in the composition of thyroxin hormone.

7) Compare between:

- 1- Ionic and covalent compounds (in the rate of reaction as a point of view).
- 2- Homogeneous mixture and heterogeneous one.
- 3- Saturated and unsaturated solutions.
- 4- Ammeter and Voltmeter (in terms of their uses and measuring units).
- 5- Alternating and direct current (in source and uses).
- 6- The mutation that occurs in reproductive cells and that occurs in somatic cells (according to their transmission from a generation to another).
- 7- Connecting electric cells in series and in parallel (in terms of the produced e.m.f)
- 8- The spontaneous mutation and induced one (in terms of their occurrence and controlling them).

Exercise (3)

General exercises on the Second term

8) What would happen when?

- 1- Heating of sodium nitrate.
- 2- Putting a piece of sodium in water.
- 3- Putting a piece of magnesium in copper sulphate solution.
- 4- Exposing a man for a large dose of atomic radiation for a short period of time.
- 5- Chemical change of genes.
- 6- Heating of red mercuric oxide.
- 7- The deficiency of growth hormone secretion in childhood.
- 8- The deficiency of thyroxin hormone secretion.
- 9- Heating of blue copper hydroxide.

9) Give reasons for each of the following:

- 1- Sodium replaces hydrogen of the acids
- 2- Reactions of iron fillings with dilute hydrochloric acid is faster than its reaction with a piece of iron.
- 3- Rate of chemical reaction is increased by increasing the reactants concentration.
- 4- Radiation has genetic effects.
- 5- Alternating current is preferred than the direct one .
- 6- Rheostat is used in some electric circuits.
- 7- Mendel chose pea plant to conduct his experiments.
- 8- Copper does not react with dilute hydrochloric acid.
- 9- Pituitary gland is called "the master gland".
- 10- The region selected for saving radioactive wastes must be stable.

General exercises on the Second term

- 11- Diabetes disease is treated with insulin hormone.
- 12- Fridge is used in preservation of foods.
- 13- Pancreas is a doubled function gland.
- 14- Mendel covered the stigma of pea plant flowers during the study of hereditary traits.
- 15- The steel scourer used in cleaning aluminum burns more faster in a cylinder full of oxygen than its burning in air.
- 16- Some mutation do not transmit from a generation to another.
- 17- Calcium hydroxide is used in civil works.
- 18- Ionic compounds react faster than covalent ones.

10) State the contributions of the following scientists:

- 1- Ohm
- 2- Mendel
- 3- Watson and Creek
- 4- Henry Becquirel
- 5- Ali Mostafa Mosharafa

Exercise (3)

General exercises on the Second term

11) What is meant by each of the following ?

- 1- Reducing agent
- 2- Chemical reaction
- 3- Neutralization
- 4- Substitution
- 5- Rate of chemical reaction
- 6- Catalyst
- 7- Ohm's law
- 8- Voltmeter
- 9- Electric potential
- 10- Resistance
- 11- Rem
- 12- Radioactivity
- 13- Electric current
- 14- Genes
- 15- Mendel's first law
- 16- Nucleotide
- 17- Mutation
- 18- Hormone
- 19- Ductless glands (endocrines)
- 20- Gametes
- 21- Coulomb
- 22- Current intensity
- 23- Mendel's second law

General exercises on the Second term

12) Answer the following questions:

- 1- Calculate quantity of electricity when an electric current of intensity 18 ampere passes for 7 minutes through a conductor.
- 2- Calculate the electric current intensity when a quantity of electricity of 600 coulomb passes for 3 minutes in a conductor.
- 3- Calculate the potential difference between two points, if the work done to transfer a charge of 600 coulomb is 16600 Joule.
- 4- Calculate the e.m.f for a battery consists of 3 cells, the e.m.f for each 1.5 volt when they are connected :
 - a) In series
 - b) In parallel.
- 5- Calculate the potential difference between the terminals of an electric set its resistance is 30 ohm and the intensity of the passing electric current is 10 ampere.
- 6- Use the following symbols to express the results of mating between a short stemmed pea plant (tt) and a long stemmed pea plant (TT).

Exercise (3)

General exercises on the Second term

13) Put (✓) or (X) in front of each statement:

- 1- Fluoride ion is a negative ion as it loses an electron.
- 2- The ability to roll the tongue in a tube shape from the dominant trait in human.
- 3- Dwarfism is a continuous growth of human limb bones, so the person becomes a giant.
- 4- Hormones are secreted by the duct glands.
- 5- Nitric acid is used in batteries industry.
- 6- Dynamo produces an alternating electric current.

General exercises on the Second term

14) Mention the most important uses for each of the following:

- 1- Direct current
- 2- Ohmmeter
- 3- Ammeter
- 4- Alternating current
- 5- Sliding rheostat
- 6- Voltmeter
- 7- Folic acid
- 8- Calcium carbonate
- 9- Dry cell
- 10- Sodium nitrate
- 11- Dynamo
- 12- Nuclear energy in the space exploration field
- 13- Silver nitrate
- 14- Nuclear energy in the drilling field
- 15- Insulin hormone
- 16- Nuclear energy in agricultural field

Answer Exercise (1)

General Answer of Exercises**- Answers****Answers of Exercise 1**

- (1) 1- b 2- c
 3- d 4- c
 5- a

2- a) Because the surface area increases in case of iron fillings.

b) Because increasing the reactant concentration (oxygen) increase the rate of reaction

c) To control the pollination process.

d) As magnesium is more active than copper so it replaces it in its salts as red ppt

$$8- R = \frac{V}{I} \qquad R = \frac{6}{0.5} = 12 \text{ ohm}$$

$$I = \frac{V}{R} \qquad I = \frac{12}{12} = 1 \text{ ampere}$$

$$9- I = \frac{V}{R} \qquad I = \frac{220}{1000} = 0.22 \text{ ampere}$$

$$Q = I \times t \qquad Q = 0.22 \times 30 \times 60 \text{ coulomb}$$

18- a) As ionic compounds are dissociated into ions so, their reaction will be faster than covalent ones which do not ionize

b) Increasing temperature led to increase chance of collision of molecules and reaction be faster

c) Due to the lack of growth hormone in the childhood stage.

General Answer of Exercises

Answer of Exercise 3

Q1:

- 1- Oxidation
- 2- Thermal decomposition
- 3- Oxidizing agent
- 4- 100%
- 5- slow
- 6- saturated
- 7- increases
- 8- coulomb
- 9- ohm
- 10- ohmmeter
- 11- DNA -protein
- 12- natural and induced or gene and chromosomal or somatic and gamete
- 13- insulin
- 14- Concentration – temperature – surface area
- 15- gigantism
- 16- diabetes
- 17- alternating – direct
- 18- kinetic energy to chemical energy
- 19- copper oxide – water vapour
- 20- $\text{CuO} - \text{CO}_2$

Answer Exercise (3)

General Answer of Exercises

21- H_2

22-fertilizers-car battery

23- growth – childhood

24- surface area – concentration – temperature

25-bond breaking – bond formation

26- lactic acid

27- treatment of some diseases – diagnoses of some diseases

Q2:

1- all the previous

2- oxygen and mercury

3- No correct answer

4- black copper oxide and SO_3

5- metal nitrite and oxygen

6-copper oxide and water vapor

7- electrochemical series

8- metal hydroxide

9- hydrogen

10- hydrogen

11- zinc chloride

12-potassium chloride

13- no reaction

14- follow it in electrochemical series

General Answer of Exercises

- | | |
|--|-----------------------------------|
| 15- red | 16- all the previous |
| 17- salt and water | 18- potassium chloride and water |
| 19- sodium chloride and CO_2 | 20- carbon dioxide |
| 21- $\text{CuO} + \text{H}_2\text{O}$ | 22- $2\text{NaNO}_2 + \text{O}_2$ |
| 23- CuCO_3 | 24- H_2 |
| 25- Zn | 26- white |
| 27- copper metal | 28- reduction |
| 29- a and b are correct | 30- b and c are correct |
| 31- oxygen | 32- oxygen |
| 33- a and b are correct | 34- all the previous |
| 35- to increase surface area | |
| 36- to increase collision number between the reacting molecules. | |
| 37- all the previous | 38- 100% |
| 39- homogenous mixture | 40- unsaturated solution |
| 41- saturated solution | 42- super saturated solution |
| 43- sulphuric acid | 44- ohm |
| 45- volt | 46- ampere |
| 47- ammeter | 48- voltmeter |
| 49- ohmmeter | 50- rheostat |
| 51- $R = \frac{V}{I}$ | 52- coulomb |
| 53- Dynamo | 54- dry cell |
| 55- changeable intensity and direction | 56- chemical |
| 57- kinetic | 58- 6 volt |

General Answer of Exercises

59- Becquerel

60- rem

61- gene

62- chromosome

63- a and c

64- adrenalin

65- estrogen

66- testosterone

67- thyroxin

68- insulin

69- Calcitonin

Q3: Answer by yourself

Q4:

1- reducing agent

2- chemical reaction

3- neutralization

4- simple substitution

5- rate of chemical reaction

6-catalyst

7- ohm's law

8- voltmeter

9- electrical potential

10- resistance

General Answer of Exercises

- 11- rem
- 12-radioactivity
- 13- electric current
- 14- genes
- 15- Mendel's first law
- 16- nucleotide
- 17- mutation
- 18- hormone
- 19- Ductless glands (endocrine glands)

Q5: Answer by yourself

Q6:

- 1- by increasing
- 2- sulphuric acid
- 3- metal oxide
- 4- directly proportional
- 5- 1 ohm
- 6- chemical
- 7- independent
- 8- genetic
- 9- testosterone
- 10- pituitary
- 11- Feedback
- 12- iodine

Answer Exercise (3)

General Answer of Exercises

Q7: Answer by yourself

Q8:

- 1- oxygen gas is evolved and sodium nitrite is formed.
- 2- hydrogen gas is evolved and sodium hydroxide is formed in a vigorous reaction.
- 3- the blue color of copper sulphate disappears, red copper is precipitated and magnesium sulphate is formed.
- 4- Leads to the damage of bone marrow, spleen, digestive system, and central nervous system.
- 5- A mutation occurs.
- 6- Decomposed into mercury and oxygen.
- 7- Leads to dwarfism.
- 8- Leads to simple goiter.
- 9- decomposed thermally into black copper oxide and water vapour.

from Q 9 to Q12 Answer by yourself

Q13: a) numbers of the correct statements: 2 - 6

b) incorrect statements numbers: all the statements except 1- 3 - 4- 5

Q14: Answer by yourself

Exams

Examination (1)

Answer the following questions:

Q1: A) Complete the following statements:

- 1- gland secretes hormone which controls the general growth of the body.
- 2- is used for measuring current intensity, while is used to measure potential difference.

B) Correct the underlined words

- 1- The fused ear pinna is a dominant hereditary trait.
- 2- Coulomb is used for measuring electromotive force.

Q2: A) Write a scientific term for the following statements

- 1- Chemical substances that control and regulate the function of most body organs.
- 2- Substance that gives oxygen and takes hydrogen.
- 3- The state of a conductor that allows the passage of electricity from or to it.

B) Explain each of the following:

- 1- Pituitary gland is called "the master gland"
- 2- On pollination of a red flowered pea plant with a white flowered pea plant, all offspring are red flowered.
- 3- Some mutation are not transmitted from a generation to another.

Exams

Q3 : Choose the correct answers:

1- Calcitonin hormone is secreted from

- a- pancreas
- b- thyroid gland
- c- pituitary gland
- d- adrenal gland

2- Which of the following characters is dominant in humans ?
.....

- a- Smooth hair
- b- Blue-coloured eyes
- c- Absence of freckles

Q4 :A) Compare between each pair of the following:

Saturated and super saturated solutions.

**B) What is meant by the principle of complete dominance ?
Give some examples.**

Exams

Examination (2)

Answer the following questions:

Q1: A) Choose the correct answers:

1-Heating of calcium carbonate produces.....

- a) calcium bicarbonate and carbon dioxide.
- b) calcium hydroxide and carbon dioxide.
- c) calcium oxide and carbon monoxide.
- d) calcium oxide and carbon dioxide.

2- The unit that is used in measuring electric resistance is

- a) ampere b) ohm c) volt d) coulomb

B) Give scientific explanation for each of the following:

- 1-Burning of the steel scourers used for cleaning aluminum in a jar full of oxygen is faster than its burning in atmospheric air.
- 2- The limbs bones of some people grow continuously, so they become giants.

C) What is meant by each of the following:

- 1- Diabetes.
- 2- Natural radioactivity.

Q 2: A) Draw a fully detailed diagram showing the feedback mechanism for homeostasis and maintaining the human blood sugar.

B) What is the difference between each pair of the following:

- 1- Induced and spontaneous mutations (in terms of their way of occurrence).
- 2- Physical , genetic and cellular effects resulted by radiation.

Exams

C) What would happen to ?

- 1- Blood sugar level, when pancreas does not secrete glucagon hormone.
- 2- Intensity of an electric current passing through a circuit, when the wire length of the sliding rheostat connected in this circuit is increased.

Q 3: A) Write the balanced chemical equations for the following reactions:

- 1- Addition of magnesium to copper sulphate solution.
- 2- Addition of zinc to dilute hydrochloric acid.
- 3- Heating of sodium nitrate.

B) Mention the following :

- 1- Mendel's first law
- 2- The law that is used to determine the value of an unknown resistance using electrical measurements.

C) Given three identical electric cells, the e.m.f. of each is 1.5 volt. Show by drawing how to connect them to produce:

- 1- A battery its e.m.f. is 1.5 volt.
- 2- A battery its e.m.f. is 3 volt.
- 3- A battery its e.m.f. is 6 volt.

Q 4: A) Calculate the quantity of electricity that passes in a conductor of a resistance 2200 ohm for two minutes when it is connected with a source of electric potential 220 volt.

B) What is the scientific ideas for?

- 1- The dominance of presence of cheek dimples over their absence.

C) What are the precautions on dealing with radioactive wastes ?

Exams

Examination (3)

Answer the following questions:

Q1: A) Choose the correct answer:

1- The hormone that controls calcium level in the blood is

- a- calcitonin b- thyroxin c- insulin d- adrenalin

2- The potential difference is measured by using apparatus

- a- ammeter b- ohmmeter c- voltmeter d- wattmeter

3- The substance that changes the rate of the reaction without itself being changed is known as ...

- a- oxidizing agent b- reducing agent
c- active agent d- catalyst

B) Give reason for each of the following:

- 1- The stopping of body growth, so the person becomes a dwarf.
2- Calcium hydroxide is used in the civil works.

C) What is meant by each of the following:

- 1- The dominant trait. 2- Radioactive element

Q2: A) Draw a fully labeled diagram showing the relation between the secretion of the thyroid stimulating hormone and thyroxin hormone.

B) Write the difference between each pair of the following:

- 1- Connection of cells in series and in parallel (according to the resulted e.m.f.).
2- Spontaneous and induced mutations (in terms of the possibility to control them).

Exams

C) What would happen to ?

- 1- The human as thyroxin hormone secretion is increased.
- 2- Ammeter and voltmeter readings used in verifying Ohm's law if the resistance is burnet.

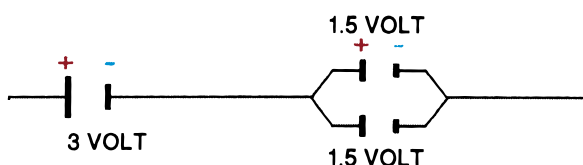
Q3: A) Write the balanced chemical equations for the following reactions:

- 1- Reduction of hot copper oxide by hydrogen.
- 2- Addition of hydrochloric acid to calcium hydroxide solution.
- 3- Placing aluminum turnings in dilute hydrochloric acid.

B) Mention each of the following:

- 1- Mendel's second law.
- 2- The two types of electric resistance.

Q4: A) Calculate the e.m.f of the battery in the opposite figure.



B) Draw the circuit used to deduce the relation between the intensity of an electric current passing through a resistance and the potential difference between its terminals.

C) Mutations vary according to several factors:

- 1- What are these factors ?
- 2- Briefly discuss one of these factors.

Exams

Examination (4)

Answer the following questions:

Q1: A) Complete the following statements:

- 1- When glucose level is increased in the blood, pancreas secretes hormone which stimulates the body to absorb..... from the blood.
- 2- Electric current intensity is measured by apparatus and its measuring unit is
- 3- The changing in nature of genes that control the organism's traits is known as
- 4- The resistance faces the flow of electric current in a conductor is known as

B) Give reasons for each of the following:

- 1- The usage of alternating current is preferred than the usage of the direct current.
- 2- Magnesium can replace copper in its salt solutions, while the opposite is impossible.

C) Give the scientific term for each of the following:

- 1- Chemical reactions in which double exchange of ions of two different compounds to produce two new compounds takes place.
- 2- The substance that takes oxygen or gives hydrogen during a chemical reaction.
- 3- The changing in concentration of the reactants and products per a unit time.

Q2: A) Compare between:

- 1- Solutions types.
- 2- Oxidation and reduction.

Exams

B) Show by drawing how electric cells are connected in:

- 1- Series 2- Parallel

C) 10 coulomb was passed through a conductor of a resistance 22ohm. Calculate the potential difference between its terminals.

Q3: A) Draw an electric circuit used to verify Ohm's law, and state Ohm's law and its mathematical relation .

B) Write the balanced chemical equations for the following reactions:

- 1- Reaction of sodium with water and mention the precautions taken for this reaction.
- 2- Reaction of hydrochloric acid with sodium hydroxide, and mention the name of the reaction.

C) Mention the factors that affect the rate of a chemical reaction.

Q4: A) Mendel assumed a group of hypotheses to explain the appearance of the dominant trait and the disappearance of the recessive trait in the individuals of the first generation in the experiments he conducted on the pea plant. Explain these hypotheses.

B) State the scientific idea for each of the following:

- 1- The dominance of curly hairs on the smooth one.
- 2- Production of more larger and sweeter taste seedless fruits.

C) Explain the findings of the two scientists Watson and Creek of the structure of DNA molecule model.

Exams

Examination (5)

Answer the following questions:

Q1: Complete the following statements:

- 1- Red mercuric oxide decomposes by heat into and
- 2- $2\text{NaNO}_3 \xrightarrow{\Delta} \dots\dots\dots + \dots\dots\dots$
- 3- $\text{Zn} + 2\text{HCl} \rightarrow \dots\dots\dots + \dots\dots\dots$
- 4- The factors that affect the speed of chemical reaction are ,.....,..... and.....

Q2: A) Compare between:

- 1- Oxidizing and reducing agents.
- 2- Direct and alternating current.

B) Put (✓) in front of the correct statement, and (X) in front of the wrong ones :

- 1- Chloride ion has a negative charge as it loses an electron.
- 2- Dwarfism is the continuous growth of the limbs bones, so the person becomes a giant.
- 3- The ability to roll the tongue in a tube-form is one of the human dominant traits.

Q3: A) Explain an activity that illustrates:

- 1- Effect of temperature on the rate of a chemical reaction.
- 2- Determination the value of an unknown resistance.

B) What is meant by each of the following ?

- | | |
|-------------------|---------------------------|
| 1- Radioactivit . | 2- Heterogeneous mixture. |
| 3- Bases | 4- Induced mutation. |

Exams

Q4: A) Show by drawing the method used for:

- 1- Connection of three cells in series and also in parallel.
- 2- Determination the potential difference between the terminals of an electric lamp.

B) Give reason for:

- 1- Learn to walk in children is not considered a genetic trait.
- 2- Red precipitate is formed on addition of magnesium to copper sulphate solution.

Exams

Examination (6)

Answer the following questions:

Q1: Complete the following statements:

- 1- Chemical reaction is a process involves in reactants molecules and formation of in products molecules.
- 2- $\text{CuSO}_4 \xrightarrow{\Delta} \dots\dots\dots + \dots\dots\dots$
- 3- acid is produced in human body during physical exercises.
- 4- Nuclear energy is used in medicine in.....and.....

Q2: Compare between :

- 1- Oxidation and reduction.
- 2- Ammeter and voltmeter.

Q3: A) Put sign (✓) in front of the correct statement, and (X) in front of the wrong ones :

- 1- Sodium ion is positive (Na^+) as it gains an electron.
- 2- Mutation vary according to their sites of occurrence, inheritance and origin.
- 3- Hormones are secreted from duct glands.

B) Calculate the current intensity resulted when a quantity of electricity of 6000 coulomb is passed in a conductor for 10 minutes.

Q4: A) Explain an activity that illustrates:

- 1- Effect of surface area on the rate of chemical reaction.
- 2- Verifying of Ohm's law practically.

Exams

B) Define each of the following:

- 1- Homogenous mixture.
- 2- Super saturated solution.
- 3- Acids
- 4- Potential difference.

Answer of Exams

Test 2

Q1: A) 1- (d)

2- (B)

B) 1- Because the speed of chemical reaction depends on the concentration of reactants and the concentration of oxygen in the beaker is more than that of air

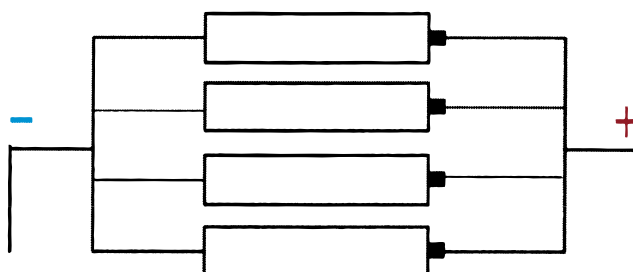
B) 2- Because secretion of growth hormone in the childhood will increase

Q2: 1-The starting of glucose sugar from the liver into the blood will decrease, so the concentration of the blood sugar in it will decrease

2- The intensity of electric current will decrease due to increasing the length of rheostat wire

Q3:

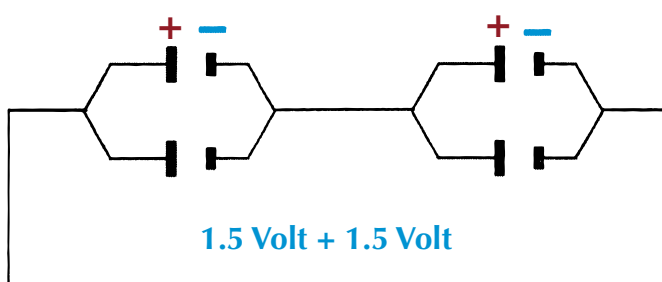
1- The cells will connect together in parallel, so the electromotive force (e.m.f) of cells = e.m.f of one cell = 1.5 volt



Answer of Exams

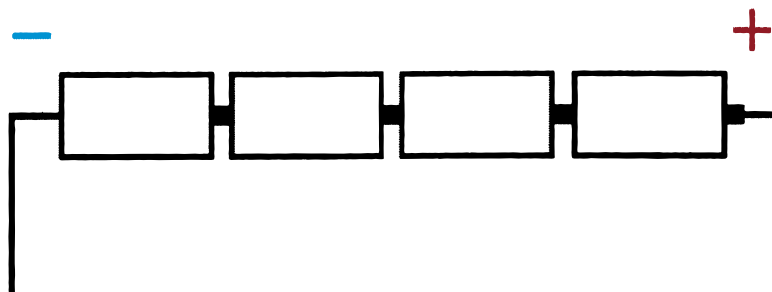
2- The four cells divided into two identical groups, each group consists of two connected cells in parallel and the two groups together are connected in series

$$\text{e.m.f} = 1.5\text{V of first group} + 1.5\text{V of second group} = 3\text{V}$$



3- The four cells connected together in series

$$\text{e.m.f} = 4 \times 1.5 = 6\text{V}$$



Q4:

A) $I = V \div R$

$$I = 220(\text{volt}) \div 2200(\text{ohm}) = 0.1\text{ampere}$$

$$\text{Quantity of electricity} = I (\text{amp}) \times t (\text{sec}) = 0.1 \times 2 \times 60 = 12 \text{ coulomb}$$

Answer of Exams

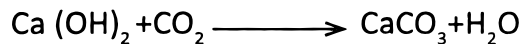
Test 3

Q1:

A) 1 - a 2 - C 3 - d

B) 1-decreasing of secretion of growth hormone in the childhood

2- Calcium hydroxide will react with carbon dioxide in air and will convert into Rocky material (Calcium carbonate) or cement manufacture



Q2:

If the resistance is burning, the current will not pass in the circuit (opened circuit), so the reading of ammeter = zero and the reading of voltmeter is equal to the electromotive force of the battery .

Answer of Exams

Test 5

Q1:

- 1- Oxygen – mercury
- 2- $\text{NaNO}_2 + \text{O}_2$
- 3- $\text{ZnCl}_2 + \text{H}_2$
- 4- Nature of reactants – concentration of reactants – temperature of the reactants – catalysts

Q1:

- A) 1- answer by yourself**
2- answer by yourself
3- answer by yourself

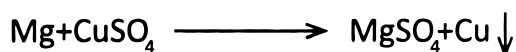
- B) 1-(X)**

Q4:

- A)** 1- school book 2- inverse application of Ohm's law
- B)** 1- catalysts 2- non homogenous mixture
- 3- basis 4- mutations

Q5:

- A) 1-** answer by yourself 2- answer yourself
- B) 1-** Since it is an acquired character, so it is not inherited .
- 2- A red copper precipitate in the glass because magnesium replaces copper in copper sulfate solution .



Answer of Exams

Test 6

Q1:

- 1- Breaking – new bonds
- 2- $\text{CuO} + \text{SO}_3$
- 3- Lactic
- 4- Examination and treatment

Q2:

- 1- answer by yourself
- 2- answer by yourself

Q3:

- | | | |
|------------------------------|--------|-------|
| A) 1-(X) | 2-(v) | 3-(X) |
| B) answer by yourself | | |

Q4:

- A)** answer by yourself
- B)** answer by yourself

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المواصفات الفنية:

مقاس الكتاب:	$\frac{1}{8}$ (٥٧ × ٨٢) سم
طبع المتن:	٤ لون
طبع الغلاف:	٤ لون
ورق المتن:	٨٠ جم أبيض
ورق الغلاف:	٢٠٠ جم كوشيه
عدد الصفحات بالغلاف:	١٦٤ صفحة

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