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"Analysis of some topics in the science book for the first year of preparatory school first and second semesters"

(Action Research)

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Abstract

This research aims to analyze the chemistry section in the preparatory school first-grade science book from an objective point of view. The analysis focuses on the contents in terms of the extent to which it achieves its educational objectives and what it includes in life applications. Additionally, multiple exercises have been established to evaluate students' levels and their understanding of each lesson's objectives. It has also been analyzed from the technical point of view in terms of the percentage of print area in the pages, percentage margins, types of fonts, specifications of the pictures, and color usage…. etc. To achieve this, we have conducted questionnaires on a sample of students.

Key Words: Science book, Preparatory stage, objective analysis, technical analysis.

1. Introduction:

The textbook is one of the main sources of learning. It contains the knowledge and information that students should acquire, such as facts, concepts, theories, and laws that are related to a particular specialization, so it is an important source of knowledge. The textbook also allows students to train in thinking, analysis, and deduction skills. It also plays an important role in developing the tendencies, trends, and values of students (Mayer,1998).

Given that the preparatory stage is important in providing students with the academic foundation and various skills, the content of the books at this stage helps the student in choosing the specialty in which he wishes to continue studying (Bradley,2015).

Science is considered one of the important subjects in the preparatory stage, as it helps students to acquire knowledge and scientific concepts related to chemistry, physics, and biology which the student can employ according to his abilities in his practical life. It also gives the student the ability to analyze, think and solve problems (Clement,2008).

Given the importance of the textbook in the preparatory stage, especially the science book, it was necessary to analyze this book from the objective perspective which focuses on the scientific content and what it includes of scientific facts, concepts, laws, and theories, the extent of their interconnection, the extent to which it achieves the objectives, and the pictures, drawings, and scientific activities that the content includes (John,1999).

Also, it was analyzed from a technical point of view, which is represented in the shape of the book, the area of pages and margins, and the specifications of pictures, drawings, shapes, and colors.

Through this objective and technical analysis, you can determine the strengths and weaknesses of the textbook, and thus you can obtain a clear vision of the effectiveness of textbooks for the middle school stage and the extent of their ability to keep pace with successive scientific developments.

In this research, the chemistry part of the preparatory stage in the science book for the first grade is analyzed through four axes:

1- **Analysis of objectives**.
2- **Life applications**.
3- **The parts that must be modified**.
4- **Some of the questions that evaluate the student's ability**.

It is also analyzed from a technical perspective.

2. The Theoretical Framework:

"FIRST SEMESTER"

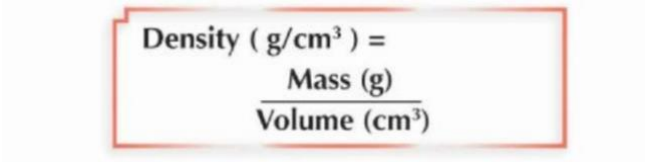
LESSON 1: MATTER AND ITS CHARACTERISTICS

1. OBJECTIVES' ANALYSIS: –

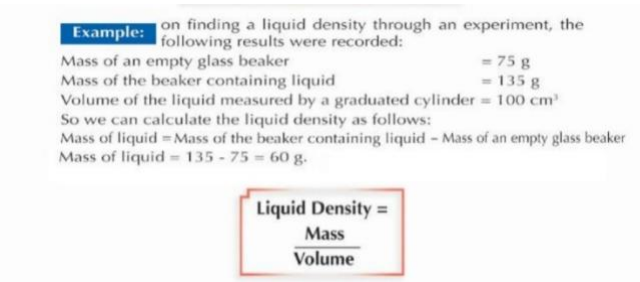
- Objective "1":" Explain the concept of density" **has been achieved**


Density: it is the mass of unit volume of a substance (mass of one cubic centimeter 1 cm^3).

- Objective "2":" Conclude that materials of densities lighter than water density float over water surface" **has been achieved**

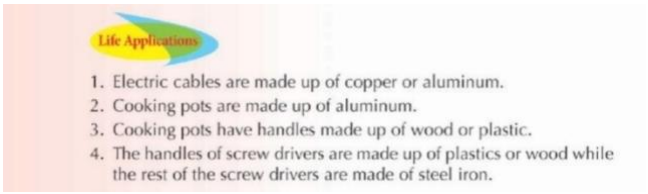

$$\text{Density } (g/cm^3) = \frac{\text{Mass (g)}}{\text{Volume } (cm^3)}$$

- Objective "3":" Determine a liquid density" **has been achieved**

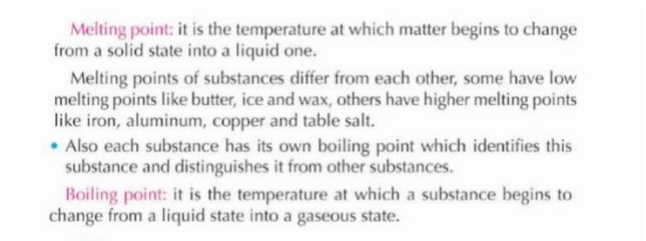

Example: on finding a liquid density through an experiment, the following results were recorded:
Mass of an empty glass beaker = 75 g
Mass of the beaker containing liquid = 135 g
Volume of the liquid measured by a graduated cylinder = 100 cm^3
So we can calculate the liquid density as follows:
Mass of liquid = Mass of the beaker containing liquid – Mass of an empty glass beaker
Mass of liquid = 135 - 75 = 60 g.

$$\text{Liquid Density} = \frac{\text{Mass}}{\text{Volume}}$$

- Objective "4": "Illustrate life applications of density" **has been achieved**.

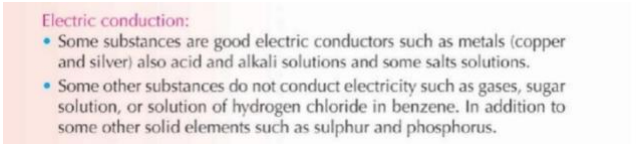

Life Applications
1. Electric cables are made up of copper or aluminum.
2. Cooking pots are made up of aluminum.
3. Cooking pots have handles made up of wood or plastic.
4. The handles of screw drivers are made up of plastics or wood while the rest of the screw drivers are made of steel iron.

- Objective "5": "Explain points of melting and boiling" **has been achieved**.

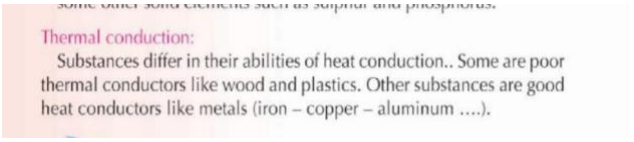

Melting point: it is the temperature at which matter begins to change from a solid state into a liquid one.
Melting points of substances differ from each other, some have low melting points like butter, ice and wax, others have higher melting points like iron, aluminum, copper and table salt.
- Also each substance has its own boiling point which identifies this substance and distinguishes it from other substances.

Boiling point: it is the temperature at which a substance begins to change from a liquid state into a gaseous state.

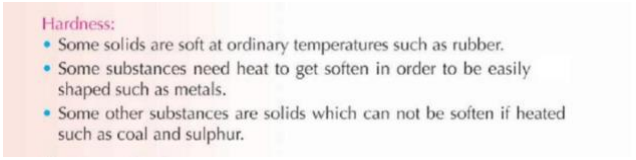
- Objective "6": "Give examples for conductors and non-conductors of electricity" **has been achieved**.


Electric conduction:
- Some substances are good electric conductors such as metals (copper and silver) also acid and alkali solutions and some salts solutions.
- Some other substances do not conduct electricity such as gases, sugar solution, or solution of hydrogen chloride in benzene. In addition to some other solid elements such as sulphur and phosphorus.

- Objective "7": "Give examples for conductors and non-conductors of heat" **has been achieved**.


Thermal conduction:
Substances differ in their abilities of heat conduction.. Some are poor thermal conductors like wood and plastics. Other substances are good heat conductors like metals (iron – copper – aluminum ….).

- Objective "8": "Compare solidification among different materials" **has been achieved**.


Hardness:
- Some solids are soft at ordinary temperatures such as rubber.
- Some substances need heat to get soften in order to be easily shaped such as metals.
- Some other substances are solids which can not be soften if heated such as coal and sulphur.

- Objective "9": "Understand money loss from the rusting process" **has been achieved**.


Metals and chemical activity:

Why do metals lose their luster when they are exposed to air for a period of time?

Some elements are very active as potassium and sodium which react with oxygen as soon as being exposed to humid air. Other substances like iron, aluminum and copper react with oxygen if left in air for some days since they have less chemical activity.

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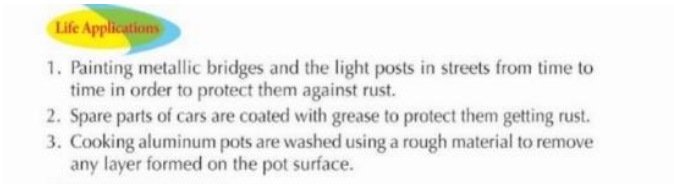
Some other substances find great difficulty to react with oxygen like silver, platinum and gold since they are poor active; so these substances are used in making jewels. Also substances, like gold and silver, which are chemically poor active are used to cover other substances which rapidly gain rust, as iron to protect them from rust and corrosion.

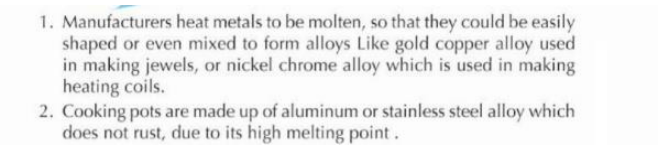
- Objective"10":" Explain methods of metal protection against metal corrosion" **has been achieved**.

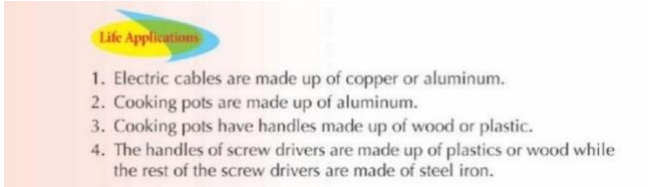

Life Applications

1. Painting metallic bridges and the light posts in streets from time to time in order to protect them against rust.
2. Spare parts of cars are coated with grease to protect them getting rust.
3. Cooking aluminum pots are washed using a rough material to remove any layer formed on the pot surface.

2. LIFE APPLICATIONS: –

(1)


1. Manufacturers heat metals to be molten, so that they could be easily shaped or even mixed to form alloys Like gold copper alloy used in making jewels, or nickel chrome alloy which is used in making heating coils.
2. Cooking pots are made up of aluminum or stainless steel alloy which does not rust, due to its high melting point .


Life Applications

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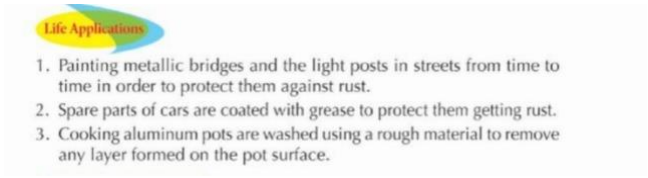
(2)


Life Applications

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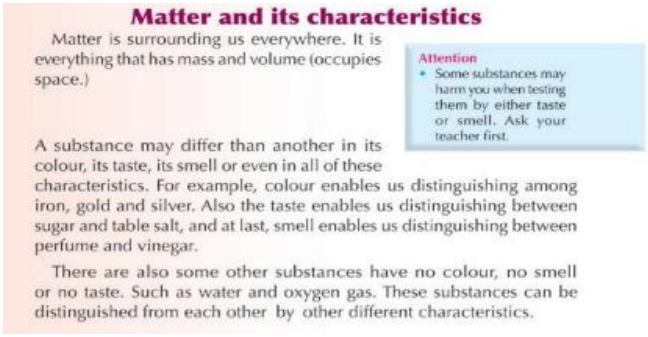
2. Spare parts of cars are coated with grease to protect them getting rust.
3. Cooking aluminum pots are washed using a rough material to remove any layer formed on the pot surface.

Life applications in this lesson are suitable for students mentally and environmentally, but they aren't supportive by pictures or QR codes.to explain the visually .

3. MODIFICATIONS AND ADDITIONS:

(1)


Matter and its characteristics

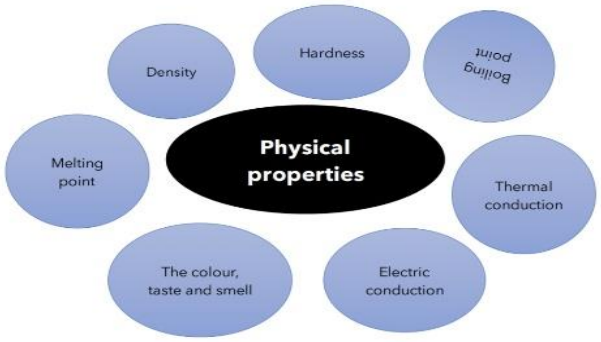
Matter is surrounding us everywhere. It is everything that has mass and volume (occupies space.)

Attention
- Some substances may harm you when testing them by either taste or smell. Ask your teacher first.

A substance may differ than another in its colour, its taste, its smell or even in all of these characteristics. For example, colour enables us distinguishing among iron, gold and silver. Also the taste enables us distinguishing between sugar and table salt, and at last, smell enables us distinguishing between perfume and vinegar.

There are also some other substances have no colour, no smell or no taste. Such as water and oxygen gas. These substances can be distinguished from each other by other different characteristics.

Shall be modified to be: –



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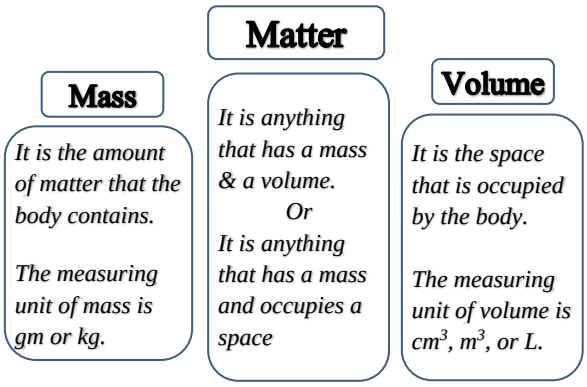

(3)


Metals and chemical activity:
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Some elements are very active as potassium and sodium which react with oxygen as soon as being exposed to humid air. Other substances like iron, aluminum and copper react with oxygen if left in air for some days since they have less chemical activity.
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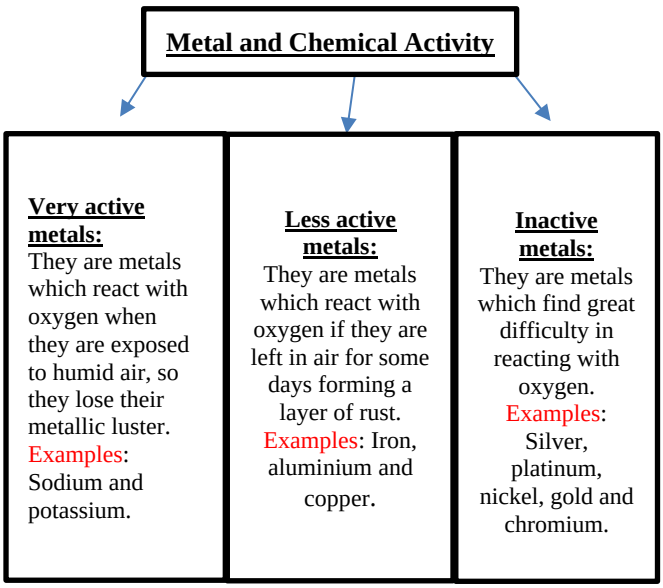
Some other substances find great difficulty to react with oxygen like silver, platinum and gold since they are poor active; so these substances are used in making jewels. Also substances, like gold and silver, which are chemically poor active are used to cover other substances which rapidly gain rust, as iron to protect them from rust and corrosion.

Shall be modified to be: –



(4)

These QR codes shall be added to explain visually by videos the life applications to the students for a better and more comprehensive understanding of the lesson.

a. ***Simple density science experiment to see how liquids and objects with different densities behave.***

b. ***This video covers how covalent bonding works, how to show it with dot and cross diagrams, and the types of substances that covalent bonds can form.***

c. ***This video shows the hardness of different materials with science experiment to simplify understanding for the student.***

4. **QUESTIONS: –**

1. **What is meant by: the density of water is 1 gm/cm^3?**
2. **The following table records the values of masses and volumes of substances. Arrange the substances descending according to density, then show which of them float on the water surface and which of them sink in water?**

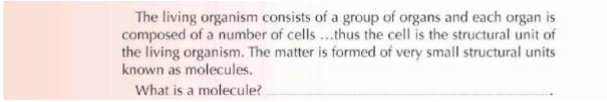
Substance	water	iron	cork
Mass(gm)	50	31.2	5
Volume(cm^3)	50	4	25

3. **A student places a graduated cylinder on a scale, ensuring that the scale reads 0 grams. The student then pours 10 cubic centimeters of oil into the cylinder and observes that the mass reading on the scale is 9.3 grams. What is the density of the oil?**
4. **give reason for: a balloon filled with hydrogen raises up in the air carrying a flag during festival?**
5. **Mention one life application about boiling and melting point?**
6. **Classifying the following substances according to conductor of electricity (Iron –sulpher–wood– acidic solution)?**
7. **Give reason for: cooking pans made of aluminium while handle are made of wood?**
8. **Compare solidification among different materials?**
9. **give reason for: steel bridges and the holders of light bulbs are painted from time to time?**
10. **Explain methods of metal protection against metal corrosion?**
11. **On Mother's Day, I brought my mother a gift to help her in the kitchen, but this gift caused my mother to burn her hand and not cook the food well. Predict the gift, What happened, and what is the solution?**
12. **When making electrical cables in a new house, but when the lights are on, there is no light, so do you think what these cables are made of?**
13. **If I have two screwdrivers, one of them is made of wood and the other is made of iron, what happens? When I use them to conduct electrical current?**

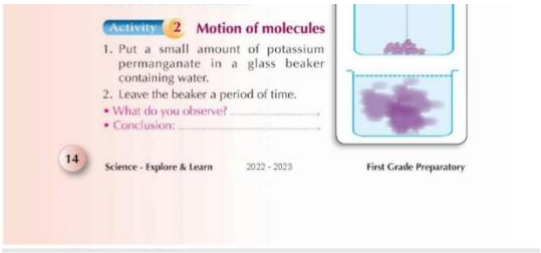
"FIRST SEMESTER"

LESSON 2: MATTER CONSTRUCTION

1. **OBJECTIVES' ANALYSIS: –**
   - Objective (1) "identify the building unit of matter" **has been achieved**.


The living organism consists of a group of organs and each organ is composed of a number of cells ...thus the cell is the structural unit of the living organism. The matter is formed of very small structural units known as molecules.
What is a molecule? .....

   - Objective (2) "prove by experiment that there are intermolecular spaces between molecules" **has been achieved**.


Activity 2 Motion of molecules
1. Put a small amount of potassium permanganate in a glass beaker containing water.
2. Leave the beaker a period of time.
• What do you observe? .....
• Conclusion: .....
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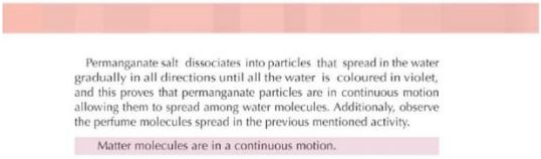
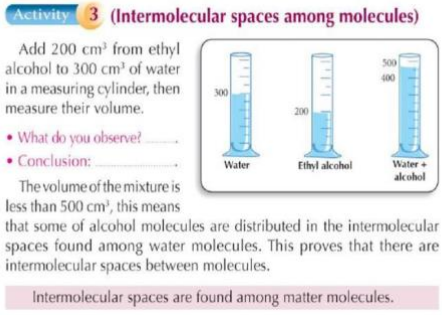
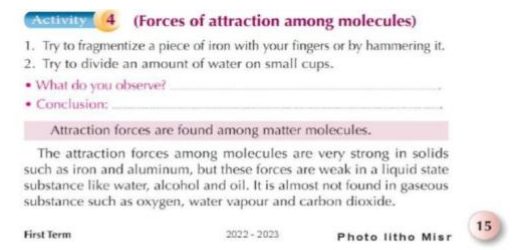

Permanganate salt dissociates into particles that spread in the water gradually in all directions until all the water is coloured in violet, and this proves that permanganate particles are in continuous motion allowing them to spread among water molecules. Additionaly, observe the perfume molecules spread in the previous mentioned activity.
Matter molecules are in a continuous motion.

   - Objective (3) "Indicate by experiment that there are intermolecular spaces between molecules" **has been achieved**.


Activity 3 (Intermolecular spaces among molecules)
Add 200 cm³ from ethyl alcohol to 300 cm³ of water in a measuring cylinder, then measure their volume.
• What do you observe? .....
• Conclusion: .....
The volume of the mixture is less than 500 cm³, this means that some of alcohol molecules are distributed in the intermolecular spaces found among water molecules. This proves that there are intermolecular spaces between molecules.
Water Ethyl alcohol Water + alcohol
Intermolecular spaces are found among matter molecules.

- Objective (4) "Compare between the three states of matter according to the attraction forces among molecules" **has been achieved**.



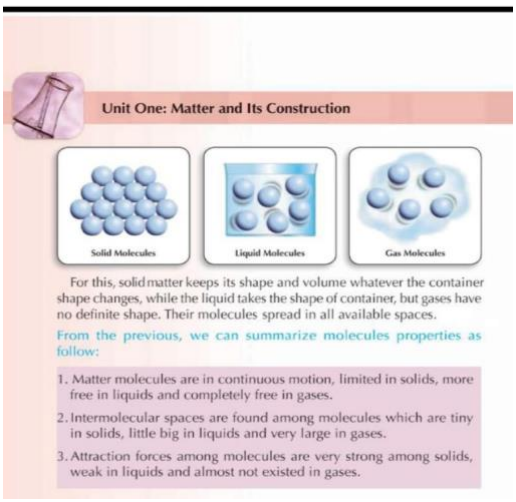
Activity 4 (Forces of attraction among molecules)

1. Try to fragmentize a piece of iron with your fingers or by hammering it.
2. Try to divide an amount of water on small cups.

• What do you observe? .....
• Conclusion: .....

Attraction forces are found among matter molecules.

The attraction forces among molecules are very strong in solids such as iron and aluminum, but these forces are weak in a liquid state substance like water, alcohol and oil. It is almost not found in gaseous substance such as oxygen, water vapour and carbon dioxide.



Unit One: Matter and Its Construction

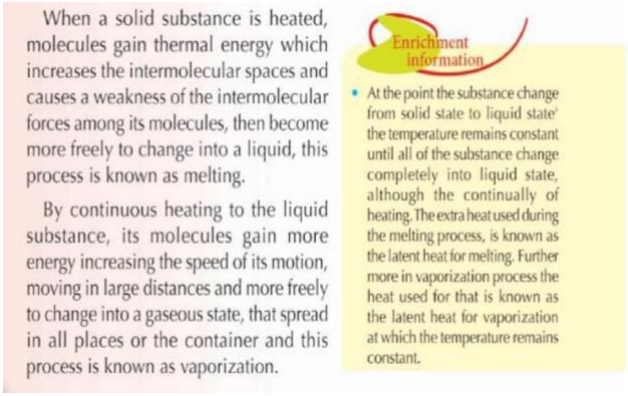
Solid Molecules | Liquid Molecules | Gas Molecules

For this, solid matter keeps its shape and volume whatever the container shape changes, while the liquid takes the shape of container, but gases have no definite shape. Their molecules spread in all available spaces.

From the previous, we can summarize molecules properties as follow:

1. Matter molecules are in continuous motion, limited in solids, more free in liquids and completely free in gases.
2. Intermolecular spaces are found among molecules which are tiny in solids, little big in liquids and very large in gases.
3. Attraction forces among molecules are very strong among solids, weak in liquids and almost not existed in gases.

- Objective (5)" Explain the relation between the temperature and the attraction forces among molecules" **has been achieved**.



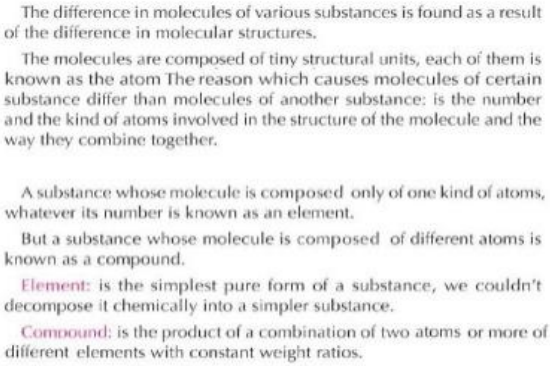
When a solid substance is heated, molecules gain thermal energy which increases the intermolecular spaces and causes a weakness of the intermolecular forces among its molecules, then become more freely to change into a liquid, this process is known as melting.

By continuous heating to the liquid substance, its molecules gain more energy increasing the speed of its motion, moving in large distances and more freely to change into a gaseous state, that spread in all places or the container and this process is known as vaporization.

Enrichment information

- At the point the substance change from solid state to liquid state the temperature remains constant until all of the substance change completely into liquid state, although the continually of heating. The extra heat used during the melting process, is known as the latent heat for melting. Further more in vaporization process the heat used for that is known as the latent heat for vaporization at which the temperature remains constant.

- Objective (6)" Define the meaning of an element and a compound" **has been achieved**.



The difference in molecules of various substances is found as a result of the difference in molecular structures.

The molecules are composed of tiny structural units, each of them is known as the atom The reason which causes molecules of certain substance differ than molecules of another substance: is the number and the kind of atoms involved in the structure of the molecule and the way they combine together.

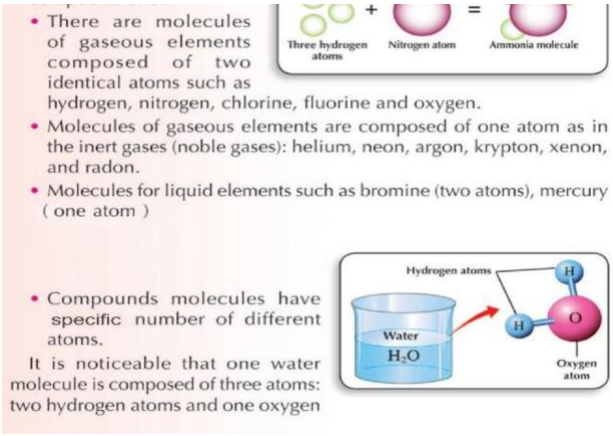
A substance whose molecule is composed only of one kind of atoms, whatever its number is known as an element.

But a substance whose molecule is composed of different atoms is known as a compound.

Element: is the simplest pure form of a substance, we couldn't decompose it chemically into a simpler substance.

Compound: is the product of a combination of two atoms or more of different elements with constant weight ratios.

- Objective (7)" Give some examples of elements and compounds as well" **has been achieved**.



- There are molecules of gaseous elements composed of two identical atoms such as hydrogen, nitrogen, chlorine, fluorine and oxygen.
- Molecules of gaseous elements are composed of one atom as in the inert gases (noble gases): helium, neon, argon, krypton, xenon, and radon.
- Molecules for liquid elements such as bromine (two atoms), mercury (one atom)

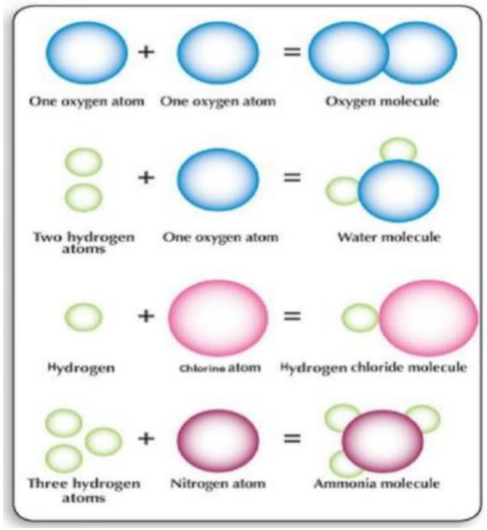
Three hydrogen atoms | Nitrogen atom | Ammonia molecule

- Compounds molecules have specific number of different atoms.

It is noticeable that one water molecule is composed of three atoms: two hydrogen atoms and one oxygen

Hydrogen atoms | Water H_2O | Oxygen atom

- Objective (8)" Design preliminary models for elements and compounds molecules" **has been achieved**.



One oxygen atom + One oxygen atom = Oxygen molecule

Two hydrogen atoms + One oxygen atom = Water molecule

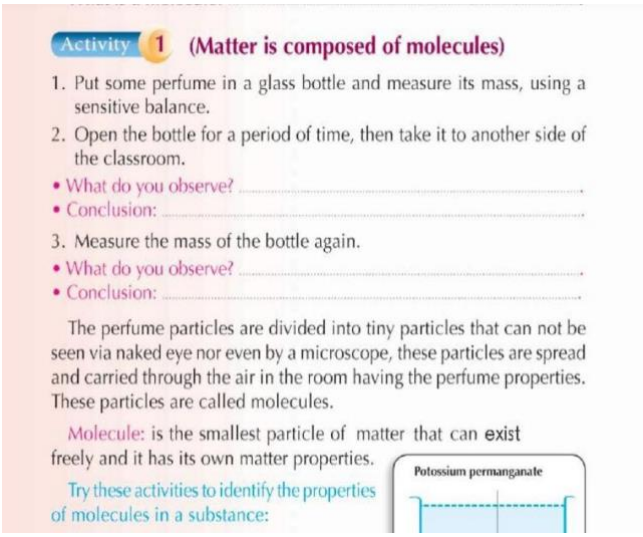
Hydrogen + Chlorine atom = Hydrogen chloride molecule

Three hydrogen atoms + Nitrogen atom = Ammonia molecule

- Objective (9)" Show the economic benefits of some elements" **has not been achieved**.

2. **LIFE APPLICATIONS**: –

- **The first activity explains that matter consists of molecules**.



Activity 1 (Matter is composed of molecules)

1. Put some perfume in a glass bottle and measure its mass, using a sensitive balance.
2. Open the bottle for a period of time, then take it to another side of the classroom.

• What do you observe? .....
• Conclusion: .....

3. Measure the mass of the bottle again.

• What do you observe? .....
• Conclusion: .....

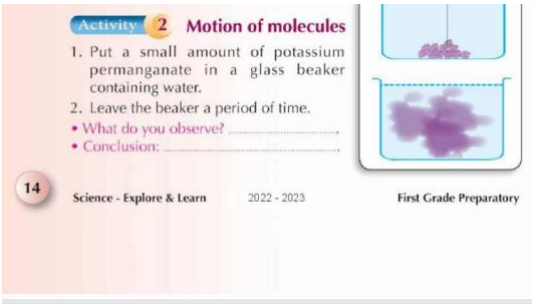
The perfume particles are divided into tiny particles that can not be seen via naked eye nor even by a microscope, these particles are spread and carried through the air in the room having the perfume properties. These particles are called molecules.

Molecule: is the smallest particle of matter that can exist freely and it has its own matter properties.

Try these activities to identify the properties of molecules in a substance:

Potassium permanganate

- **The second activity explains the movement of molecules**.



Activity 2 Motion of molecules

1. Put a small amount of potassium permanganate in a glass beaker containing water.
2. Leave the beaker a period of time.

• What do you observe? .....
• Conclusion: .....

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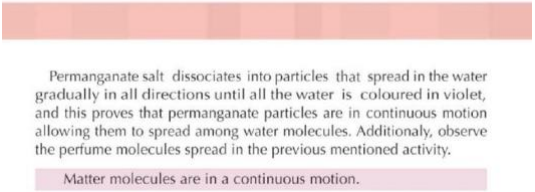
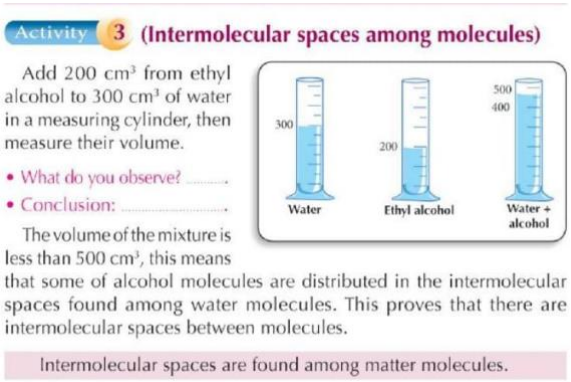


Permanganate salt dissociates into particles that spread in the water gradually in all directions until all the water is coloured in violet, and this proves that permanganate particles are in continuous motion allowing them to spread among water molecules. Additionaly, observe the perfume molecules spread in the previous mentioned activity.

Matter molecules are in a continuous motion.

- **The third activity explains the interspace between molecules**.



Activity 3 (Intermolecular spaces among molecules)

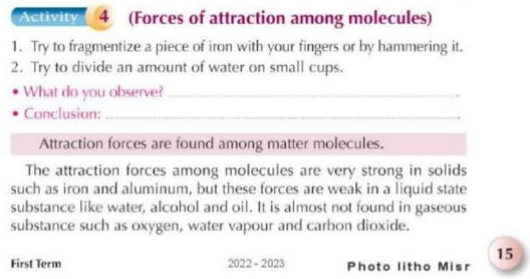
Add 200 cm³ from ethyl alcohol to 300 cm³ of water in a measuring cylinder, then measure their volume.

• What do you observe? .....
• Conclusion: .....

The volume of the mixture is less than 500 cm³, this means that some of alcohol molecules are distributed in the intermolecular spaces found among water molecules. This proves that there are intermolecular spaces between molecules.

Intermolecular spaces are found among matter molecules.

- **The fourth activity explains the forces of attraction between molecules**.



Activity 4 (Forces of attraction among molecules)

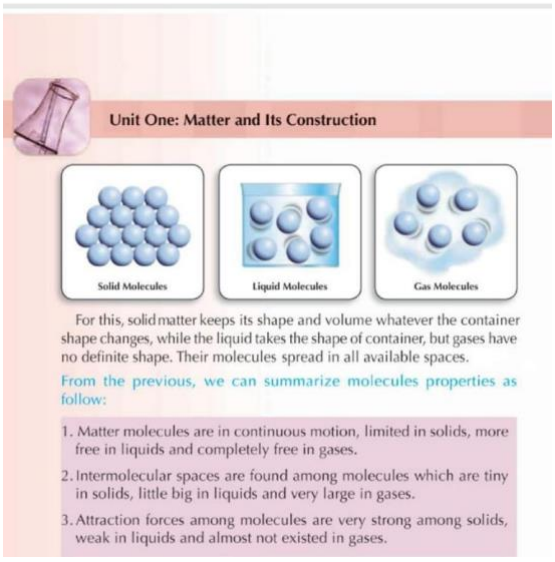
1. Try to fragmentize a piece of iron with your fingers or by hammering it.
2. Try to divide an amount of water on small cups.

• What do you observe? .....
• Conclusion: .....

Attraction forces are found among matter molecules.

The attraction forces among molecules are very strong in solids such as iron and aluminum, but these forces are weak in a liquid state substance like water, alcohol and oil. It is almost not found in gaseous substance such as oxygen, water vapour and carbon dioxide.

First Term 2022 - 2023 Photo litho Misr 15



Unit One: Matter and Its Construction

For this, solid matter keeps its shape and volume whatever the container shape changes, while the liquid takes the shape of container, but gases have no definite shape. Their molecules spread in all available spaces.

From the previous, we can summarize molecules properties as follow:

1. Matter molecules are in continuous motion, limited in solids, more free in liquids and completely free in gases.
2. Intermolecular spaces are found among molecules which are tiny in solids, little big in liquids and very large in gases.
3. Attraction forces among molecules are very strong among solids, weak in liquids and almost not existed in gases.

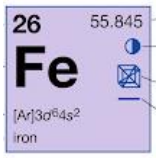
3. MODIFICATIONS AND ADDITIONS: –

- **This comparison helps the student understand the differentiation of the properties of matter into the three states of matter easily, instead of giving him all the information on a different page. This makes it difficult for him to collect the properties of the states of matter.**

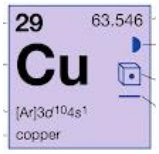
Points of comparison	solid	liquid	gaseous
Motion of Molecules	limited (Vibrational motion)	More force (Intermediate)	Completely force (unlimited)
Intermolecular spaces	Very small Narrow	Relatively large (Intermediate)	Very large
Intermolecular force	Very strong	Relatively weak (Intermediate)	Very weak or almost not exist
volume	Definite (fixed)	definite	indefinite
shape	definite	indefinite	indefinite
examples	Ice – copper – iron	Water- oil- alcohol.	Water vapor- carbon dioxide- oxygen

- **In objective 9 (show some economic benefits of some elements) nothing has been mentioned about it, so a few examples shall be added to clarify that: –**

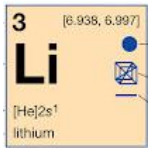
  - **Iron: Iron is the most widely used metal in the world. It is used to make steel which is used in construction, machines, cars…etc.**



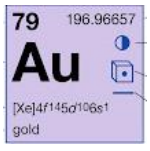
  - **Copper: Copper is used in wiring, electrical circuits, and plumbing.**



  - **Lithium: Lithium is a light metal that is used in batteries for electric vehicles and electronic devices. Lithium is also used in some medications.**



  - **Gold: Gold is a precious metal that is used in jewelry, investment, and electronics.**



- **Addition of some QR codes to clarify some of the life activities: –**

  - **This video shows and explains the motion of molecules mentioned in Activity No. 2.**

  - **This video shows and explains the intermolecular spaces among molecules mentioned in Activity No. 3.**

  - **This video shows and explains the intermolecular forces among molecules mentioned in Activity No. 4.**

4. **QUESTIONS: –**
   1. **What is a molecule?**
   2. **What happens when you put potassium permanganate in a glass of water? and why?**
   3. **What happens to the level of water when you dissolve grains of sugar into a glass of water? Why?**
   4. **Compare between the attraction force among molecules found in Iron, Water, and carbon dioxide?**
   5. **What is the effect of heating on molecules of a solid and liquid substances?**
   6. **Define the meaning of element and compound? And mention some examples?**
   7. **Design preliminary models for elements and compound molecules of Oxygen, water, hydrogen chloride, and ammonia molecules?**
   8. **What are the economic benefits of iron, and copper?**
   9. **choose the correct answer: Properties of molecules in matter are…….**
      a. **Molecules in matter are in constant motion.**
      b. **Molecules in matter are in temporary motion.**
      c. **There are spaces between molecules in matter**
      d. **a and c together)**
   10. **Compare between the state of matter in the solid and liquid states?**

"FIRST SEMESTER"

LESSON 3: ATOMIC STRUCTURE OF MATTER

1. OBJECTIVES' ANALYSIS: –

o Objective (1) "Mention the chemical symbols of the elements" **has been achieved**.

Chemical symbols of elements

Matter is composed of molecules. Molecules are composed of smaller particles called atoms.

Chemists use symbols which easily express the elements. The following table includes the symbols of some of the most famous used atoms of elements.

Element	Atom symbol	Element	Atom symbo
Lithium	Li	Hydrogen	H
Potassium	K	Oxygen	O
Sodium	Na	Nitrogen	N
Calcium	Ca	Fluorine	F
Magnesium	Mg	Chlorine	Cl
Aluminum	Al	Bromine	Br
Zinc	Zn	Iodine	I
Iron	Fe	Helium	He
Lead	Pb	Argon	Ar
Copper	Cu	Sulphur	S
Mercury	Hg	Phosphorous	P
Silver	Ag	Carbon	C
Gold	Au	Silicon	Si

o Objective (2)" Explain the atomic structure" **has been achieved**.

Atomic construction:

The scientists operated many experiments to reach the final idea about the atomic construction of nucleus and electrons:

A. Nucleus:

It is the central core of the atom where its mass and positive charges are concentrated; the nucleus contains.

1. Positive charged particles known as (+) protons.
2. Neutral particles known as (±) neutrons.

To express an atom of any element we use two terms:

o Objective (3)" Explain the atomic number and mass number" **has been achieved**.

Atomic number: it is the number of the positive charged particles (protons) and it is written to the left side below the symbol of the element.

Unit One: Matter and Its Construction

Mass number: is the sum of protons and neutrons number found in the nucleus, it is written above the symbol.

o Objective (4) "Calculate the number of the particles found in the atom by knowing both mass and atomic numbers" **has been achieved but not in a direct way**.

Electronic configuration:

The atomic number of nitrogen atom is 7, so the number of protons = 7, The number of electrons rotating around the nucleus = 7 as well.

The electronic configuration is:

2 electrons in K level, and 5 electrons in L level.

Also the energy of the level K is less than that of the L level. Electrons are distributed in the 1st level then the second and so on.

The atomic number of sodium atom is 11, so there are 11 electrons in the atom which are distributed as:

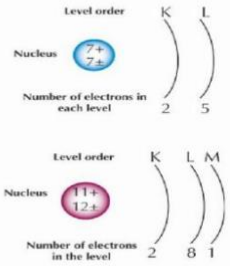
2 electrons in K level,

8 electrons in L level

1 electron in M level

The total = 11 electrons

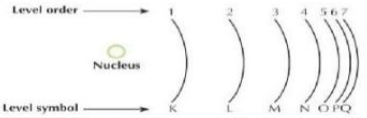
The configuration is expressed as in the figure.



o Objective (5) "Identify the energy levels in the atom" **has been achieved**.

Energy levels: are imaginary places around the nucleus in which the electrons move according to their energy.

- The number of energy levels in the largest known atom is 7 levels represented from inner to outer levels by letters: K, L, M, N, O, P, Q.



- Each level has a certain amount of energy that increases by the increase of the level distance from nucleus, this means that energy of level L is greater than that of level K.
- Each level has a certain number of electrons which can revolve in, for example:
  1st level K: is saturated by 2 electrons.
  2nd level L: is saturated by 8 electrons.
  3rd level M: is saturated by 18 electrons.
  4th level N: is saturated by 32 electrons.
  Any other farther level, is saturated by 32 electrons.
- The number of electrons that saturates the level $n = 2n^2$ i.e. it is double the square number of the level order, (n) .

o Objective (6) "Determine the rules of electronic Configuration" **has been achieved**.

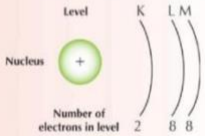
The electronic configuration and the chemical activity:

The atom is active and not stable as far as the number of the electrons in the outer level is less than 8 electrons.

This means that the chemical activity is related to the number of electrons in the outer level. If the number of electrons in the outer level of an atom is less than 8 electrons, this atom reacts chemically with another atom or more to produce a molecule in a stable state.

There are some atoms like those of the inert gases that do not react chemically with other elements.

For example Argon $^{40}_{18}Ar$. Its electronic configuration is as follows:



The atom: is the smallest individual unit of matter which can share in a chemical reaction.

Enrichment information

- The following are scientists who contributed the discovery of the atom construction: Greek scientists – Boyle – Dalton – Thomson – Rutherford –Bohr.
- The atom diameter is measured in Angstrom which equals one part of ten thousands million parts of one metre – for example the radius of hydrogen atom = 0.3 Angstrom, this indicates how much the atom is small.

- Objective (7) "Deduce the electronic configuration by knowing the atomic number" **has been achieved**.

- Objective (8) "Deduce the relation between the electronic configuration and chemical activity" **has been achieved**.

- Objective (9) "Design a preliminary model of atom construction" **has not been achieved**.

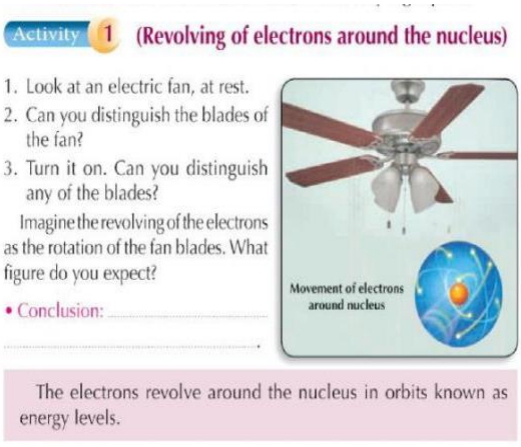
- Objective (10) "Write a short brief about scientists who had studied the atomic construction" **has not been achieved**.

- Objective (11) "Appreciate the role of scientists who have discovered the atom" **has not been achieved**.

- Objective (12) "Share with some classmates to make a model of an atom with its electronic configuration" **has been achieved**.

2. LIFE APPLICATIONS: –

- Revolving of electrons around the nucleus.


Activity 1 (Revolving of electrons around the nucleus)

1. Look at an electric fan, at rest.
2. Can you distinguish the blades of the fan?
3. Turn it on. Can you distinguish any of the blades?

Imagine the revolving of the electrons as the rotation of the fan blades. What figure do you expect?

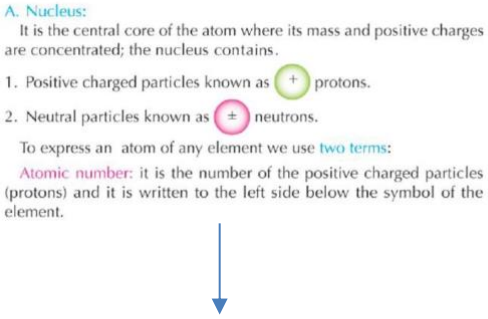
• Conclusion: .....

Movement of electrons around nucleus

The electrons revolve around the nucleus in orbits known as energy levels.

3. MODIFICATION: –

- Modifying some parts of the lesson on page 25: -


A. Nucleus:

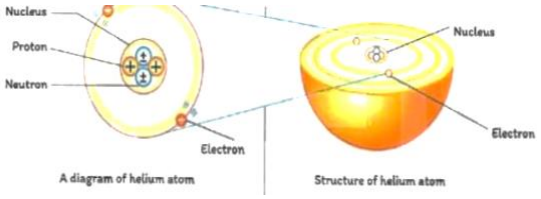
It is the central core of the atom where its mass and positive charges are concentrated; the nucleus contains.

1. Positive charged particles known as (+) protons.
2. Neutral particles known as (±) neutrons.

To express an atom of any element we use two terms:

Atomic number: it is the number of the positive charged particles (protons) and it is written to the left side below the symbol of the element.

Shall be modified to be: –



It is the central core of the atom	They orbit the nucleus at a very high speed
Its positive charge **Protons**: positively charged particles `**Neutrons**: electrically neutral particles	They are negatively charged particles and Their Number of positive protons in the neutral atom
The mass of the atom is concentrated in the nucleus	The electron has a negligible mass relative to the proton of the neutron.

4. QUESTIONS: –

1. **The chemical activity of the element depends on the number of: –**
   a. **Neutron.**
   b. **Electrons in the outer level.**
   c. **Levels filled with electrons.**
   d. **Proton.**

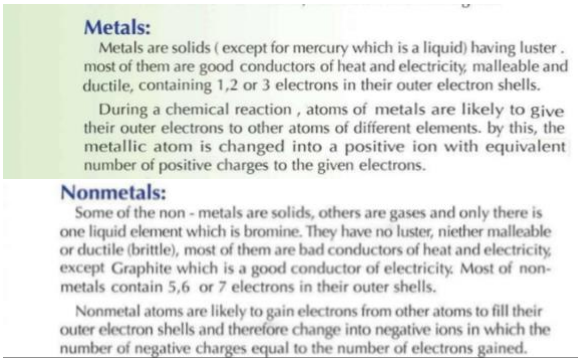
2. **The sum of the number of protons and neutrons in the nucleus of the atom is known as: –**
    a. **Atomic number.**
    b. **Mass number.**
    c. **Valency.**
    d. **Density.**
3. **Give reason for: –**
    a. **Atom of active element takes part in the chemical reaction?**
    b. **Sodium atom is active while argon atom is inactive?**
4. **Complete the following statement: – electrons are particles with……charge while protons are particles with……..charge.**

"SECOND SEMESTER"

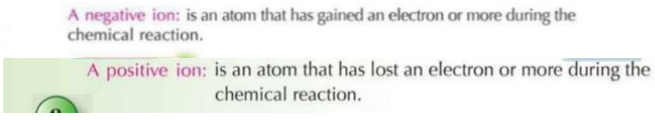
LESSON 1: CHEMICAL COMBINATION

1. OBJECTIVES' ANALYSIS: –

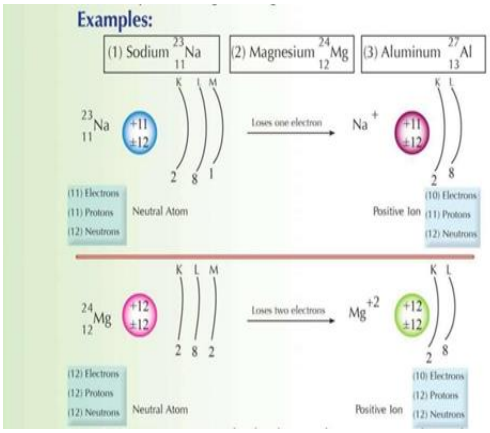
- Objective (1) "Compare between metals and nonmetals" and Objective (2) "Identify an element type through its electronic configuration" **have been achieved**.

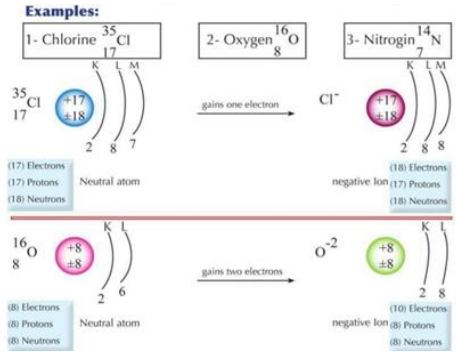


- Objective (3) "Compare between the positive ion and the negative ion" **has been achieved**.

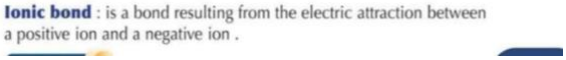


- Objective (4) "Write the electronic configuration to an atom and its ion" **has been achieved**.

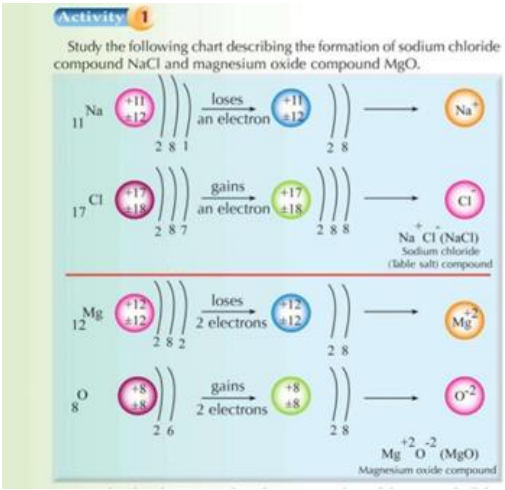




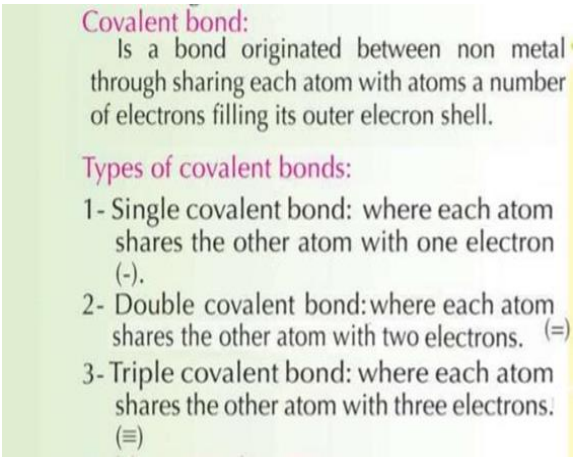
- Objective (5) "Explain the meaning of ionic bond" **has been achieved**.



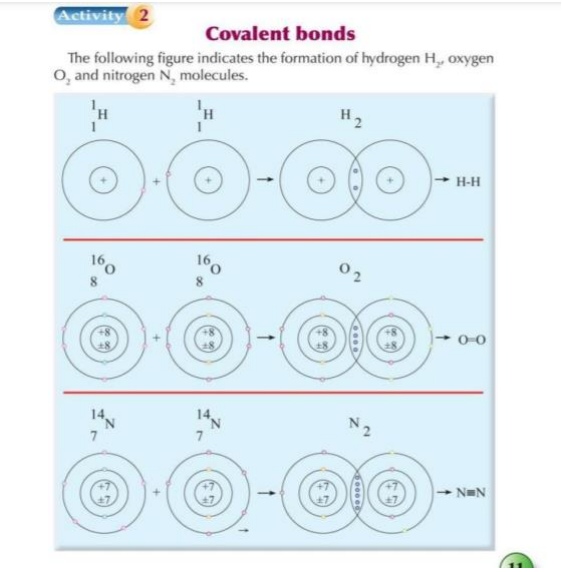
- Objective (6) "Show the ionic bond formation in one of the compounds or elements" **has been achieved**.



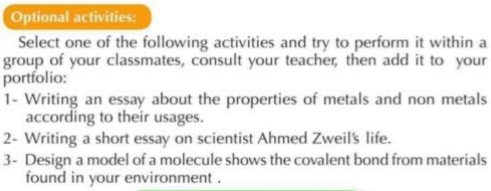
- Objective (7) "Explain the meaning of the covalent bond and give its types" **has been achieved**.



- Objective (8) "Illustrate the formation of a covalent bond in a compound and an element" **has been achieved**.



- Objective (9) "Design a model to a molecule of an ionic compound and a covalent one" **has been achieved**.



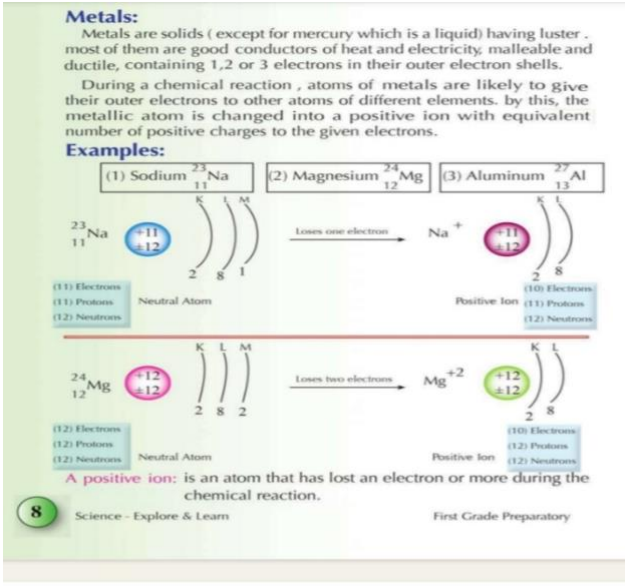
2. LIFE APPLICATIONS: –

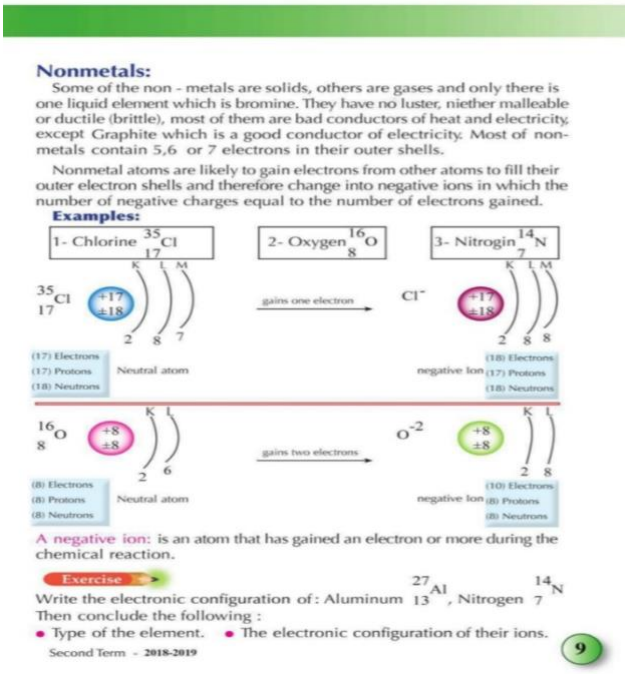
- There are no real-life applications in this lesson that were mentioned in the textbook.

3. MODIFICATIONS AND ADDITIONS:

- Modifying some parts on pages 8 and 9 will make a table comparison between metal and nonmetal: –

(Old)

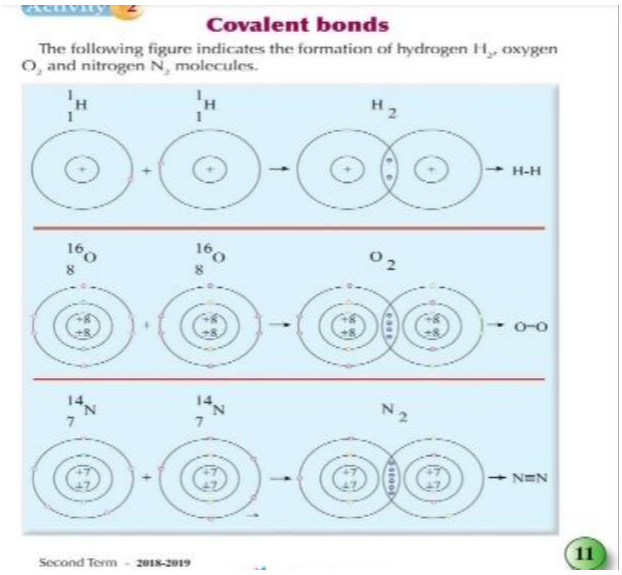


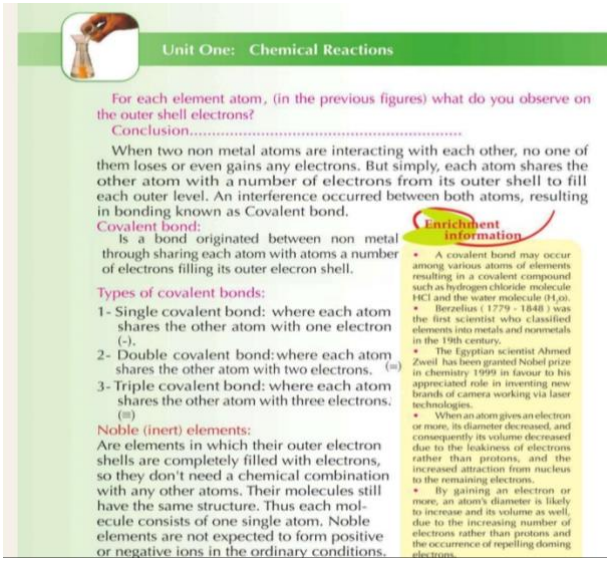


Shall be Modified to:

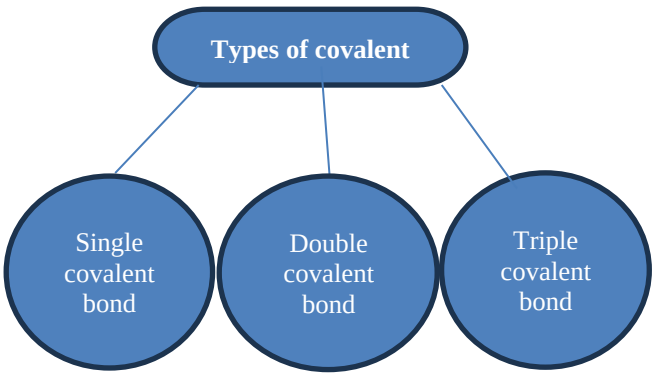
P.O.C	Metal	Non-metal
Physical state	They are solids except mercury (Hg) which is a [liquid].	They are solids and gases except bromine (Br) which is a [liquid].
Metallic lustre	-They have metallic lustre.	They have no lustre.
Malleable and ductile	They are malleable and ductile.	They are not malleable or ductile.
Heat and electric conduction	They are good conductors of heat and electricity.	They are bad conductors of heat and electricity [except graphite which is a good conductor of electricity].
No. of electrons in the outer shell	They have less than (4) electrons in the outermost energy level.	They have more than (4) electrons in the outermost energy level.
Behaviour of atom during a chemical reaction	During the chemical reaction, their atoms tend to lose an electron or more and change into positive ions.	During the chemical reaction, their atoms tend to gain an electron or more and change into negative ions.

- Adding definitions of covalent bonds with examples some parts on pages 11 and 12:





These Shall be Added: -



1. **Single Covalent bond: -**
   - It is a Chemical bond which arises between two non-metal atoms by sharing of one pair of electrons, where each atom shares the other atom with one electron.
   - Examples: -
     a) Single covalent bond between two atoms for one element => Formation of a hydrogen molecule (H_2).
     b) Single Covalent bond between one atom for one element and two atoms for another element => formation of a water molecule (H_2O).
2. **Double Covalent bond: -**
   - It is a chemical bond which arises between two non-metal atoms by sharing of two pairs of electrons, where each atom shares the other atom with two electrons.
   - Example: -Formation of an oxygen molecule (O_2).
3. **Triple Covalent bond: -**
   - It is a chemical bond which arises between two non-metal atoms by sharing of three pairs of electrons, where each atom shares the other atom with three electrons.
   - Example: -Formation of a Nitrogen molecule (N_2).

These QR codes shall be added to explain visually through videos to the students for a better and more comprehensive understanding of the lesson: –

a) This video covers the difference between the properties of metals and non–metals. Also, it takes a look at transition metals.

b) *This video covers how covalent bonding works, how to show it with dot and cross diagrams, and the types of substances that covalent bonds can form.*

c) *This video includes everything you need to know about ionic bonding. Ionic bonds form when one atom transfers electron/s to another atom so that both atoms form oppositely charged ions. These ions are then attracted to each other by electrostatic forces which is called an ionic bond.*

4. QUESTIONS: –

1. **Compare between the following: –**
   a. **metal and nonmetal?**
   b. **Positive ion and negative ion?**
2. **Choose the correct answer: –**
   - **All the following elements can form positive ions except: –**
     a. **Sodium (Na11).**
     b. **Magnesium (Mg12).**
     c. **Chlorine.**
   - **The number of energy levels in sodium is ……the number of energy levels in its atom**
     a. **More than.**
     b. **Equal.**
     c. **Less than.**
     d. **None of the above.**

- **It's a chemical reaction resulted from the electric attraction between a positive ion and a negative ion: –**
    a. **Covalent bond.**
    b. **Ionic bond.**
    c. **Valency.**
- **The chemical bonds which rise between 2 nonmetals by sharing one pair of electrons where each atom shares the other atom with one electron: –**
    a. **Single covalent bond.**
    b. **Double covalent bond.**
    c. **Covalent bond.**
- **All the following are covalent except: –**
    a. **MgO.**
    b. **HCL.**
    c. **O2.**

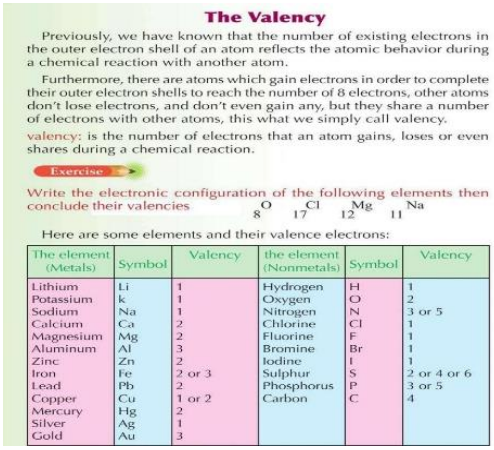
3. **"A, B, C, and D" are four elements, whose atomic numbers are "1, 11, 10, and 17" respectively: –**
    a. **Classify them into metal, non–metal, or noble gas?**
    b. **Show by drawing how two atoms of (A) form a covalent bond?**
    c. **What is the type of bond when (B) combines with (D)?**
    d. **What is the type of bond when two atoms of (D) combine together?**
    e. **Explain why element (C) doesn't undergo chemical reaction under normal conditions?**
4. **Two elements ($_8$A) and ($_{12}$B): –**
    a. **Which one is metal and which one is non–metal?**
    b. **What is the kind of bond formed between the two atoms of (A)? show by drawing.**
    c. **Show by drawing the bond formed between (A) and (B) elements and mention the name of the formed compound?**

"SECOND SEMESTER"

LESSON 2: CHEMICAL COMPOUNDS

1. OBJECTIVES' ANALYSIS: –

- Objective (1) "Explain the meaning of valences" **has been achieved**.



The Valency

Previously, we have known that the number of existing electrons in the outer electron shell of an atom reflects the atomic behavior during a chemical reaction with another atom.

Furthermore, there are atoms which gain electrons in order to complete their outer electron shells to reach the number of 8 electrons, other atoms don't lose electrons, and don't even gain any, but they share a number of electrons with other atoms, this what we simply call valency.

valency: is the number of electrons that an atom gains, loses or even shares during a chemical reaction.

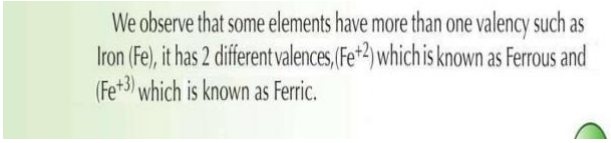
Exercise

Write the electronic configuration of the following elements then conclude their valencies O (8) Cl (17) Mg (12) Na (11)

Here are some elements and their valence electrons:

The element (Metals)	Symbol	Valency	the element (Nonmetals)	Symbol	Valency
Lithium	Li	1	Hydrogen	H	1
Potassium	k	1	Oxygen	O	2
Sodium	Na	1	Nitrogen	N	3 or 5
Calcium	Ca	2	Chlorine	Cl	1
Magnesium	Mg	2	Fluorine	F	1
Aluminum	Al	3	Bromine	Br	1
Zinc	Zn	2	Iodine	I	1
Iron	Fe	2 or 3	Sulphur	S	2 or 4 or 6
Lead	Pb	2	Phosphorus	P	3 or 5
Copper	Cu	1 or 2	Carbon	C	4
Mercury	Hg	2			
Silver	Ag	1			
Gold	Au	3			

- Objective (2) "Mention examples of some elements having different valences" **has been achieved**.



We observe that some elements have more than one valency such as Iron (Fe), it has 2 different valences, (Fe^{+2}) which is known as Ferrous and (Fe^{+3}) which is known as Ferric.

- Objective (3) "Explain the meaning of the atomic group" **has been achieved**.

The Atomic Group

It is a set of atoms joined together conducting the behavior of one atom during a chemical reaction, having its own valency and it is not existed solely.

Here are some examples of atomic groups and their valencies:

Atomic group	Symbol	Valency	Atomic group	Symbol	Valency
Hydroxide	OH^-	1	Sulphate	$(SO_4)^{-2}$	2
Nitrate	NO_3^-	1	Carbonate	$(CO_3)^{-2}$	2
Bicarbonate	HCO_3^-	1			
Ammonium	NH_4^+	1	Phosphate	$(PO_4)^{-3}$	3
Nitrite	NO_2^-	1			

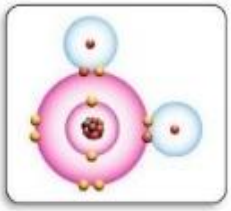
- Objective (4) "Write the chemical formulae of the atomic groups" **has been achieved**.

Atomic group	Symbol	Valency	Atomic group	Symbol	Valency
Hydroxide	OH^-	1	Sulphate	$(SO_4)^{-2}$	2
Nitrate	NO_3^-	1	Carbonate	$(CO_3)^{-2}$	2
Bicarbonate	HCO_3^-	1			
Ammonium	NH_4^+	1	Phosphate	$(PO_4)^{-3}$	3
Nitrite	NO_2^-	1			

Chemical formula

We can express a molecule of a compound via a certain formula known as the chemical formula which expresses the number of atoms in a molecule and their types. For example sodium chloride molecule (Table salt) expressed as NaCl, that means it is composed of two atoms of two elements sodium Na and chlorine Cl.

The chemical formula of water is H_2O, which means that the water molecule is composed of 3 atoms of two elements, one atom of oxygen and two atoms of hydrogen.



- Objective (5) "Write the chemical formulae of some compounds" **has been achieved**.

Exercise

Study the following table that indicates some compounds and their chemical formulae. Notice the way of writing each formula then complete the missing parts:

Compound	Chemical formula	No. of atoms in molecule	No. of forming elements
Sodium Carbonate	Na_2CO_3	.....	.....
Copper Carbonate	$CuCO_3$	.....	.....
Sodium Hydroxide	NaOH	.....	.....
Magnesium Hydroxide	$Mg(OH)_2$	.....	.....
Aluminum Sulphate	$Al_2(SO_4)_3$	.....	.....
Calcium Sulphate	$CaSO_4$	.....	.....
Sodium Oxide	Na_2O	.....	.....
Calcium Oxide	CaO	.....	.....

You may use the following helping steps to write the chemical formula for a compound:

1- Write the name of the compound in words.
2- Write the symbol of each element or atomic group down to the name.
3- Write the valency down to each symbol.
4- All numbers are to be shortened as much as you can.
5- Interchange the written numbers (you don't have to write the digit (1))
6- In case of atomic groups, if the number was not (1), put the atomic group parenthesis and write the number right down to it.

- Objective (6) "Explain the meaning of acids and bases as well" **has been achieved**.

Types of Compounds

In nature there is a countless number of existing compounds.

Only they can be classified according to their properties to many types as acids, bases, salts and oxides

Activity

Study the following chart which indicates examples of some acids, bases, and their chemical formula.

Type of compound	Name	Chemical formula
Acids	Hydrochloric Acid	HCl
	Sulphuric Acid	H_2SO_4
	Nitric Acid	HNO_3
Bases	Sodium Hydroxide (caustic soda)	NaOH
	Potassium Hydroxide	KOH
	Calcium Hydroxide (Lime water)	$Ca(OH)_2$

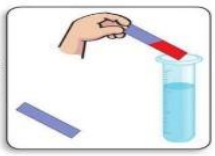
What do you observe on the chemical formula of each of them.

Conclusion: .....

Acids:

Acids are materials that dissociate in water producing positive ions of hydrogen (H^+).

Acid are common in some of their properties such as : the sour taste and changing the colour of litmus to be red due to the presence of the hydrogen ion (H^+).



20 Science - Explore & Learn First Grade Preparatory

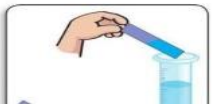
Unit One: Chemical Reactions

Chemical formulae of mineral acids begin with hydrogen joined with one of the negative atomic groups (except hydroxide group(OH^-) such as Sulphuric acid H_2SO_4,Nitric acid HNO_3 .Hydrogen may join with some nonmetals like chlorine or bromine composing some acids such as Hydrochloric acid HCl.

Bases:

They are compounds that produce negative hydroxide ions when decomposed in water.

Aqueous solutions of bases have bitter taste and feel slippery, they change the colour of litmus into blue due to the presence of (OH).



- Objective (7) "Explain the meaning of salts and oxides" **has been achieved**.

Oxides:
An element joins with oxygen producing either oxides of metal or non metal, such as:

Sodium oxide Na_2O Aluminum oxide Al_2O_3
Carbon dioxide CO_2 Sulphur trioxide SO_3

Salts:
Salts are produced as a result of the chemical combination of a positive metal ion (or positive atomic group) with a negative atomic group or a negative ion (except oxygen).
Salts exist in earth's crust or are dissolved in water. They vary in some of their properties such as taste, colour, smell, solubility in water and others.

- Objective (8) "Give examples of an acid, a base, an oxide, and salts" **has been achieved**.

Chemical formulae of mineral acids begin with hydrogen joined with one of the negative atomic groups (except hydroxide group(OH^-) such as Sulphuric acid H_2SO_4,Nitric acid HNO_3 .Hydrogen may join with some nonmetals like chlorine or bromine composing some acids such as Hydrochloric acid HCl.

Bases:
They are compounds that produce negative hydroxide ions when decomposed in water.

Examples:
Table salt (sodium chloride), the unhydrous copper sulphate, and sodium nitrate.

Sodium oxide Na_2O Aluminum oxide Al_2O_3
Carbon dioxide CO_2 Sulphur trioxide SO_3

- Objective (9) "Mention examples of salts which easily dissolve in water and others which do not dissolve in water" **has been achieved**.

Examples for some minerals:

Salts dissolve in water	Salts do not dissolve in water
Sodium chloride NaCl	Silver chloride AgCl
Potassium sulphate K_2SO_4	Lead iodide PbI_2
Calcium nitrate $Ca(NO_3)_2$	Lead sulphate $PbSO_4$
Sodium sulphide Na_2S	

2. LIFE APPLICATIONS: –

- Exercise :
  - Having two unmarked tubes, one contains an acid and the other contains a base. How can you distinguish or classify them?

3. MODIFICATIONS AND ADDITIONS:

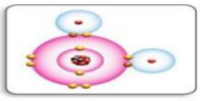
- Adding an example on the lesson on pages 18 and 19 of the textbook because the fifth goal was achieved in the book on pages 18 and19 and the method for writing the chemical formula was mentioned without an example, so it needs to be simplified more for a better understanding by adding an example, so the following table has been made: -

(Old)

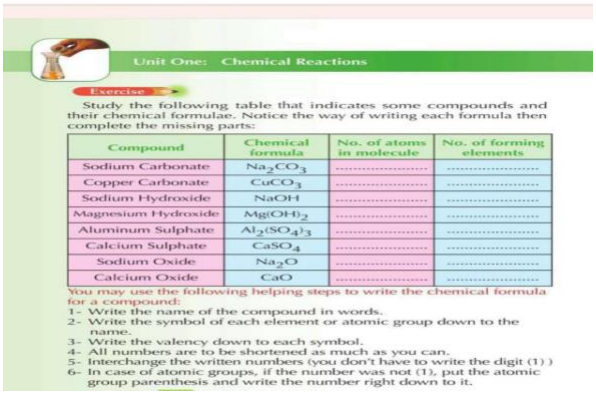
Chemical formula

We can express a molecule of a compound via a certain formula known as the chemical formula which expresses the number of atoms in a molecule and their types. For example sodium chloride molecule(Table salt) expressed as NaCl, that means it is composed of two atoms of two elements sodium Na and chlorine Cl.

The chemical formula of water is H_2O, which means that the water molecule is composed of 3 atoms of two elements, one atom of oxygen and two atoms of hydrogen.



18 Science - Explore & Learn First Grade Preparatory



Unit One: Chemical Reactions

Exercise

Study the following table that indicates some compounds and their chemical formulae. Notice the way of writing each formula then complete the missing parts:

Compound	Chemical formula	No. of atoms in molecule	No. of forming elements
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Copper Carbonate	$CuCO_3$	.....	.....
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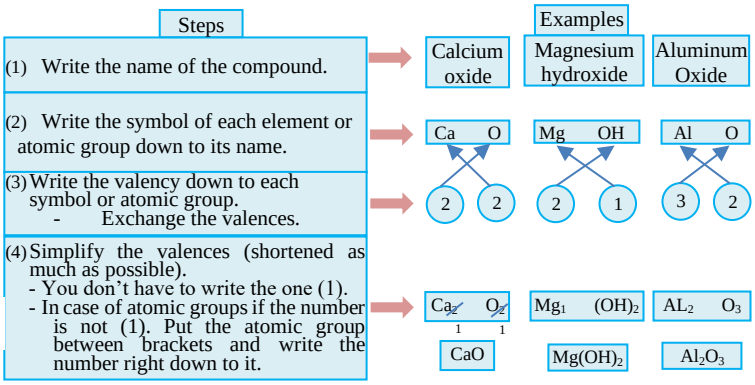
Calcium Sulphate	$CaSO_4$	.....	.....
Sodium Oxide	Na_2O	.....	.....
Calcium Oxide	CaO	.....	.....

You may use the following helping steps to write the chemical formula for a compound:
1- Write the name of the compound in words.
2- Write the symbol of each element or atomic group down to the name.
3- Write the valency down to each symbol.
4- All numbers are to be shortened as much as you can.
5- Interchange the written numbers (you don't have to write the digit (1))
6- In case of atomic groups, if the number was not (1), put the atomic group parenthesis and write the number right down to it.

This shall be added to: –

How can you write a chemical formula for a compound?
Just follow the following steps: -



These QR codes shall be added to explain visually through videos to the students for a better and more comprehensive understanding of the lesson: –

a) ***This video is mandatory to explain the concept of Valency.***

b) ***This video is mandatory to simplify and make it easier for students to understand how to write chemical formulas for ionic compounds.***

c) ***This video is mandatory to simplify and make it easier for students to understand Acid and base.***

d) ***Metals react with oxygen present in the air and form their respective oxides. This video shows an experiment of what happens when metal oxides react with an acid.***

4. QUESTIONS: –

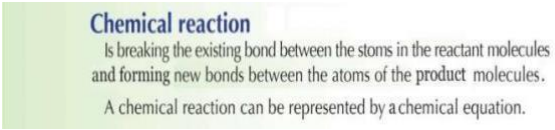
1. **What is meant by valency?**
2. **What is meant by salt and oxides?**
3. **Complete the following: –**
   a. **The Chemical formula of Calcium bicarbonate is..... and Calcium Sulphate is.....**
   b. **Sodium sulphate is from the salts that.....in water, while lead sulphate is from the salts that..... In water.**
4. **Put true or false: –**
   a. **Both nitrate and nitrate groups have the same valency.** ( )
   b. **Aluminium oxide is metal oxide while carbon dioxide is a nonmetal oxide** ( )
5. **Write the name of the following compounds: –**
   a. 1-Mg **(OH)**2 ⟶ **.....**
   b. 2-**Na3Po4** ⟶ .....
6. **Mention the properties of acid and base?**
7. **Mention the valency of oxygen and Iron?**

"SECOND SEMESTER"

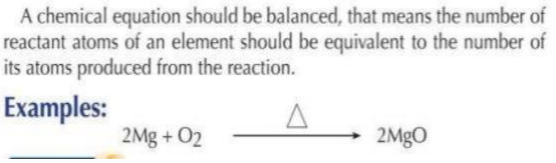
LESSON 3: CHEMICAL EQUATION AND CHEMICAL REACTION

1. OBJECTIVES' ANALYSIS: –

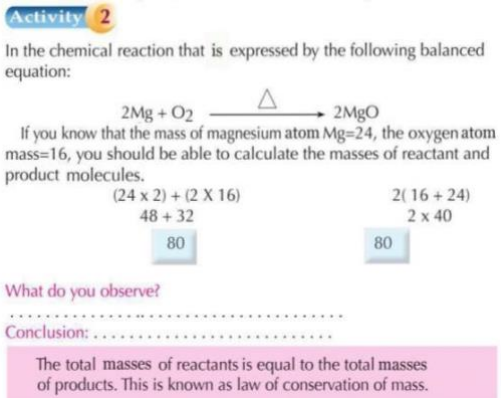
- Objective (1) "Explain the meaning of a chemical reaction" **has been achieved**.



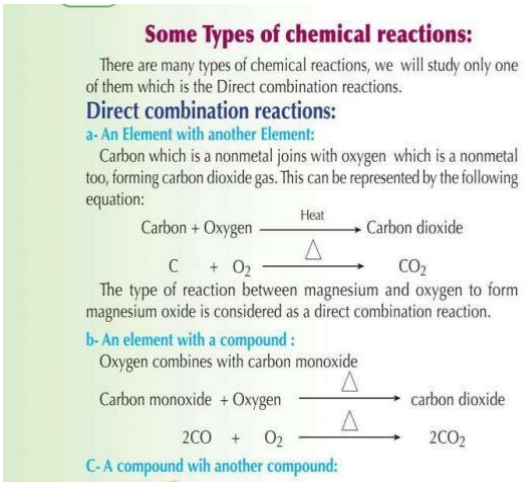
- Objective (2) "Give an example to a chemical equation" **has been achieved**.



- Objective (3) "Prove via a balanced chemical equation that the total mass of reactants through a chemical reaction is equal to the total mass of products" **has been achieved**.



- Objective (4) "identify the types of chemical reactions" **has been achieved**.



Some Types of chemical reactions:

There are many types of chemical reactions, we will study only one of them which is the Direct combination reactions.

Direct combination reactions:

a- An Element with another Element:

Carbon which is a nonmetal joins with oxygen which is a nonmetal too, forming carbon dioxide gas. This can be represented by the following equation:

Carbon + Oxygen $\xrightarrow{\text{Heat}}$ Carbon dioxide

$C + O_2 \xrightarrow{\triangle} CO_2$

The type of reaction between magnesium and oxygen to form magnesium oxide is considered as a direct combination reaction.

b- An element with a compound :

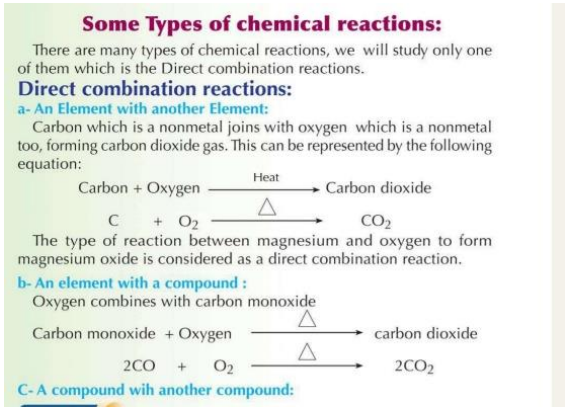
Oxygen combines with carbon monoxide

Carbon monoxide + Oxygen $\xrightarrow{\triangle}$ carbon dioxide

$2CO + O_2 \xrightarrow{\triangle} 2CO_2$

C- A compound wih another compound:

- Objective (5) "Explain the meaning of direct combination reactions" **has been achieved**.



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Direct combination reactions:

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b- An element with a compound :

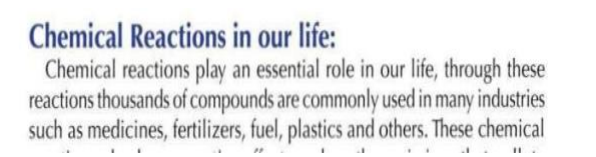
Oxygen combines with carbon monoxide

Carbon monoxide + Oxygen $\xrightarrow{\triangle}$ carbon dioxide

$2CO + O_2 \xrightarrow{\triangle} 2CO_2$

C- A compound wih another compound:

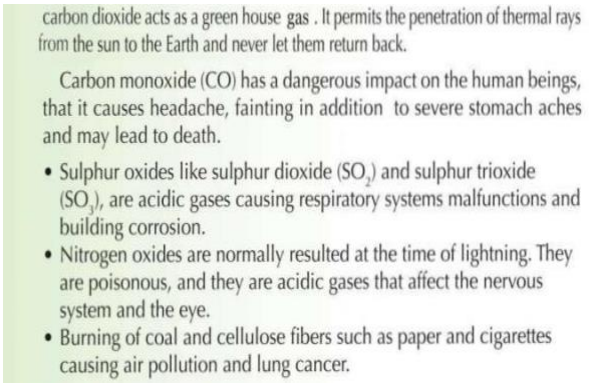
- Objective (6) "Explain the benefits of the Chemical reactions" **has been achieved**.



Chemical Reactions in our life:

Chemical reactions play an essential role in our life, through these reactions thousands of compounds are commonly used in many industries such as medicines, fertilizers, fuel, plastics and others. These chemical

- Objective (7) "Show some harms of chemical reaction" **has been achieved**.

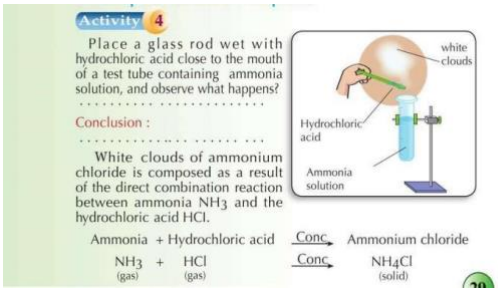


carbon dioxide acts as a green house gas . It permits the penetration of thermal rays from the sun to the Earth and never let them return back.

Carbon monoxide (CO) has a dangerous impact on the human beings, that it causes headache, fainting in addition to severe stomach aches and may lead to death.

- Sulphur oxides like sulphur dioxide (SO_2) and sulphur trioxide (SO_3), are acidic gases causing respiratory systems malfunctions and building corrosion.
- Nitrogen oxides are normally resulted at the time of lightning. They are poisonous, and they are acidic gases that affect the nervous system and the eye.
- Burning of coal and cellulose fibers such as paper and cigarettes causing air pollution and lung cancer.

- Objective (8) Cooperate his (her) classmates to avoid the negative effect of some chemical reactions" **has been achieved**.



Activity 4

Place a glass rod wet with hydrochloric acid close to the mouth of a test tube containing ammonia solution, and observe what happens?

Conclusion :

White clouds of ammonium chloride is composed as a result of the direct combination reaction between ammonia NH_3 and the hydrochloric acid HCl.

Ammonia + Hydrochloric acid $\xrightarrow{\text{Conc.}}$ Ammonium chloride

NH_3 (gas) + HCl (gas) $\xrightarrow{\text{Conc.}}$ NH_4Cl (solid)

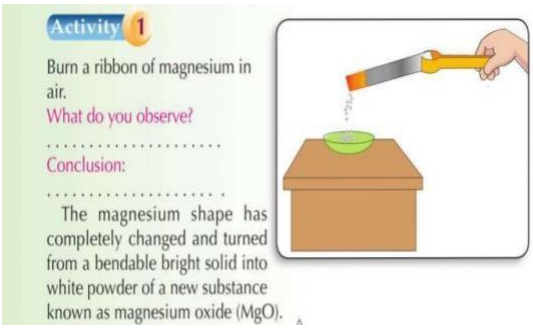
white clouds

Hydrochloric acid

Ammonia solution

2. LIFE APPLICATIONS: –

- To understand the concept of chemical reaction.



Activity 1

Burn a ribbon of magnesium in air.

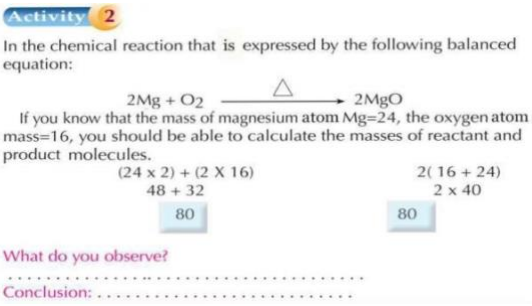
What do you observe?

Conclusion:

The magnesium shape has completely changed and turned from a bendable bright solid into white powder of a new substance known as magnesium oxide (MgO).

- Observation: The solid magnesium ribbon burns and changes from a bendable bright solid into a white powder of a new substance.

- Achieving the law of conservation of matter in the reaction.



Activity 2

In the chemical reaction that is expressed by the following balanced equation:

$2Mg + O_2 \xrightarrow{\triangle} 2MgO$

If you know that the mass of magnesium atom Mg=24, the oxygen atom mass=16, you should be able to calculate the masses of reactant and product molecules.

$(24 \times 2) + (2 \times 16)$ $\quad$ $2(16 + 24)$

$48 + 32$ $\quad$ 2×40

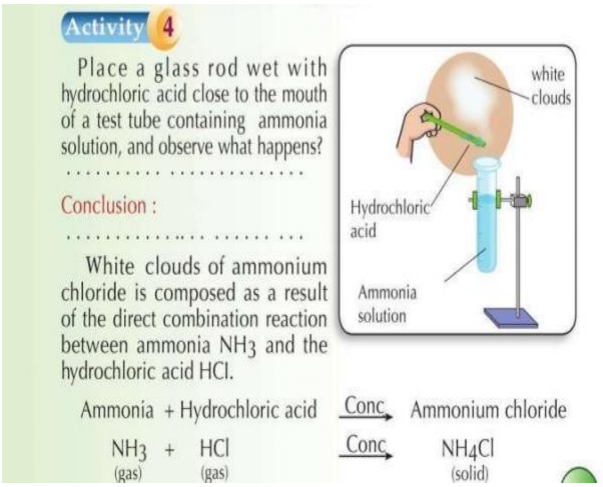
80 $\quad$ 80

What do you observe?

Conclusion:

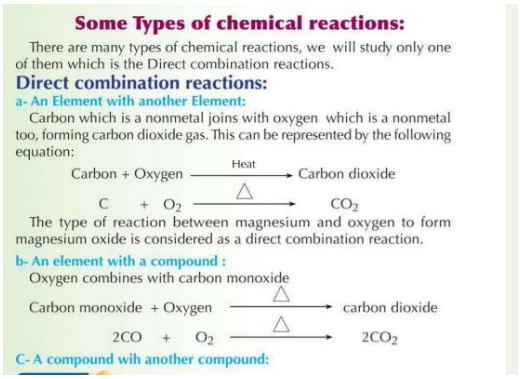
- The sum of reactants masses (=) The sum of product masses Which achieves the law of conservation of matter.

- Combination of a compound with another compound.

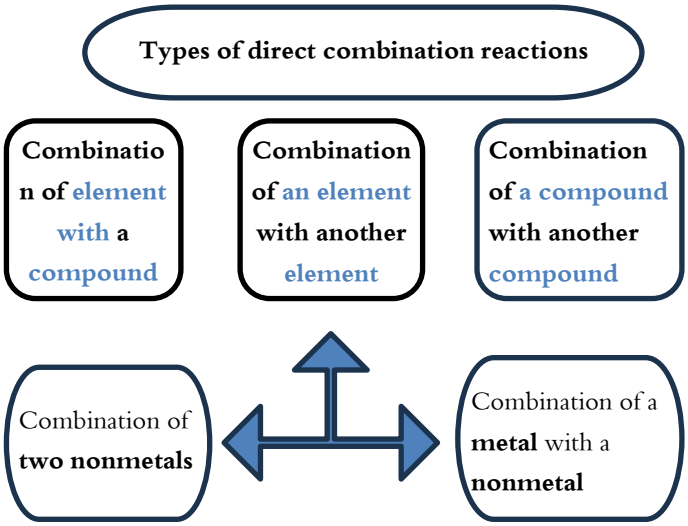


3. MODIFICATIONS AND ADDITIONS:

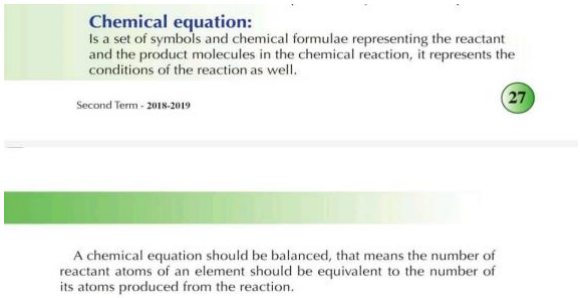
- Modifying some parts of the lesson on page 29: -



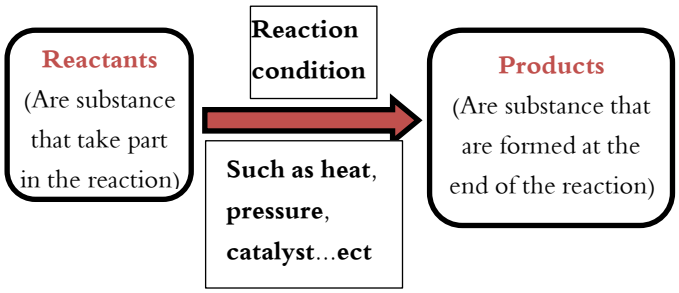
Shall be modified to be: –



- Adding an illustration on page 27 to facilitate and understand better the concept of the chemical equation: -



What will be added: –



4. QUESTIONS: –

1. **Choose the correct answer: –**
   - **The sum of reactants masses in any chemical reaction is …the sum of products masses.**
     a. **Doubled**
     b. **More than**
     c. **Equal to**
     d. **Less than**

   - **The bright magnesium ribbon change into a white powder of ……. when it burns in air.**
     a. **Magnesium nitrite.**
     b. **Magnesium Oxide.**
     c. **Magnesium dioxide.**
     d. **Magnesium hydroxide.**

- The ratio between the mass of reactants in the chemical reaction to the mass of products is one according to the law of conservation of ..... matter.
    a. More than.
    b. Less than.
    c. Equal to.
    d. None of the above.

2. Give reason for: –
    a. Country prevent the passage of cars in the archaeological areas?
    b. Erosion of the front of a house in the industrial areas?
3. What is meant by each of the following? –
    a. Chemical reaction.
    b. Direct combination reaction

The connection between the unit of chemistry in the first and second term in first preparatory school: –

there is a strong connection between the chemistry unit "Matter and Its Composition" in the first term and the "Chemical Reactions" unit in the second term of first-year middle school.

Here's why these units are linked:

Atomic Structure: In "Matter and Its Composition," you learn about the basic building blocks of matter – atoms. This includes understanding the number of protons, neutrons, and electrons in each element. This knowledge is crucial for understanding how atoms interact with each other in chemical reactions.

Chemical Bonding: The first unit explores different types of chemical bonds, such as ionic, covalent, and metallic bonds. Understanding these bonds is essential for grasping how elements combine to form compounds and how those compounds can react with each other.

Chemical Equations: The "Chemical Reactions" unit introduces balanced chemical equations. These equations show the types and quantities of reactants (starting materials) and products (resulting materials) in a reaction. Writing balanced equations relies on your understanding of atomic structure and chemical bonding.

Types of Reactions: In the second term, you'll learn about various types of chemical reactions, such as combination, decomposition, combustion, and displacement. Understanding these reactions depends on your knowledge of chemical bonding and how atoms interact and rearrange during the reaction.

In essence, "Matter and Its Composition" lays the foundation for understanding "Chemical Reactions."

Your grasp of atomic structure and chemical bonding is essential for comprehending how materials interact and transform in chemical reactions.

SECOND: TECHNICAL ANALYSIS

In this section the science book is also analyzed from a technical point of view through the following axes:

1– The percentage of print area in the pages is 65: 75%

2–Percentage margins

3–Types of fonts for titles and body writing are suitable for students

4– Uses appropriate types of bold fonts

5–Clarity and ease of reading

6–Pictures, drawings, and illustrations are suitable for the lessons

7–Clarity of details in the illustrations

8–Pictures and shapes include explanatory words

9–Pointing to numbers of pictures, figures, and tables in the body writing

10–Clarity of data explaining pictures and drawings

11– Suitability of heading colors

12– The appropriateness of the colors of the writings

13– Use color areas to emphasize some sections of the text

14– The degree of resolution of pictures and colors

3.Methods of Research and the tools used

Questionnaires have been conducted on a sample of students consisting of (20) students. These questionnaires are questions that measure the extent to which the objectives of the chemistry section are achieved. The three–way Likert scale has been relied upon to conduct and analyze these questionnaires

First: - Objective Analysis.

First Semester: - Lesson 1

STUDENTS	EXPLAIN THE CONCEPT OF DENSITY	CONCLUDE THAT MATERIAL OF DENSITY LIGHTER THAN WATER DENSITY FLOATS OVER WATER SURFACE	DETERMINE A LIQUID DENSITY	ILLUSTRATE LIFE APPLICATIONS OF DENSITY	EXPLAIN POINTS OF MELTING AND BOILING	GIVE AN EXAMPLE OF CONDUCTOR AND NON-CONDUCTOR OF ELECTRICITY	GIVE EXAMPLE FOR A CONDUCTOR AND NON-CONDUCTOR OF HEAT	COMPARE SOLIDIFICATION AMONG DIFFERENT MATERIAL	UNDERSTAND MONEY LOSS FROM THE RUSTING PROCESS	EXPLAIN THE METHOD OF METAL PROTECT METAL
1	3	3	3	3	3	3	3	3	3	3
2	3	3	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3	3	3
4	3	2	3	3	2	2	2	2	3	3
5	3	3	3	3	3	3	3	3	3	3
6	3	3	3	3	3	3	3	2	3	3
7	3	2	3	3	2		3	2	3	3
8	3	3	2	3	3	3	3	2	2	3
9	2	3	3	3	3	3	3	3	2	3
10	3	3	3	3	3	3	3	2	3	3
11	2	3	3	3	2	3	3	3	2	3
12	3	3	3	3	3	3	3	3	3	3
13	3	3	3	3	3	3	3	3	2	3
14	3	2	2	2	2	3	3	2	2	2
15	3	3	3	3	3	3	3	3	3	3
16	2	2	3	2	3	3	3	3	3	3
17	2	3	3	2	2	3	3	3	2	3
18	3	3	2	3	3	3	3	3	3	3
19	2	3	2	3	2	3	3	2	2	3
20	3	3	2	3	3	3	3	3	3	3
AVERAGA	$\frac{55}{20} = 2.75$	$\frac{54}{20} = 2.7$	$\frac{55}{20} = 2.75$	$\frac{57}{20} = 2.85$	$\frac{54}{20} = 2.7$	$\frac{59}{20} = 2.9$	$\frac{59}{20} = 2.9$	$\frac{53}{20} = 2.65$	$\frac{53}{20} = 2.65$	$\frac{59}{20} = 2.9$

$$Mean = \frac{27.75}{10} = 2.775$$

First Semester: - Lesson 2

STUDENTS	IDENTIFY THE BUILDING UNIT OF MATTER.	PROVE BY EXPERIMENT THAT MOLECULES OF MATTER ARE IN CONTINUOUS MOTION.	INDICATE BY EXPERIMENT THAT THERE ARE INTERMOLECULAR SPACES BETWEEN MOLECULES.	COMPARE BETWEEN THE THREE STATES OF MATTER ACCORDING TO THE ATTRACTION FORCES AMONG MOLECULES.	EXPLAIN THE RELATION BETWEEN THE TEMPERATURE AND THE ATTRACTION FORCES AMONG MOLECULES	DEFINE THE MEANING OF AN ELEMENT AND A COMPOUND.	GIVE SOME EXAMPLES OF ELEMENTS AND COMPOUNDS AS WELL.	DESIGN PRELIMINARY MODELS FOR ELEMENTS AND COMPOUND MOLECULES.	SHOW THE ECONOMIC BENEFITS OF SOME ELEMENTS.	DESIGN A MODEL OF A MOLECULE OF AN IONIC COMPOUND AND A COVALENT ONE
1	3	3	2	3	2	3	3	3	1	3
2	3	3	2	2	2	3	3	2	1	3
3	3	2	3	3	3	3	3	3	2	3
4	3	2	3	3	3	3	3	2	2	3
5	2	2	2	2	2	3	2	3	2	3
6	2	3	3	2	3	2	3	2	1	3
7	3	2	2	3	3	2	3	2	2	3
8	1	3	3	3	3	1	2	3	1	2
9	3	2	2	2	2	3	3	2	1	2
10	3	3	3	2	3	3	3	3	2	3
11	2	3	3	2	2	3	3	3	1	2
12	3	3	2	3	2	2	2	3	1	3
13	2	3	3	3	3	1	3	3	1	2
14	3	2	2	2	2	3	2	3	1	2
15	2	3	2	2	2	2	2	3	1	3
16	3	3	3	2	2	2	3	2	1	3
17	2	3	2	3	3	3	2	3	1	2
18	2	2	3	3	2	2	2	2	1	3
19	3	3	3	3	3	2	3	3	2	2
20	2	2	3	3	3	3	2	3	1	3
AVERAGA	$\frac{50}{20} = 2.5$	$\frac{52}{20} = 2.25$	$\frac{51}{20} = 2.55$	$\frac{51}{20} = 2.55$	$\frac{50}{20} = 2.30$	$\frac{49}{20} = 2.45$	$\frac{52}{20} = 2.6$	$\frac{53}{20} = 2.65$	$\frac{26}{20} = =1.3$	$\frac{53}{20} = 2.65$

$$\boldsymbol{Mean = \frac{23.8}{10} = 2.38}$$

Second Semester: - Lesson 1

STUDENTS	COMPARE BETWEEN METAL AND NON-METAL	IDENTIFY AN ELEMENT TYPE THROUGH ELECTRONIC CONFIGURATION	COMPARE BETWEEN POSITIVE AND NEGATIVE ION	WRITE THE ELECTRONIC CONFIGURATION TO AN ATOM AND ITS I	EXPLAIN THE MEANING OF IONIC BOND	SHOW THE IONIC BOND FORMATION OF ONE OF COMPOUND OR ELEMENT	EXPLAIN THE MEANING OF COVALENT BONDS AND THEIR TYPES	ILLUSTRATE THE FORMATION OF COVALENT BOND	DESIGN A MODEL OF A MOLECULE OF AN IONIC COMPOUND AND A COVALENT ONE
1	2	3	3	3	3	3	3	3	3
2	2	3	3	3	3	3	3	3	3
3	3	3	3	3	3	3	3	3	3
4	2	2	3	3	3	2	2	2	3
5	2	3	3	3	3	3	3	3	3
6	2	3	3	3	3	3	2	2	3
7	3	2	3	3	3	3	3	2	3
8	3	3	2	3	3	3	3	2	2
9	2	3	3	3	3	3	3	3	2
10	3	3	3	3	3	3	3	2	3
11	2	3	3	3	3	3	2	3	2
12	3	3	3	3	3	3	3	3	3
13	3	3	3	3	3	3	3	3	2
14	2	2	2	2	2	3	2	2	2
15	3	3	3	3	3	3	3	3	3
16	2	2	3	2	3	3	2	3	3
17	2	3	3	2	2	3	3	3	2
18	3	3	3	3	3	3	3	3	3
19	2	3	3	3	2	3	2	2	2
20	3	3	3	3	3	3	3	3	3
AVERAGA	$\frac{47}{20} = 2.35$	$\frac{56}{20} = 2.8$	$\frac{58}{20} = 2.9$	$\frac{57}{20} = 2.85$	$\frac{57}{20} = 2.85$	$\frac{59}{20} = 2.95$	$\frac{54}{20} = 2.7$	$\frac{53}{20} = 2.65$	$\frac{53}{20} = 2.65$

$$\boldsymbol{Mean = \frac{24.7}{9} = 2.74}$$

Second Semester: - Lesson 2

STUDENTS	EXPLAIN THE MEANING OF VALENCIES.	MENTION EXAMPLES TO SOME ELEMENTS HAVING DIFFERENT VALENCIES.	EXPLAIN THE MEANING OF THE ATOMIC GROUP.	WRITE THE CHEMICAL FORMULAE OF THE ATOMIC GROUPS.	WRITE THE CHEMICAL FORMULAE OF SOME COMPOUNDS.	EXPLAIN THE MEANING OF ACIDS AND BASES AS WELL.	EXPLAIN THE MEANING OF SALTS AND OXIDES.	GIVE EXAMPLES OF AN ACID, A BASE, AN OXIDE AND SALTS.	MENTION EXAMPLES OF SALTS WHICH EASILY DISSOLVE IN WATER AND OTHERS THAT DO NOT DISSOLVE IN WATER.	DESIGN A MODEL OF A MOLECULE OF AN IONIC COMPOUND AND A COVALENT ONE
1	3	3	2	3	2	3	3	3	3	3
2	3	3	3	2	3	3	3	2	3	3
3	3	2	3	3	3	3	3	3	3	3
4	3	2	3	3	3	3	3	2	2	3
5	2	2	2	2	2	3	2	3	2	3
6	2	3	3	2	3	2	3	2	3	3
7	3	2	2	3	3	2	3	3	2	3
8	3	3	3	3	3	1	2	3	3	2
9	3	3	2	2	2	3	2	2	3	2
10	3	3	3	3	3	3	3	3	2	3
11	2	3	3	2	2	3	3	3	3	2
12	3	3	2	3	2	2	2	3	3	3
13	3	3	3	3	3	3	3	3	3	2
14	3	3	2	3	1	3	2	3	2	2
15	3	3	2	3	2	2	2	3	3	3
16	3	3	3	2	2	2	3	2	2	3
17	3	3	2	3	3	3	1	3	3	2
18	3	2	3	3	2	2	2	2	3	3
19	3	3	3	3	3	2	3	3	2	2
20	2	2	3	3	3	3	2	3	3	3
AVERAGA	$\frac{56}{20} = 2.8$	$\frac{54}{20} = 2.7$	$\frac{52}{20} = 2.6$	$\frac{54}{20} = 2.7$	$\frac{50}{20} = 2.5$	$\frac{51}{20} = 2.55$	$\frac{50}{20} = 2.5$	$\frac{54}{20} = 2.7$	$\frac{53}{20} = 2.65$	$\frac{51}{20} = 2.55$

$$\boldsymbol{Mean = \frac{26.25}{10} = 2.625}$$

Second Semester: - Lesson 3

STUDENTS	EXPLAIN THE MEANING OF CHEMICAL REACTION	GIVE AN EXAMPLE OF CHEMICAL EQUATION	PROVIDE VIA ABALANCE CHEMICAL EQUATION THE TOTAL MASS OF REACTANTS	IDENTIFY THE TYPES OF CHEMICAL REACTION	EXPLAIN THE MEANING OF DIRECT COMBINATION REACTION	EXPLAIN THE BENEFITS OF CHEMICAL REACTION	SHOW SOME HARMS HARMS OF CHEMICAL REACTION
1	3	3	3	3	3	3	3
2	3	3	3	3	3	2	2
3	3	3	3	3	3	3	3
4	3	2	1	1	3	2	2
5	3	3	3	3	3	3	3
6	3	3	3	3	3	3	3
7	3	2	2	1	3	1	1
8	3	3	2	3	3	2	2
9	3	3	3	3	3	3	3
10	3	3	3	3	3	3	3
11	2	3	1	2	3	2	2
12	3	3	3	3	3	3	3
13	3	3	3	3	3	3	3
14	2	2	2	2	2	2	2
15	3	3	3	3	3	3	3
16	2	2	2	2	3	3	3
17	3	3	3	2	2	2	2
18	3	3	1	3	3	1	1
19	2	3	2	1	2	2	2
20	3	3	3	3	3	3	3
AVERAGA	$\frac{56}{20} = 2.8$	$\frac{54}{20} = 2.7$	$\frac{49}{20} = 2.45$	$\frac{50}{20} = 2.5$	$\frac{54}{20} = 2.7$	$\frac{49}{20} = 2.4$	$\frac{49}{20} = 2.4$

$$\boldsymbol{Mean = \frac{17.95}{7} = 2.56}$$

Second: - Technical Analysis.

STUDENTS	THE PERCENTAGE OF PRINT AREA IS 65.75%	PERCENTAGE MARGINS	TYPES OF FONTS FOR TITLES AND BODY WRITING ARE SUITABLE FOR STUDENTS	USES APPROPRIATE TYPES OF BOLD FONTS	CLARITY AND EASE OF READING
1	2	3	3	3	1
2	2	3	3	3	3
3	2	3	2	1	3
4	2	2	1	2	2
5	3	3	3	3	3
6	3	3	3	3	3
7	2	3	1	2	2
8	3	3	3	3	2
9	3	3	2	3	3
10	2	3	3	2	3
11	2	3	2	3	2
12	2	3	3	1	3
13	3	3	3	3	3
14	2	2	2	2	2
15	3	3	3	3	3
16	2	3	2	3	3
17	3	3	2	2	2
18	3	3	3	3	1
19	2	3	1	3	2
20	3	3	2	3	3
AVERAGA	$\frac{49}{20} = 2.45$	$\frac{58}{20} = 2.9$	$\frac{44}{20} = 2.2$	$\frac{55}{20} = 2.75$	$\frac{50}{20} = 2.5$

$$\boldsymbol{Mean = \frac{12.8}{5} = 2.56}$$

STUDENTS	PICTURES, DRAWINGS AND ILLUSTRATIONS ARE SUITABLE FOR THE LESSON TOPIC	CLARITY OF DETAILS IN THE ILLUSTRATIONS	PICTURES AND SHAPES INCLUDE EXPLANATORY WORDS	POINTING TO NUMBERS OF PICTURES, FIGURES, AND TABLES IN THE BODY WRITING	CLARITY OF DATA EXPLAINING PICTURES AND DRAWINGS
1	2	3	3	3	1
2	3	3	2	3	3
3	3	3	2	1	3
4	2	2	1	2	2
5	3	3	3	1	3
6	3	3	3	3	3
7	2	3	2	2	3
8	3	3	3	3	2
9	3	3	2	3	3
10	2	3	3	2	1
11	2	3	2	3	2
12	2	3	3	1	3
13	3	3	2	1	3
14	3	2	2	2	2
15	1	3	3	3	3
16	3	2	2	1	3
17	3	2	3	2	3
18	3	3	3	3	2
19	2	3	3	3	2
20	3	3	2	3	3
AVERAGA	$\frac{50}{20} = 2.5$	$\frac{56}{20} = 2.8$	$\frac{49}{20} = 2.45$	$\frac{50}{20} = 2.5$	$\frac{51}{20} = 2.5$

$$\boldsymbol{Mean = \frac{12.75}{5} = 2.55}$$

STUDENTS	SUITABILITY OF HEADING COLORS	THE APPROPRIATENESS OF THE COLORS OF THE WRITINGS	USE COLOR AREAS TO EMPHASIZE SOME SECTIONS OF THE TEXT	THE DEGREE OF RESOLUTION OF PICTURES AND COLOURS
1	2	3	2	3
2	3	3	3	3
3	3	3	2	1
4	2	2	2	2
5	3	2	3	1
6	2	3	3	3
7	2	1	3	2
8	3	3	2	3
9	3	3	3	3
10	2	3	2	2
11	2	1	1	3
12	2	3	3	1
13	3	3	3	1
14	1	2	3	2
15	1	3	3	3
16	3	2	3	3
17	3	2	3	2
18	3	3	3	3
19	3	3	2	3
20	3	3	3	3
AVERAGA	$\frac{48}{20} = 2.4$	$\frac{51}{20} = 2.55$	$\frac{47}{20} = 2.35$	$\frac{52}{20} = 2.6$

$$\boldsymbol{Mean = \frac{9.9}{4} = 2.47}$$

4. Results of Research

First: objective analysis

It is clear from the questionnaires that:

The general average for achieving the objectives = 2.56

Second: technical analysis

The general average for the technical part = 2.52

5. Interpretation of Results

According to the three-point Likert scale

The value of the general average for achieving the objectives means that the objectives are achieved to a high degree (85%) and the value of the general average for the technical part means that is satisfied to a high degree (84%).

6. Conclusion

Through the objective and technical analysis, it is evident that the science book for the first year of the preparatory stage requires significant modifications to enhance its effectiveness and keep pace with scientific developments. Our research emphasizes the need for improvements in the science book's

content, educational objectives, technical aspects, and overall suitability for students. It highlights the importance of continuous evaluation and enhancement of educational materials to ensure they meet the evolving needs of students and align with educational goals.

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