

LESSON NOTES

Subject: Basic Science

Year/Level: 9

Week 22

Strand	2: MATTER
Sub Strand	2.3 : REACTIONS
Content Learning Outcome	Investigate how elements and compounds are formed and describe interactions between elements

2.3.1 Elements, Ions and Compounds

Elements

- ❖ pure substance made up of only one type of a particle atom.
- ❖ Example:
 - ✓ element iron is made up of iron atoms which are all alike .
 - ✓ Sulphur is made of sulphur atoms which are all alike.
- ❖ Scientists use symbols to represent elements.
- ❖ Most of the symbols are the first letters of the element's name.

Element	Symbol	Element	Symbol
Carbon	C	Iron	Fe
Oxygen	O	Zinc	Zn
Nitrogen	N	Copper	Cu
Hydrogen	H	Aluminium	Al
Sulphur	S	Sodium	Na
Chlorine	Cl	Calcium	Ca

Ions

- ❖ When an element reacts during a chemical reaction, it can either lose or gain electrons.
- ❖ When it loses or gains an electron, what results or forms is an **ion**.
- ❖ All elements have equal number of protons which are positively charged and electrons which are negatively charged.
- ❖ **Cation:**

- ✓ element loses its electron(s) in a chemical reaction
- ✓ has a positive charge on it.

❖ **Anion:**

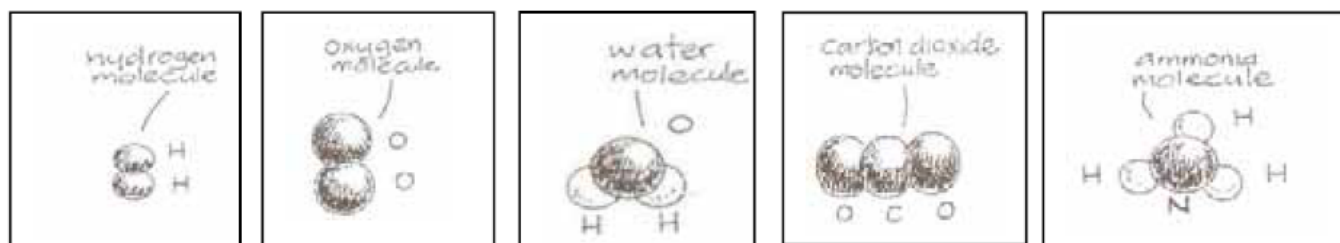
- ✓ element gains electron(s) in a chemical reaction
- ✓ has a negative charge on it.

Most metal elements lose electrons when they react while non-metal elements gain electrons.

Molecules

- ❖ made up of two or more atoms of the same kind or of different kinds chemically combined together.
- ❖ Molecules exist in both elements and compounds.
- ❖ We write an oxygen molecule as O_2 .
- ❖ Hydrogen usually exists as H_2 molecules, nitrogen forms N_2 and ammonia exist as NH_3 .

Models of some molecules



Hydrogen

oxygen

water

carbon dioxide

ammonia

Compounds

- ❖ substances which are made of more than one type of atom joined together.
- ❖ may be made by chemically combining two or more elements.
- ❖ may be decomposed (broken up) by the use of heat, electricity or by the action of other chemicals.
- ❖ represented using a chemical formula.
- ❖ formula of a compound shows the type of atoms present in the compound and how many of each atom.

Acids and Bases

- ❖ very important compounds in everyday life.
- ❖ defined by what they do.
- ❖ referred to as operational definition and specifically based on their properties.
- ❖ Acids can be divided into two groups:

1) mineral acids

ones used commonly in the laboratory and in industries. They are known for their corrosive nature and must be handled with care

2) organic acids.

found in plants or animals.

Properties of Acids

- Most acids are corrosive ('burns' your skin) and react with many materials.
- All acids have a sour taste (e.g. lemons, vinegar). Do not detect acids by tasting them.
- Acids contain hydrogen ions (H^+) when dissolved in water and have pH less than 7.

- Acids turn blue litmus paper to a red colour.
- Aqueous solutions of acids are good electrical conductors.
- Acids react with alkalis to form salt and water.
- Dilute acid reacts with metals to produce hydrogen gas.
- Dilute acid reacts with carbonates to produce carbon dioxide gas.

Common Acids and their Uses

Acid	Formula	Uses
Acetic acid or ethanoic acid	CH_3COOH	Preserving food and for cooking. Found in vinegar and used to be made by the souring of wine
Citric acid Ascorbic acid	$\text{C}_6\text{H}_8\text{O}_7$ $\text{C}_6\text{H}_8\text{O}_6$	Making health food. Found in many fruit and vegetables, particularly citrus and source of vitamin C.
Hydrochloric acid	HCl	Cleaning metallic surfaces before they are coated. Found in the stomach and called spirits of salts. A mixture of hydrochloric and nitric acids is known as "aqua regia" - literally 'royal water' because the mixture is the only substance that will dissolve gold.
Sulphuric acid	H_2SO_4	Function as electrolyte in batteries, electroplating, making plastics and fertilizers.
Nitric acid	HNO_3	Manufacture of nitrogen-based fertilizers and explosives.
Carbonic acid	H_2CO_3	Very weak acid formed when carbon dioxide dissolves in water. When carbon dioxide in the air dissolves in rain, it dissolves in limestone (calcium carbonate)
Phosphoric acid	H_3PO_4	Making fertilizers and inhibiting the rusting of iron.



Test for Hydrogen Gas

Introduce a burning splint into a tube containing the gas.
Hydrogen gas is identified by a 'pop' sound.



Test for Carbon dioxide Gas

Pass some carbon dioxide gas through clear Limewater. Carbon dioxide is identified by the limewater turning 'milky' or by the formation of a white precipitate.

ACTIVITY:

1. Define Element.

2. State the symbol of the following elements:

i. Carbon? _____

ii. Zinc? _____

iii. Copper? _____

iv. Aluminium? _____

...STAY SAFE... 