



## SECOND TERM E-LEARNING NOTE

**SUBJECT: CHEMISTRY**

**CLASS: SS 1**

### SCHEME OF WORK

WEEK	TOPIC
1.	Revision/Introduction to the mole concept: Molar volume of gases, Avogadro's number, Percentage of element in a compound. Writing and Balancing Chemical Equations.
2-3.	Stoichiometry of Reactions: Calculation of Masses of Reactants and Products, Calculation of Volume of Reacting Gases. Empirical and Molecular formulae.
4-5.	Chemical Laws and their Verification: Law of Conservation of Mass, Law of Constant Composition, Law of Multiple Proportion.
6-7.	Chemical Combinations: Electrovalent Bond: Properties of Electrovalent Compounds, Covalent Bond: Properties of Covalent Compounds. Other Types of Bonding
8-9.	The Kinetic theory of Matter and the Gas Laws: Boyle's Law, Charles' Law, Ideal Gas Equation, Dalton's Law of Partial Pressure.
10.	Avogadro's law, Gay-Lussac's Law of Combining Volumes, Graham's Law of Diffusion.

### REFERENCE BOOKS

- New Chemistry for Senior Secondary School by Osei Yaw Ababio; U.T.M.E Past Questions and Answers.
- Practical Chemistry for Senior Secondary Schools by Godwin Ojokuku
- Outline Chemistry for Schools & Colleges by Ojiodu C.C.
- Chemistry Pass Questions for S.S.C.E and UTME.

### WEEK ONE

**DATE-----**

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### TOPIC: INTRODUCTION TO THE MOLE CONCEPT CONTENT

- Relative atomic mass
- Relative molecular mass
- Molar volume of gases
- Percentage of an element in a compound

### THE MOLE

A mole is a number of particles of a substance which may be atoms, ions, molecules or electrons. This number of particles is approximately  $6.02 \times 10^{23}$  in magnitude and is known as Avogadro's number of particles.

The mole is defined as the amount of a substance which contains as many elementary units as there are atoms in 12g of Carbon-12.

### RELATIVE ATOMIC MASS

The relative atomic mass of an element is the number of times the average mass of one atom of that element is heavier than one twelfth the mass of one atom of Carbon-12. It indicates the mass of an atom of an element. For e.g, the relative atomic mass of hydrogen, oxygen, carbon, sodium and calcium are 1, 16, 12, 23, and 40 respectively.



The atomic mass of an element contains the same number of atoms which is  $6.02 \times 10^{23}$  atoms; 1 mole of hydrogen having atomic mass of 2.0g contains  $6.02 \times 10^{23}$  atoms.

### EVALUATION

1. Define relative atomic mass of an element
2. State the relative atomic mass of the following elements: potassium, chlorine, silver, lead, phosphorus and nitrogen

### RELATIVE MOLECULAR MASS

The relative molecular mass of an element or compound is the number of times the average mass of one molecule of it is heavier than one-twelfth the mass of one atom of Carbon-12

It is the sum of the relative atomic masses of all atoms in one molecule of that substance. It is also called the formula mass. The formula mass refers not only to the relative mass of a molecule but also that of an ion or radical.

### CALCULATION

Calculate the relative molecular mass of:

1. Magnesium chloride
  2. Sodium hydroxide
  3. Calcium trioxocarbonate
- [Mg=24, Cl=35.5, Na=23, O=16, H=1, Ca=40, C=12]

#### Solution:

1.  $\text{MgCl}_2 = 24 + 35.5 \times 2 = 24 + 71 = 95 \text{ gmol}^{-1}$
2.  $\text{NaOH} = 23 + 16 + 1 = 40 \text{ gmol}^{-1}$
3.  $\text{CaCO}_3 = 40 + 12 + 16 \times 3 = 100 \text{ gmol}^{-1}$

### EVALUATION

1. What is relative molecular mass of a compound?
2. Calculate the relative molecular mass of (a)  $\text{NaNO}_3$  (b)  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

### MOLAR VOLUME OF GASES

The volume occupied by 1 mole of a gas at standard conditions of temperature and pressure (s.t.p) is  $22.4 \text{ dm}^3$ . Thus 1 mole of oxygen gas of molar mass  $32.0 \text{ gmol}^{-1}$  occupies a volume of  $22.4 \text{ dm}^3$  at s.t.p and 1 mole of helium gas of molar mass  $4.0 \text{ gmol}^{-1}$  occupies a volume of  $22.4 \text{ dm}^3$  at s.t.p.

Note: When the conditions of temperature and pressure are altered, the molar volume will also change. Also, standard temperature = 273K and standard pressure = 760mmHg.

### RELATIONSHIP BETWEEN QUANTITIES

Molar mass =  $\frac{\text{mass (g)}}{\text{Amount (moles)}}$  i.e.  $M = \frac{m}{n} \text{ gmol}^{-1}$

Note: Amount = Number of moles

Molar volume of gas =  $\frac{\text{volume (cm}^3 \text{ or dm}^3\text{)}}{\text{Amount (mole)}}$  i.e.  $V_m = \frac{v}{n} \text{ dm}^3 \text{ mol}^{-1}$

Amount =  $\frac{\text{Reacting mass (g)}}{\text{Molar mass (gmol}^{-1}\text{)}}$

Also, Amount of substance = Number of particles



Avogadro's constant

But, Avogadro's constant =  $6.02 \times 10^{23}$

Combining the two expressions:

Reacting mass = Number of particles

Molar mass       $6.02 \times 10^{23}$

### CALCULATIONS

1. What is the mass of 2.7 mole of aluminium (Al=27)?

**Solution:**

Amount = Reacting mass

Molar mass

Reacting mass = Amount x Molar mass

$$= 2.7 \text{ mole} \times 27 \text{ gmol}^{-1} = 72.9 \text{g.}$$

2. What is the number of oxygen atoms in 32g of the...