WORKSHEET 1

CHAPTER 3 – ATOMS AND MOLECULES

A. Tick (✓) the correct option.

1. The law of conservation of mass was given by
   a. Antoine Lavoisier. b. Joseph Proust. c. John Dalton. d. Amedeo Avogadro.
2. The Latin name of potassium is
   a. Ferrum. b. Wolfram. c. Kalium. d. Natrium.
3. Which of the following is taken as the standard reference for measuring atomic masses?
   a. Carbon-14 b. Oxygen-16 c. Oxygen-18 d. Carbon-12
4. In a molecule of methane, what is the ratio by mass of carbon and hydrogen?
   a. 6 : 1 b. 3 : 1 c. 3 : 2 d. 4 : 1
5. Which of the following is not an ionic compound?
   a. $MgCl_2$ b. KBr c. $CaSO_4$ d. CO_2

B. Fill in the blanks.

1. In a chemical reaction, if the total mass of the reactants is 7.2 g, then, the total mass of the products will be _____ g.
2. A _____ is the smallest particle of an element or a compound that is capable of independent existence.
3. A/An _____ is smaller in size than its parent atom.
4. The chemical formula of zinc phosphate is _____
5. The number of molecules in 16 g of oxygen gas is _____

C. State whether the following statements are true or false.

1. According to Dalton's theory, atoms are divisible particles which cannot be created or destroyed in a chemical reaction.
2. Atomic radius is measured in millimetres.
3. In carbon dioxide, carbon and oxygen are present in the ratio 3 : 8 by mass.
4. Both atomic mass and molecular mass are expressed in atomic mass unit.
5. The value of Avogadro's constant is 6.022×10^{22}.

D. Match the following.

1. Ozone	monoatomic gas
2. Fluorine	molar mass
3. Argon	polyatomic ion

Name: ..... Teacher's signature: .....

Class: IX Date: .....

4. Group of atoms carrying a charge — atomicity of 3
5. Mass of one mole of particles — atomicity of 2

E. Answer the following questions.

Very Short Answer Questions

1. Define atomic mass unit.
2. Write the chemical formula of
   a. Hydrogen bromide.
   b. Potassium sulphate.

Short Answer Questions

1. What is meant by molecular empirical formula? What is the relation between molecular formula and empirical formula?
2. Calculate the formula unit mass of
   a. KCl.
   b. $MgBr_2$.

Long Answer Questions

1. 2.8 g of sodium sulphate reacts with 5.2 g of barium chloride to form barium sulphate and sodium chloride. If the mass of barium sulphate formed is 6.1 g, what will be the mass of sodium chloride formed?
2. What mass of sodium would contain the same number of atoms as there are molecules present in 1.7 g of ammonia?

ANSWERS

WORKSHEET 1

A. Tick (✓) the correct option.

1. a
2. d
3. d
4. b
5. d

B. Fill in the blanks.

1. 7.2
2. molecule
3. cation
4. $Zn_3(PO_4)_2$
5. 3.011×10^{23}

C. State whether the following statements are true or false.

1. F
2. F
3. T
4. T
5. F

D. Match the following.

1. Ozone	atomicity of 3
2. Fluorine	atomicity of 2
3. Argon	monoatomic gas
4. Group of atoms carrying a charge	polyatomic ion
5. Mass of one mole of particles	molar mass

E. Answer the following questions.

Very Short Answer Questions

1. The mass equal to $\frac{1}{12}$th of the mass of a ^{12}C atom is called one atomic mass unit.
2. a. HBr

   b. K_2SO_4

Short Answer Questions

1. Empirical formula of a compound is the formula which gives the simplest whole number ratio between the number of atoms of different elements present in one molecule/formula unit of a compound. The relation between molecular formula and empirical formula is as follows:

   $$\text{Molecular formula} = n \times \text{Empirical formula}$$

   where n is an integer.

3. a. KCl

   The atomic mass of potassium is 39 u while that of chlorine is 35.5 u. So,

   $$\text{Formula unit mass of KCl} = \text{Atomic mass of potassium} + \text{Atomic mass of chlorine}$$
   $$= 39 \text{ u} + 35.5 \text{ u}$$
   $$= 74.5 \text{ u}$$

   b. $MgBr_2$

   The atomic mass of magnesium is 24 u while that of bromine is 80 u. So,

   $$\text{Formula unit mass of } MgBr_2 = \text{Atomic mass of magnesium} + 2 \times \text{Atomic mass of bromine}$$
   $$= 24 \text{ u} + (2 \times 80) \text{ u} = 184 \text{ u}$$

Long Answer Questions

1. The reaction between sodium sulphate and barium chloride is given by the following equation

$$Na_2SO_4 + BaCl_2 \rightarrow BaSO_4 + 2NaCl$$

As per the data in the question, 2.8 g of sodium sulphate reacts with 5.2 g of barium chloride to form barium sulphate and sodium chloride. According to the law of conservation of mass,

Total mass of reactants = Total mass of products

So,

Mass of sodium sulphate + Mass of barium chloride = Mass of barium sulphate + Mass of sodium chloride

2.8 g + 5.2 g = 6.1 g + Mass of sodium chloride

Mass of sodium chloride formed = 1.9 g

2. First, we will calculate the number of molecules present in 1.7 g of ammonia. The molar mass of ammonia is 17 g. So,

Number of molecules present in 17 g of ammonia = 6.022×10^{23}

$$\text{Number of molecules present in 1 g of ammonia} = \frac{6.022 \times 10^{23}}{17}$$

$$\text{Number of molecules present in 1.7 g of ammonia} = \frac{6.022 \times 10^{23}}{17} \times 1.7 = 6.022 \times 10^{22}$$

So, there are 6.022×10^{22} molecules present in 1.7 g of ammonia. Now, we will calculate that mass of sodium which contains 6.022×10^{22} atoms. The molar mass of sodium is 23 g. This means that the mass of 6.022×10^{23} atoms of sodium is 23 g. Thus,

Mass of 6.022×10^{23} atoms of sodium = 23 g

$$\text{Mass of 1 atom of sodium} = \frac{23}{6.022 \times 10^{23}} \text{ g}$$

$$\text{Mass of } 6.022 \times 10^{22} \text{ atoms of sodium} = 23 \times \frac{6.022 \times 10^{22}}{6.022 \times 10^{23}} \text{ g}$$

$$= 2.3 \text{ g}$$

Hence, 2.3 g of sodium will contain the same number of atoms as are molecules present in 1.7 g of ammonia.