## Short Answer Type Questions – II

## [3 marks]

**Q. 1. Write the cations and anions present (if any) in the following compounds:**
**(a) $CH_3COONa$ (b) NaCl**
**(c) $H_2$ (d) $NH_4NO_3$**

**Ans. Anions Cations**

**(a)** $CH_3COO^-$ $Na^+$

**(b)** $Cl^-$ $Na^+$

**(c)** $H_2$ - It is a covalent compound

**(d)** $NO_3^-$ $NH_4^+$

**Q. 2. Calculate the mass percentage of oxygen present in the following compounds and state the law of chemical combination associated. Given, H = 1, O = 16.**

**(i) Water ($H_2O$) and (ii) Hydrogen peroxide ($H_2O_2$)**

**Ans.** According to Law of multiple proportions

(i) $H_2O$, % of O = x $\frac{16}{18}$ 100 = **88.89%**

(ii) $H_20_2$, % of O = $\frac{32}{34}$ x 100 = **94.12%**

**Q.3. Classify each of the following on the basis of their atomicity.**
**(a) $F_2$ (b) $NO_2$ (c) $CO_3^{2-}$ (d) $C_2H_6$**
**(e) CO (f) $H_2O_2$ (g) $P_4O_{10}$ (h) $O_3$**
**(i) HCl (j) $CH_4$ (k) He (l) Ag**

**Ans.** (a) 2 (b) 3 (c) 4 (d) 8
(e) 2 (f) 4 (g) 14 (h) 3
(i) 2 (j) 5

(k) 1 (Noble gases do not combine and exist as monoatomic gases)

(l) **Polyatomic:** It is difficult to talk about the atomicity of metals as any measurable quantity will contain millions of atoms bound by metallic bond.

**Q.4. Calculate the molecular mass of the following:**
**(a) $H_2CO_3$ (b) $C_2H_5OH$ (c) $MgSO_4$**

**Ans.** (a) Molecular mass of $H_2CO_3$ = 2 x 1 + 1 x 12 + 3 x 16

= 2 + 12 + 48

**= 62 u**

(b) Molecular mass of $C_2H_5OH$ = 2 x 12 + 5 x 1 + 1 x 16 + 1

= 24 + 5 + 16 + 1

**= 46 u**

(c) Molecular mass of MgSO4 = 1 x 24 + 1 x 32 + 4 x 16

= 24 + 32 + 64

**= 120 u**

**Q.5. What are ionic and molecular compounds? Give examples.**

**Ans.** Atoms of different elements join together in definite proportions to form molecules of compounds. For example, water, ammonia, carbon dioxide. Compounds composed of metals and non-metals contain charged species. The charged species are known as ions. An ion is a charged particle and can be negatively or positively charged. A negatively charged ion is called an anion and the positively charged ion is called cation. For example, sodium chloride, calcium oxide.

**Q.6. Give three significance of mole.**

**Ans.** (a) One mole represents $6.022 \times 10^{23}$ entities of a substance.
(b) One mole of an element contains $6.022 \times 10^{23}$ atoms of the element.
(c) One mole of a substance represents one gram formula mass of the substance.

**Q.7. How many (a) molecules (b) hydrogen atoms (c) oxygen atoms are there in 0.5 mol of water?**

**Ans.** (a) 1 mol of water contains $6.022 \times 10^{23}$ molecules

$\therefore$ 0.5 mol of water contains $\frac{6.022 \times 10^{23}}{2}$ molecules

**= 3.011 x $10^{23}$ molecules**

(b) 1 molecule of water contains 2 atoms of hydrogen

1 mol of water contains $2 \times 6.022 \times 10^{23}$ atoms of hydrogen

$\therefore$ 0.5 mol of water contains $\frac{2 \times 6.022 \times 10^{23}}{2}$ atoms of hydrogen

**= $6.022 \times 10^{23}$ atoms of hydrogen**

(c) 1 molecule of water contains 1 atom of oxygen

1 mol of water contains $6.022 \times 10^{23}$ atoms of oxygen

$\therefore$ 0.5 mol of water contains $\frac{6.022 \times 10^{23}}{2}$ atoms of oxygen

**Q.8. Calculate the number of moles present in:**
**(i) 3.011 x $10^{23}$ number of oxygen atoms.**

**(ii) 60 g of calcium**
**[Given that atomic mass of Ca = 40 u, Avogadro No. = $6.022 \times 10^{23}$]**

**Ans.** (i) 1 mole of oxygen contains 6.022 x $10^{23}$ atoms

∴ 6.022 x $10^{23}$ atoms of oxygen = 1 mol

1 atom of oxygen = $\frac{1}{6.022 \times 10^{23}}$ mol

∴ 3.01 1 x $10^{23}$ atoms of oxygen = $\frac{1 \times 3.011 \times 10^{23}}{6.022 \times 10^{23}}$ mol

**= 0.5 mol**

(ii) Atomic mass of Ca = 40 u

40g of calcium = 1 mol

60g of calcium = $\frac{60}{40}$ mol = **1.5 mol**

**Q.9. Calculate the mass per cent of each element of sodium chloride in one mole of it.**

**Ans.** Molecular mass of NaCl = (1 x 23 + 1 x 35.5) u = 58.5 u

Atomic mass of sodium = 23 u

Mass per cent of Na = $\frac{\text{Atomic mass of Na}}{\text{Molecular mass of NaCl}}$ x 100

= $\frac{23}{58.5}$ X 100 = **39.32%**

Mass % of Na = 39.32 %

Atomic mass of chlorine = 35.5 u

Mass % of Cl = $\frac{\text{Atomic mass of Cl}}{\text{Molecular mass of NaCl}}$ x 100

= $\frac{35.5}{58.5}$ x 100 = **60.68 %**

**Q. 10. Calculate the number of particles in each of the following:**
**(a) 46 g of Na atom**
**(b) 8 g of $O_2$ molecules**
**(c) 0.1 moles of carbon atom**

**Ans.** (a) No. of moles of sodium = $\frac{46}{23}$ = 2 moles

We know that one mole of sodium contains 6.022 x $10^{23}$ atoms.

∴ 2 moles of sodium contain = 2 x 6.022 x $10^{23}$ atoms

**= 1.204 x $10^{24}$ atoms**

(b) 1 mole of oxygen = 32 g

32 g of $O_2$ contains 6.022 x $10^{23}$ molecules

∴ 8 g of $O_2$ contains = $\frac{6.022 \times 10^{23}}{32}$ x 8 molecules

**= 1.51 x $10^{23}$ molecules**

(c) 1 mole of carbon atoms contains 6.022 × 1023 atoms

∴ 0.1 mole of carbon atoms contains = 6.022 x 1023 x 0.1 atoms

**= 6.022 x $10^{22}$ atoms**

**Q. 11. Raunak took 5 moles of carbon atoms in a container and Krish also took 5 moles of sodium atoms in another container of same weight.**
**(a) Whose container is heavier?**
**(b) Whose container has more number of atoms?**

**Ans.** (a) Mass of sodium atoms carried by Krish = (5 x 23) g = 115 g

Mass of carbon atoms carried by Raunak = (5 × 12) g = 60 g

Thus, Krish's container is heavier.

(b) Both the bags have same number of atoms as they have same number of moles of atoms.