## QUESTIONS FROM NCERT TEXTBOOK

Question 1. A 0.24 g sample of compound of oxygen and boron was found by analysis to contain 0.096 g of boron and 0.144 g of oxygen. Calculate the percentage composition of the compound by weight.
Answer: Boron and oxygen compound → Boron + Oxygen
0.24 g → 0.096 g + 0.144 g

**Percentage composition of the compound**

**For boron:**

$$0.24\ g \rightarrow 0.096\ g$$
$$100\ g \rightarrow ?$$
$$\frac{100 \times 0.096}{0.24} = 40\%$$

**For oxygen:**

$$0.24\ g \rightarrow 0.144\ g \text{ of oxygen}$$
$$100\ g \rightarrow ?$$
$$\frac{100 \times 0.144}{0.24} = 60\%$$

Question 2. When 3.0 g of carbon is burnt in 8.00 g oxygen, 11.00 g of carbon dioxide is produced. What mass of carbon dioxide will be formed when 3.00 g of carbon is burnt in 50.00 g of oxygen? Which law of chemical combination will govern your answer?
Answer: The reaction of burning of carbon in oxygen may be written as:

$$\underset{\text{1 mole carbon, 12 g}}{C} + \underset{\text{Oxygen 1 mole, 32 g}}{O_2} \longrightarrow \underset{\text{carbon dioxide, 44 g}}{CO_2}$$

It shows that 12 g of carbon bums in 32 g oxygen to form 44 g of carbon dioxide. Therefore 3 g of carbon reacts with 8 g of oxygen to form 11 g of carbon dioxide. It is given that 3.0 g of carbon is burnt with 8 g of oxygen to produce 11.0 g of $CO_2$. Consequently 11.0 g of carbon dioxide will be formed when 3.0 g of C is burnt in 50 g of oxygen consuming 8 g of oxygen, leaving behind 50 - 8 = 42 g of $O_2$. The answer governs the law of constant proportion.

Question 3. What are poly atomic ions? Give examples.
Answer: The ions which contain more than one atoms (same kind or may be of different kind) and behave as a single unit are called polyatomic ions e.g., $OH^-$, $SO_4^{2-}$, $CO_3^{2-}$.

Question 4. Write the chemical formulae of the following:

(a) Magnesium chloride
(b) Calcium oxide
(c) Copper nitrate
(d) Aluminium chloride
(e) Calcium carbonate.
Answer: (a) Magnesium chloride
Symbol → Mg Cl
Change → +2 -1
Formula → $MgCl_2$
(b) Calcium oxide
Symbol → Ca O
Charge → +2 -2
Formula → CaO
(c) Copper nitrate
Symbol → Cu NO
Change → +2 -1
Formula → $Cu(NO_3)_2$
(d) Aluminium chloride
Symbol → Al Cl
Change → +3 -1
Formula → $AlCl_3$
(d) Calcium carbonate
Symbol → Ca $CO_3$
Change → +2 -2
Formula → $CaCO_3$

Question 5. Give the names of the elements present in the following compounds:
(a) Quick lime
(b) Hydrogen bromide
(c) Baking powder
(d) Potassium sulphate.
Answer: (a) Quick lime → Calcium oxide
Elements → Calcium and oxygen
(b) Hydrogen bromide
Elements → Hydrogen and bromine
(c) Baking powder → Sodium hydrogen carbonate
Elements → Sodium, hydrogen, carbon and oxygen
(d) Potassium sulphate
Elements → Potassium, sulphur and oxygen

Question 6. Calculate the molar mass of the following substances.
(a) Ethyne, $C_2H_2$
(b) Sulphur molecule, $S_8$
(c) Phosphorus molecule, $P_4$ (Atomic mass of phosphorus = 31)
(d) Hydrochloric acid, HCl
(e) Nitric acid, $HNO_3$
Answer: The molar mass of the following: [Unit is 'g']
(a) Ethyne, $C_2H_2$ = 2 x 12 + 2 x 1 = 24 + 2 = 26 g
(b) Sulphur molecule, $S_8$ = 8 x 32 = 256 g
(c) Phosphorus molecule, $P_4$=4 x 31 = i24g
(d) Hydrochloric acid, HCl = 1 x 1 + 1 x 35.5 = 1 + 35.5 = 36.5 g
(e) Nitric acid, $HNO_3$ = 1 x 1 + 1 x 14 + 3 x 16 = 1 + 14 + 48 = 63 g

Question 7. What is the mass of
(a) 1 mole of nitrogen atoms?
(b) 4 moles of aluminium atoms (Atomic mass of aluminium = 27)?
(c) 10 moles of sodium sulphite ($Na_2SO_3$)?
Answer:
(a) Mass of 1 mole of nitrogen atoms = 14 g
(b) 4 moles of aluminium atoms
Mass of 1 mole of aluminium atoms = 27 g
∴ Mass of 4 moles of aluminium atoms = 27 x 4 = 108 g

(c) 10 moles of sodium sulphite ($Na_2SO_3$)
Mass of 1 mole of $Na_2SO_3$ = 2 x 23 + 32 + 3 x 16 = 46 + 32 + 48 = 126 g
∴ Mass of 10 moles of $Na_2SO_3$ = 126 x 10 = 1260 g

Question 8. Convert into mole.
(a) 12 g of oxygen gas
(b) 20 g of water
(c) 22 g of Carbon dioxide.
Answer:
(a) Given mass of oxygen gas = 12 g
Molar mass of oxygen gas ($O_2$) = 32 g
Mole of oxygen gas 12/32 = 0.375 mole
(b) Given mass of water = 20 g
Molar mass of water ($H_2O$) = (2 x 1) + 16 = 18 g
Mole of water = 20/18 = 1.12 mole
(c) Given mass of Carbon dioxide = 22 g
Molar mass of carbon dioxide ($CO_2$) = (1 x 12) + (2 x 16)
= 12 + 32 = 44 g
∴ Mole of carbon dioxide = 22/44 = 0.5 mole

Question 9. What is the mass of:
(a) 0.2 mole of oxygen atoms?
(b) 0.5 mole of water molecules?
Answer:
(a) Mole of Oxygen atoms = 0.2 mole
Molar mass of oxygen atoms = 16 g
Mass of oxygen atoms = 16 x 0.2 = 3.2 g
(b) Mole of water molecule = 0.5 mole
Molar mass of water molecules = 2 x 1 + 16= 18 g .
Mass of $H_2O$ = 18 x 0.5 = 9 g

Question 10. Calculate the number of molecules of sulphur ($S_8$) present in 16 g of solid sulphur.
Answer: Molar mass of $S_8$ sulphur = 256 g = $6.022 \times 10^{23}$ molecule
Given mass of sulphur = 16 g

$$\text{Molecules of sulphur} = \frac{16 \times 6.022 \times 10^{23}}{256} = \frac{96.35 \times 10^{23}}{256}$$
$$= 0.376 \times 10^{23}$$
$$= 3.76 \times 10^{22} \text{ molecules}$$

Question 11. Calculate the number of aluminium ions present in 0.051 g of aluminium oxide. (Hint: The mass of an ion is the same as that of an atom of the same element. Atomic mass of Al = 27 u)
Answer: Molar mass of aluminium oxide $Al_2O_3$
= (2 x 27) + (3 x 16)
= 54 + 48 = 102 g.

$$\therefore \quad 102 \text{ g of } Al_2O_3 \text{ contains} = 2 \times 6.022 \times 10^{23} \text{ aluminium ions}$$

$$\therefore \quad 0.051 \text{ g of } Al_2O_3 \text{ contains} = \frac{2 \times 6.022 \times 10^{23}}{102} \times 0.051$$
$$= \frac{12.044 \times 10^{23} \times 0.051}{102} = \frac{0.614 \times 10^{23}}{102}$$
$$= 0.006022 \times 10^{23}$$
$$= 6.022 \times 10^{20} \ Al^{3+} \text{ ions}$$

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