Q.1 In a reaction 5.3 g of sodium carbonate reacted with 6g of ethanoic acid. The products were 2.2 g of carbon dioxide, 0.9 g water and 8.2 g of sodium ethanoate. Show that these observations are in agreement with the law of conservation of mass carbonate.

Ans: The law of conservation of mass states that mass is neither created nor destroyed in a chemical reaction. This means the total mass of the reactants must equal the total mass of the products.

Step 1: Total mass of reactants
= Mass of sodium carbonate + Mass of ethanoic acid
= 5.3 g + 6.0 g
= 11.3 g

Step 2: Total mass of products
= Mass of carbon dioxide + Mass of water + Mass of sodium ethanoate
= 2.2 g + 0.9 g + 8.2 g
= 11.3 g

Conclusion:
Since the total mass of the reactants (11.3 g) is equal to the total mass of the products (11.3 g), the observations are in agreement with the law of conservation of mass.

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Q.1 In a reaction 5.3 g of sodium carbonate reacted with 6 g of ethanoic acid. The products were 2.2 g of carbon dioxide, 0.9 g water and 8.2 g of sodium ethanoate. Show that these observations are in agreement with the law of conservation of mass carbonate.

Ans:

Sodium carbonate	+	Ethanoic acid	→	Sodium ethanoate	+	Carbon dioxide	+	Water
5.3 g	+	6 g	→	8.2 g	+	2.2 g	+	0.9 g

LHS RHS
∴ 11.3 g = 11.3 g
(Mass of reactant) (Mass of product)
This shows that during a chemical reaction mass of reactant = mass of product.

Q.2 Hydrogen and oxygen combine in the ratio of 1 : 8 by mass to form water. What mass of oxygen gas would be required to react completely with 3 g of hydrogen gas?

Ans: Ratio of H: O by mass in water is:
Hydrogen : Oxygen —> H_2O
∴ 1 : 8 = 3 : x
x = 8 x 3
x = 24 g

Q.3 Which postulate of Dalton's atomic theory is the result of the law of conservation of mass?

Ans: The postulate of Dalton's atomic theory that is the result of the law of conservation of mass is—the relative number and kinds of atoms are constant in a given compound. Atoms cannot be created nor destroyed in a chemical reaction.

Q.4 Which postulate of Dalton's atomic theory can explain the law of definite proportions?

Ans: The relative number and kinds of atoms are constant in a given compound.

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Q.1 Define the atomic mass unit.

Ans: One atomic mass unit is equal to exactly one-twelfth (1/12th) the mass of one atom of carbon-12. The relative atomic masses of all elements have been found with respect to an atom of carbon-12.

Q.2 Why is it not possible to see an atom with naked eyes?

Ans: Atom is too small to be seen with naked eyes. It is measured in nanometres.
1 m = 109 nm

NCERT Textbook Questions – Page 39

Q.1 Write down the formulae of

(i) Sodium oxide (ii) Aluminium chloride

(iii) Sodium sulphide (iv) Magnesium hydroxide

Ans: The formulae are

(i) Formula of Sodium Oxide

Symbol → Na O

Charge → +1 –2

Formula → Na_2O

(ii) Formula of aluminium chloride

Symbol → Al Cl

Charge → +3 – 1

Formula → $AlCl_3$

(iii) Formula of Sodium Oxide

Symbol → Na S

Charge → +1 –2

Formula → Na_2S

(iv) Formula of magnesium hydroxide

Symbol → Mg OH

Charge → +2 1

Formula → $Mg(OH)_2$

Q.2 What is meant by the term chemical formula?

Ans: The chemical formula of the compound is a symbolic representation of its composition, e.g., chemical formula of sodium chloride is NaCl.

Q.3 How many atoms are present in a

i) H_2S molecule ii) $P0_4^{3-}$ ion?

Ans: i) H_2S —> 3 atoms are present ii) $P0_4^{3-}$ —> 5 atoms are present

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Q.1 Calculate the formula unit masses of ZnO, Na_2O, K_2C0_3, given atomic masses of Zn = 65 u, Na = 23 u, K = 39 u, C = 12 u, and O = 16 u.

Ans: The formula unit mass of

i) ZnO = 65 u + 16 u = 81 u

ii) Na_2O = (23 u x 2) + 16 u = 46 u + 16 u = 62 u

iii) K_2C0_3 = (39 u x 2) + 12 u + 16 u x 3

= 78 u + 12 u + 48 u = 138 u

Q.2 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.

Ans: Given:

* Total mass of compound = 0.24 g
* Mass of boron = 0.096 g
* Mass of oxygen = 0.144 g

Percentage of boron = (0.096 / 0.24) × 100 = 40%

Percentage of oxygen = (0.144 / 0.24) × 100 = 60%

Q.3 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?

Ans: The reaction of burning of carbon in oxygen may be written as:

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

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.

Q.4 What are poly atomic ions? Give examples.

Ans: 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-}.

Q.5 Write the chemical formulae of the following:

a) Magnesium chloride b) Calcium oxide c) Copper nitrate

d) Aluminium chloride e) Calcium carbonate.

Ans: 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 -4 $CU(N0_3)_2$

d) Aluminium chloride

Symbol —> Al Cl

Change —> +3 -1

Formula —> $AlCl_3$

e) Calcium carbonate

Symbol —> Ca CO_3

Change —> +2 -2

Formula —> $CaC0_3$

Q.6 Give the names of the elements present in the following compounds:

a) Quick lime b) Hydrogen bromide c) Baking powder d) Potassium sulphate.

Ans: 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

Q.7 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

Ans**:** 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, $HN0_3$ = 1 x 1 + 1 x 14 + 3 x 16 = 1 + 14 + 48 = 63 g