Class 9 CBSE Test paper Solved Chapter 3: Atoms and Molecules-4

NCERT Solution, MCQs, *Study Notes*, Q & A

Q1: Name the international organization who approves names of elements.

Ans : IUPAC (International Union of Pure and Applied Chemistry)

Q2: How do we know the presence of atoms if they do not exist independently for most of the elements?

Answer: Atom join in different way to form matter(neutral molecules or ion) that we are able to touch, feel and see.

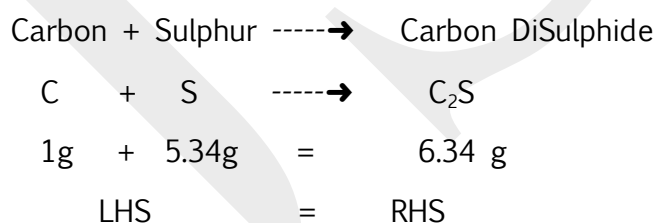**Q3: Give an example to show Law of conservation of mass applies to physical change also.**

Ans: When ice melts into water, is a physical change. Take a piece of ice in small flask, cork it and weight it (say W_{ice} gm). Heat the flask gently and ice (solid) slowly melts into water (liquid). Weigh the flask again (W_{water} gm). It is found there is no change in the weight i.e. $W_{ice} = W_{water}$.

$$Ice \xrightarrow{Heat} Water$$

This shows law of conservation of mass holds true for physical changes.

Q4: Explain with example that law of conservation of mass is valid for chemical reactions.

Ans: According to this law, total mass of the products (chemicals produced) is equal to the total mass of the reactants (chemicals take part in reaction). e.g. Carbon combines with Sulphur to form Carbon disulphide. The mass of reactants i.e. carbon and sulphur is same mass of products (carbon disulphide).

$$Carbon + Sulphur \longrightarrow Carbon\ DiSulphide$$
$$C \quad + \quad S \quad \longrightarrow \quad C_2S$$
$$1g \quad + \quad 5.34g \quad = \quad 6.34\ g$$
$$LHS \quad\quad\quad = \quad RHS$$

Q5: Is there any exception to law of conservation of mass?

Ans: Later after atoms were discovered, it was found during nuclear reactions this law does not hold good. In a nuclear reaction, some of the mass gets converted into energy, as given by famous Einstein's mass-energy relationship ($E = mC^2$). The law was rechristened as Law of conservation of mass and energy.

Q6.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.

sodium carbonate + ethanoic acid → sodium ethanoate + carbon dioxide + water

Ans: Mass of sodium carbonate (Na_2CO_3) = 5.3 g Mass of ethanoic acid (CH_3COOH) = 6g

Mass of carbon dioxide (CO_2) = 2.2g Mass of Water (H_2O) = 0.9 g

Mass of sodium ethanoate (CH_3COONa) = 8.2 g

Total mass of reactants = 5.3g + 6g = 11.3g

Total mass of products = 2.2g + 0.9 g + 8.2g = 11.3g

Since, Total mass of reactants = Total mass of products, the observations in this reaction are in agreement with the law of conservation of mass.

Q7 If 12 g of carbon is burnt in the presence of 32 g of oxygen, how much carbon dioxide will be formed?

Ans: Given, the reaction is carbon + oxygen → carbon dioxide

Mass of carbon = 12g   Mass of oxygen = 32g

Mass of carbon dioxide (CO_2) = xg

Since the reaction is in agreement with law of conservation of mass, then

Total mass of reactants = Total mass of products

i.e. 12g + 32g = x   i.e. x = 44g

∴ mass of carbon dioxide (CO_2) formed = 44g

Q.8. 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, mass of boron = 0.096 g   mass of the oxygen = 0.144g

mass of the sample compound (boron+oxygen) = 0.24 g

According to Law of definite proportions, boron and oxygen are in fixed ratio in the given compound.= 0.096 : 0.0144   = 2:3

% of boron = mass of boron × 100 / mass of compound = 0.096 × 100/0.24 = 40%and % of oxygen = mass oxygen × 100 / mass of compound = 0.144 × 100/0.24 = 60%

Q.9. 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 given reaction is

Carbon + Oxygen ➔ Carbon Dioxide

3g   + 8g   =   11g

⇒ Total mass of reactants = Total mass of products

∴ Law of conservation of mass is obeyed.

It also shows that carbon dioxide (CO_2) contains carbon and oxygen in fixed ratio i.e. 3:8 which follows Law of Constant proportion.

⇒ 3g of carbon (C) will react with 8g of oxygen (O) to give 11g of carbon dioxide (CO_2).

⇒ Remaining oxygen (50 -8 = 42g) will not participate in the reaction.

Q10 : Magnesium and oxygen combine in the ratio of 3 : 2 by mass to form magnesium oxide. How much oxygen is required to react completely with 12 g of magnesium?

Answer: Magnesium (Mg) and Oxygen (O) combine in the ratio = 3:2 to form compound magnesium oxide (MgO). It follows Law of Constant proportions.

⇒ 3g of Mg combines with = 2g of O.

∴ 12g of Mg combines with = 2 x 12/3 = 8g of O.

Q.11.Why are Dalton's symbol not used in chemistry?

Answer: Dalton was the first scientist to use the symbol for the name of the elements a specific sense but it was difficult to memorize and in uses so Dalton's symbol are not used inchemistry

Q.12. If 1 mole of Sodium atoms weighs 23 grams, what is the mass (in grams) of 1 atom of Sodium?

 Answer: 1 mole of Sodium atoms weigh 23 grams

⇒ 6.22×10^{23} atom of Sodium atoms weigh 23 grams

⇒ the mass (in grams) of 1 atom of Sodium = $\frac{23}{6.22 \times 10^{23}}$ = 3.69×10^{-23} gm

Q.13. 1.375 g of cupric oxide was reduced by heating in current of hydrogen and the weight of copper that remained was 1.098 g. In another experiment, 1.179 g of copper was dissolved in the nitric acid and the resulting copper nitrate converted into cupric oxide by ignition. The weight of cupric oxide formed was 1.476 g. Show that these results illustrate the law of constant proportions.

Solution:

In First experiment

Oxygen present: (1.375 - 1.098) = 0.277g

% of oxygen in CuO = $\frac{0.277 \times 100}{1.375}$ = 20.14

In another experiment

Oxygen present: (1.476 - 1.179) = 0.297g

% of oxygen in CuO = $\frac{0.297 \times 100}{1.179}$ = 20.12

% of oxygen is same in both experiment So, these results illustrate the law of constant proportions.

Q.14. 10.0 g CaCO3 on heating gave 4.4 g of CO_2 and 5.6 g of CaO. Show that these observations are in agreement with law of conservation of mass.

Solution : Mass of reactants: 10gm Mass of product = 4.4 + 5.6 = 10g

Since Mass of reactants is equal to Mass of products , therefore these observations are in agreement with law of conservation of mass.

Q.15.Carbon and oxygen are known to form two compounds. The carbon component in one of these is 42.9% while in other is 27.3%. Show that these data is the law of constant proportion.

Solution:

In compound I = carbon = 42.9%   then oxygen = 57.1%

In compound I = carbon = 27.3%   then oxygen = 72.7%

For a fix mass of carbon is 1

The ration of oxygen in these compounds would be = $\frac{57.1}{42.9} : \frac{27.3}{72.7}$ = 1.33 : 2.66 = 1 : 2

Since it is a simple whole ratio, it illustrate the law of constant proportion the law of constant proportion

Q.16. Which has more number number of atoms, 100 grams of sodium or 100 grams of iron given, atomic mass of Na = 23u, Fe = 56 u?

Solution: n = 6.22x10²³ atoms

23 gm of Na has n atoms $\Rightarrow$ 100 gm of Na has n atoms = $\frac{100 \times n}{23}$ = 4.35n

56 gm of Fe has n atoms $\Rightarrow$ 100 gm of Na has n atoms = $\frac{100 \times n}{56}$ = 1.76n

So, 100 gm of Na has more number number of atoms

Q.17. A compound is found to contain 47.25% copper and 52.75% chlorine. Find the empirical formula for this compound.

element	Cu	Cl
mass in grams	47.25	52.75
r.a.m	63.6	35.5
moles = mass ÷ r.a.m	47.25 ÷ 63.6 = 0.74	52.75 ÷ 35.5 = 1.49
divide throughout by lowest number	0.74 ÷ 0.74 = 1	1.49 ÷ 0.74 = 2.01 = 2

Empirical formula for this compound is $CuCl_2$