

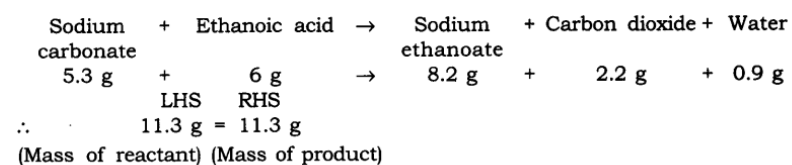


## IN-TEXT QUESTIONS SOLVED

NCERT Textbook Page 32

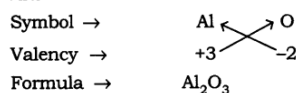
Question 1. In a reaction 5.3 g of sodium carbonate reacted with 6 g of ethanoic acid. The products were 2.2 g of carbon dioxide, 0.9 g water and 8.2 g of sodium ethanoate. Show that these observations are in agreement with the law of conservation of mass carbonate.

Answer.



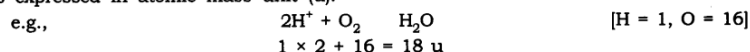
This shows that during a chemical reaction mass of reactant = mass of product.

(b) Aluminium oxide



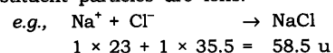
### • Molecular Mass

It is the sum of the atomic masses of all the atoms in a molecule of the substance. It is expressed in atomic mass unit (u).



### • Formula Unit Mass

It is the sum of the atomic masses of all atoms in a formula unit of a compound. The constituent particles are ions.

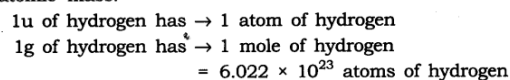


### • Mole Concept

**Definition of mole:** It is defined as one mole of any species (atoms, molecules, ions or particles) is that quantity in number having a mass equal to its atomic or molecular mass in grams.

$$1 \text{ mole} = 6.022 \times 10^{23} \text{ in number}$$

**Molar mass** = mass of 1 mole → is always expressed in grams, and is also known as gram atomic mass.

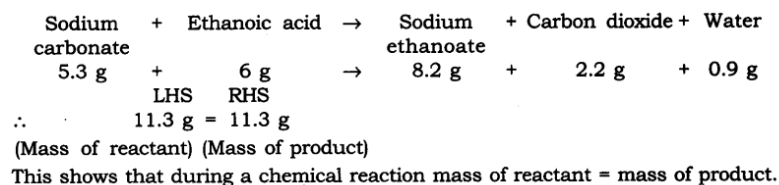


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NCERT Textbook Page 32

Question 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 etkanoate. Show that these observations are in agreement with the law of conservation of mass carbonate.

Answer:



Question 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?

Answer:

Ratio of H : O by mass in water is:

Hydrogen : Oxygen  $\rightarrow \text{H}_2\text{O}$

$$\therefore 1 : 8 = 3 : x$$

$$x = 8 \times 3$$

$$x = 24 \text{ g}$$

$\therefore$  24 g of oxygen gas would be required to react completely with 3 g of hydrogen gas.

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

Answer: 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.

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

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

NCERT Textbook Page 35

Question 1. Define the atomic mass unit.

Answer: 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.

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

Answer: Atom is too small to be seen with naked eyes. It is measured in nanometres.

$$1 \text{ m} = 10^9 \text{ nm}$$

NCERT Textbook Page 39

Question 1. Write down the formulae of

(i) Sodium oxide

(ii) Aluminium chloride

(iii) Sodium sulphide

(iv) Magnesium hydroxide

Answer: The formulae are

(i) **Formula of Sodium Oxide**

Symbol  $\rightarrow \text{Na} \quad \text{O}$

Charge  $\rightarrow +1 \quad -2$

Formula  $\rightarrow \text{Na}_2\text{O}$

(iii) **Formula of Sodium Sulphide**

Symbol  $\rightarrow \text{Na} \quad \text{S}$

Charge  $\rightarrow +1 \quad -2$

Formula  $\rightarrow \text{Na}_2\text{S}$

(ii) **Formula of aluminium chloride**

Symbol  $\rightarrow \text{Al} \quad \text{Cl}$

Charge  $\rightarrow +3 \quad -1$

Formula  $\rightarrow \text{AlCl}_3$

(iv) **Formula of magnesium hydroxide**

Symbol  $\rightarrow \text{Mg} \quad \text{OH}$

Charge  $\rightarrow +2 \quad 1$

Formula  $\rightarrow \text{Mg(OH)}_2$

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

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

Question 3. How many atoms are present in a

(i)  $\text{H}_2\text{S}$  molecule and

(ii)  $\text{PO}_4^{3-}$  ion?

Answer: (i)  $\text{H}_2\text{S} \rightarrow 3$  atoms are present

(ii)  $\text{PO}_4^{3-} \rightarrow 5$  atoms are present

NCERT Textbook Page 40

Question 1. Calculate the molecular masses of  $\text{H}_2$ ,  $\text{O}_2$ ,  $\text{Cl}_2$ ,  $\text{CO}_2$ ,  $\text{CH}_4$ ,

$\text{C}_2\text{H}_2$ ,  $\text{NH}_3$ ,  $\text{CH}_3\text{OH}$ .

Answer: The molecular masses are:

$$\text{H}_2 \Rightarrow 1 \times 2 \rightarrow 2 \text{ u}$$

$$\text{O}_2 \Rightarrow 16 \times 2 \rightarrow 32 \text{ u}$$

$$\text{Cl}_2 \Rightarrow 35.5 \times 2 \rightarrow 71 \text{ u}$$

$$\text{CO}_2 \Rightarrow 1 \times 12 + 2 \times 16 = 12 + 32 = 44 \text{ u}$$

$$\text{CH}_4 \Rightarrow 1 \times 12 + 4 \times 1 = 16 \text{ u}$$

$$\text{C}_2\text{H}_6 \Rightarrow 2 \times 12 + 6 \times 1 = 30 \text{ u}$$

$$\text{C}_2\text{H}_4 \Rightarrow (2 \times 12) + (4 \times 1) = 28 \text{ u}$$

$$\text{NH}_3 \Rightarrow (1 \times 14) + (3 \times 1) = 17 \text{ u}$$

$$\text{CH}_3\text{OH} \Rightarrow 12 + (3 \times 1) + 16 + 1 = 32 \text{ u}$$

Question 2. Calculate the formula unit masses of  $\text{ZnO}$ ,  $\text{Na}_2\text{O}$ ,  $\text{K}_2\text{CO}_3$ , given atomic masses of  $\text{Zn} = 65 \text{ u}$ ,  $\text{Na} = 23 \text{ u}$ ,  $\text{K} = 39 \text{ u}$ ,  $\text{C} = 12 \text{ u}$ , and  $\text{O} = 16 \text{ u}$ .

Answer: The formula unit mass of

(i)  $\text{ZnO} = 65 \text{ u} + 16 \text{ u} = 81 \text{ u}$

(ii)  $\text{Na}_2\text{O} = (23 \text{ u} \times 2) + 16 \text{ u} = 46 \text{ u} + 16 \text{ u} = 62 \text{ u}$

(iii)  $\text{K}_2\text{CO}_3 = (39 \text{ u} \times 2) + 12 \text{ u} + 16 \text{ u} \times 3$

$= 78 \text{ u} + 12 \text{ u} + 48 \text{ u} = 138 \text{ u}$

NCERT Textbook Page 42

Question 1. If one mole of carbon atoms weigh 12 grams, what is the mass (in grams) of 1 atom of carbon?

Answer:

$$1 \text{ mole of carbon atoms } 6.022 \times 10^{23} \text{ atoms} = 12 \text{ g}$$

$$\text{Mass of 1 atom} = ?$$

$$\begin{aligned} \therefore \text{Mass of 1 atom of carbon} &= \frac{12}{6.022 \times 10^{23}} \\ &= 1.99 \times 10^{-23} \text{ g} \end{aligned}$$

Question 2. Which has more number of atoms, 100 grams of sodium or 100 grams of iron (given atomic mass of  $\text{Na} = 23 \text{ u}$ ,  $\text{Fe} = 56 \text{ u}$ )?

Answer:

$$23 \text{ g of Na} = 6.022 \times 10^{23} \text{ atoms (1 mole).}$$

$$\therefore 100 \text{ g of Na} = ?$$

$$= \frac{100 \times 6.022 \times 10^{23}}{23} = \frac{6022}{23} \times 10^{23}$$

$$= 26.182 \times 10^{23} = 2.6182 \times 10^{24} \text{ atoms}$$

$$56 \text{ g of Fe} = 6.022 \times 10^{23} \text{ atoms}$$

$$100 \text{ g of Fe} = ?$$

$$= \frac{100 \times 6.022 \times 10^{23}}{56} = \frac{6022 \times 10^{23}}{56}$$

$$= 10.753 \times 10^{23} = 1.075 \times 10^{24}$$

$$100 \text{ g of Na contain} \rightarrow 2.618 \times 10^{24} \text{ atoms}$$

$$100 \text{ g of Fe contain} \rightarrow 1.075 \times 10^{24} \text{ atoms}$$

$\therefore$  100 g of Na contains more atoms.

\*\*\*\*\* END \*\*\*\*\*