Class 9 CBSE Test paper Solved Chapter 3: Atoms and Molecules-5

1. Q. 5 g of calcium combines with 2 g of oxygen to form a compound. Find the molecular formula of the compound. (Atomic mass of Ca = 40 u; O = 16 u) [CBSE 2011]

Ans. Number of moles in 5g of calcium = mass / molar mass = (5 / 40) = 0.125

Number of moles in 2g of oxygen = mass / molar mass = (2 / 16) = 0.125

Now we will calculate the simplest ratio of the element by dividing the number of moles of each element by the smallest value. Since number of moles of each element is 0.125, therefore calcium and oxygen are present in a ratio of 1 : 1. Thus the empirical formula of the compound is CaO.

For calculating the molecular formula, we need the molecular mass of the compound. However, because a compound with the formula CaO is known,

Therefore the molecular formula of the compound is CaO.

2. Q. (i) Name the body which approves the nomenclature of elements and compounds.

(ii) The symbol of sodium is written as Na and not as S. Give reason.

(iii) Name one element which form diatomic and one which form tetra atomic molecules.

Ans. (i) IUPAC (International Union of Pure and Applied Chemistry)

(ii) Latin name of sodium is Natrium. The first two letters (Na) of this name represents the symbol of sodium.

(iii) Oxygen forms diatomic molecules and phosphorus forms tetra atomic molecules.

3. Q. Calcium and Oxygen are combined in the rates of 5:4 by mass to form calcium oxide. What mass of Oxygen gas would be required to react with 2.5 g of calcium ?

Ans: Calcium and oxygen combine in the rates of 5:4 by mass to form calcium oxide

let x gram of oxygen is required to react with 2.5 g of calcium to form calcium oxide

Therefore $5/4 = 2.5 / x \Rightarrow 5x = 2.5 \times 4 \Rightarrow x = (2.5 \times 4) / 5 \Rightarrow x = 2$

Therefore 2 grams of oxygen is required to react with 2.5 grams of calcium to form calcium oxide .

4. Q. a. Calculate the number of moles in 81g of aluminium

Solution : Atomic mass of Al= 27gm

27g of aluminium = 1 mole of aluminium

81g of aluminium = 1/27 x 81=3 moles of aluminium

OR, Use formula, Number of moles = given mass/atomic mass

Self: ii) 4.6g sodium iii) 5.1g of Ammonia iv) 90g of water v) 2g of NaOH

5. Q. Calculate the mass of 0.5 mole of iron

Solution: Atomic mass of iron = 55.9 g

Mass of the 1 mole of iron = 55.9 g

Mass of the 0.5 mole of iron = 0.5 x 55.9 g = 27.95 g

Or, Using formula: mass = atomic mass x number of moles

FOLLOW UP: Find the mass of 2.5 mole of oxygen atoms

6. Q. Calculate the number of molecules in 11g of CO_2

Solution: gram molecular mass of CO_2 = 44g

44g of CO_2 = 6.023×10^{23} molecules

1 g of CO_2 = ($6.023 \times 10^{23} \div 44$ g) molecules

11g of CO_2 = ($6.023 \times 10^{23} \div 44$ g) x 11 = 1.51×10^{23} molecules

FOLLOW UP: Calculate the number of molecules in 360g of glucose

7. Q. Calculate the mass of 18.069×10^{23} molecules of SO_2

Solution: Mass of a substance = gram molecular mass x number of particles/ 6.023×10^{23}

Gram molecular mass SO2 = 64g

6.023×10^{23} molecules of SO2 = 64 gm

1 molecules of SO2 = $64/(6.023 \times 10^{23})$ gm

18.069×10^{23} molecules of SO2 = [$64/(6.023 \times 10^{23}) \times 18.069 \times 10^{23}$]gm = 192 g

8. Q. Calculate the mass of glucose in 2×10^{24} molecules

Solution: Gram molecular mass of glucose = 180g

Mass of glucose [$180 \times 2 \times 10^{24}$] / [6.023×10^{23}] = 597.7g

FOLLOW UP: Calculate the mass of 12.046×10^{23} molecules in CaO.

9. Q. Calculate the number moles for a substance containing 3.0115×10^{23} molecules in it.

Solution: Number of moles = Number of molecules/Avogadro Number

= [3.0115×10^{23}] / [6.023×10^{23}] = 0.5 moles

10.Q. How many molecules are present in 1 ml of water?

Answer: we know that density of water is 1gm/ml. Hence, 1 gm water will = 1 ml water.

Now, we have molecular mass of water H_2O = 1x2 + 16 = 18 gm

18 gm of water contain 6.022×10^{23} molecules

1 gm of water will contain = $(6.022 \times 10^{23})/18$ molecules = 0.33×10^{23} molecules

So, the no. of molecules of water in 1ml of water = 3.3×10^{22}