PHYSICAL CHEMISTRY

DPP
DAILY PRACTICE PROBLEMS

DPP No. 4

Total Marks : 31

Max. Time : 33 min.

Topic : Mole Concept

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.3,4,6,7	(3 marks, 3 min.)	[12, 12]
Multiple choice objective ('–1' negative marking) Q.1,8	(4 marks, 4 min.)	[8, 8]
Short Subjective Questions ('–1' negative marking) Q.2	(3 marks, 3 min.)	[3, 3]
Match the Following (no negative marking) (2 × 4) Q.5	(8 marks, 10 min.)	[8, 10]

1.* 11.2 L of a gas at STP weighs 14 g The gas could be :
   (A) N_2O (B) NO_2 (C) N_2 (D) CO

2. A compound of Mg contains 6% of Mg by mass. If the minimum molar mass of the compound is n × 10^2 g/mol then determine value of 'n'.

3. A sample of a compound contains 9.75 g Zn, 1.8 × 10^{23} atoms of Cr and 0.6 gram-atoms of O. What is empirical formula of compound ? (Atomic Mass Zn = 65)
   (A) $ZnCrO_4$ (B) $ZnCr_2O_4$ (C) Zn_2CrO_4 (D) $ZnCr_2O_2$

4. An organic compound on analysis was found to contain 0.032% of sulphur by mass. The molecular mass of the compound, if its one molecule contains two sulphur atoms, is :
   (A) 100000 u   (B) 10000 u   (C) 20000 u   (D) 200000 u

5.

Column - I	Column - II
(A) A compound containing 5 g 'S' and 5 g oxygen	(p) Empirical formula is CH_2
(B) A hydrocarbon containing $\dfrac{600}{7}$ % 'C' by mass	(q) Molecular formula is C_2H_4
(C) A compound containing $\dfrac{300}{11}$ % of 'C' and $\dfrac{800}{11}$ % of 'O' by mass	(r) Empirical formula is SO_2
(D) A hydrocarbon containing $\dfrac{100}{7}$ % H by mass (Molecular mass = 28)	(s) Empirical formula is CO_2

6. 0.1 mole of a carbohydrate with empirical formula CH_2O contains 1 g of hydrogen. What is its molecular formula?
   (A) $C_5H_{10}O_5$ (B) $C_6H_{12}O_6$ (C) $C_4H_8O_4$ (D) $C_3H_6O_3$

7. The number of moles of oxygen obtained by the electrolytic decomposition of 90 g water is :

$$(2H_2O \xrightarrow{\text{elec.}} 2H_2 + O_2)$$

   (A) 2.5   (B) 5   (C) 7.5   (D) 10

8.* In a gaseous reaction of type :

   $$xA(g) + yB(g) \longrightarrow pC(g) + qD(g)$$

   where x, y, p and q are stoichiometric coefficients.
   Which of the following statements is/are correct :
   (A) At STP, x litre of A combine with y litre of B to give C and D
   (B) x mole of A combine with y mole of B to give C and D
   (C) x g of A combine with y g of B to give C and D.
   (D) x molecules of A combine with y molecules of B to give C and D.

Answer Key

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1.*	(C,D)	2.	4	3.	(B)	4.	(D)		
5.	[A — r] ; [B — p] ; [C — s] ; [D — p, q].	6.	(A)	7.	(A)			8.*	(A,B,D)

Hints & Solutions

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1.*   Weigh of 11.2 L gas at S.T.P. ———— 14 g

Weigh of 22.4 L gas at S.T.P. ———— $\dfrac{14}{11.2} \times 22.4 = 28$ g

$M_{N_2} = M_{CO} = 28$

The gas could be N_2 or CO.

2.   Let the molar mass of compound be 'M'

Hence $\dfrac{M \times 6}{100} = 24$

M = 400 g /mole

3.   Mole of Zn $= \dfrac{9.81}{65}$ Mole of Cr $= \dfrac{1.8 \times 10^{23}}{6.023 \times 10^{23}}$

              = 0.15   = 0.3

Mole of O = 0.6

$\therefore$ simple ratio   Zn $= \dfrac{0.15}{0.15}$ Cr $= \dfrac{0.3}{0.15}$ O $= \dfrac{0.6}{0.15}$

                   = 1   = 2   = 4

So $ZnCr_2O_4$.

4. $\dfrac{\text{Mass of sulphur}}{\text{Mol. mass of compound}} \times 100 = \%$ of sulphur

$\therefore$ $\left(\dfrac{2 \times 32}{M}\right) \times 100 = 0.032$

$\therefore$ M = 2,00,000

5. For S and O,

$$S \Rightarrow \frac{5}{32} \qquad\qquad O \Rightarrow \frac{5}{16}$$

Simple ratio $S \Rightarrow \dfrac{\frac{5}{32}}{\frac{5}{32}} \Rightarrow 1 \qquad\qquad O \Rightarrow \dfrac{\frac{5}{16}}{\frac{5}{32}} \Rightarrow 2$

i.e. SO_2

For CH_2,

$$\% \, C = \frac{12}{14} \times 100 = \frac{600}{7} \qquad\Rightarrow\qquad H\% = \frac{2}{14} \times 100 = \frac{100}{7}$$

For C_2H_4,

$$\% \text{ of } C = \frac{24}{28} \times 100 = \frac{600}{7} \qquad\Rightarrow\qquad \% \text{ of } H = \frac{4}{28} \times 100 = \frac{100}{7}$$

For CO_2,

$$\% \text{ of } C = \frac{12}{44} \times 100 = \frac{300}{11} \qquad\Rightarrow\qquad \% \text{ of } O = \frac{32}{44} \times 100 = \frac{800}{11}$$
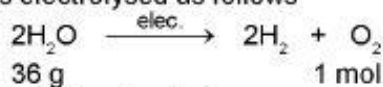
6. 0.1 mole of carbohydrate with E.F. CH_2O contains 1 g of hydrogen.

∴ 1 mole of carbohydrate will contain hydrogen
= 10 g = 10 g atoms

In CH_2O, g atomic ratio of C : H : O = 1 : 2 : 1.

∴ With 10 g atoms of H, g atoms of C combined = 5 and g atoms of O combined = 5. Hence, actual formula (molecular formula) will be $C_5H_{10}O_5$.

7. Water is electrolysed as follows

$$2H_2O \xrightarrow{\text{elec.}} 2H_2 + O_2$$
$$36 \text{ g} \qquad\qquad\qquad 1 \text{ mol}$$

36 g H_2O yield = 1 mol of oxygen

1 g of H_2O will yield = $\dfrac{1}{36}$ mol of O_2

∴ 90 g of water will yield = $\dfrac{1}{36} \times 90$ mol of O_2

8.* According to stoichiometry of reaction option A, B and D are correct.