PHYSICAL CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

# DPP No. 3

**Total Marks : 41**

**Max. Time : 43 min.**

**Topic : Mole Concept**

| Type of Questions | | M.M., Min. |
|---|---|---|
| Single choice Objective ('–1'negative marking)Q.1,2,4 to 9,11,12 | (3 marks, 3 min.) | [30, 30] |
| Short Subjective Questions ('–1' negative marking) Q.10 | (3 marks, 3 min.) | [3, 3] |
| Match the Following (no negative marking) (2 × 4) Q.3 | (8 marks, 10 min.) | [8, 10] |

**1.** Number of gold atoms in 300 mg of a gold ring of 20 carat gold (pure gold is 24 carat) are :
(A) $4.5 \times 10^{20}$ (B) $6.8 \times 10^{15}$ (C) $7.6 \times 10^{20}$ (D) $9.5 \times 10^{20}$

**2.** From a container having 64 g Oxygen, 11.2 L Oxygen gas at S.T.P. and $6.022 \times 10^{23}$ Oxygen atoms are removed. Find the mass of the oxygen gas left :
(A) zero (B) 32 g (C) 16 g (D) none

**3.**

| Column-I | Column-II |
|---|---|
| (A) 32 g each of $O_2$ and S | (p) 2 moles of Fe |
| (B) 2 gram-molecules of $K_3[Fe(CN)_6]$ | (q) 3 moles of ozone molecule |
| (C) 144 g of Oxygen atom | (r) one mole of given unit |
| (D) From 168 g of iron, $6.022 \times 10^{23}$ atoms of iron are removed, then the iron left | (s) 12 moles of carbon atoms |

**4.** If a sample of Ferric sulphate $Fe_2(SO_4)_3$ contains 7.2 moles of O-atoms, then the number of S-atoms in the given sample are :
(A) 1.8 $N_A$ (B) 1.2 $N_A$ (C) 1.6 $N_A$ (D) 1.4 $N_A$

**5.** 10 moles of $CO_2$ do not contain :
(A) 120 g of C (B) $6.022 \times 10^{24}$ atoms of O
(C) 10 $N_A$ molecules of $CO_2$ (D) 20 gram-atoms of O.

**6.** A compound has the molecular formula $X_4O_6$. If 11 g of $X_4O_6$ has 6.2 g of X, then atomic mass of X is :
(A) 31 amu (B) 37 amu (C) 42 amu (D) 98 amu

**7.** A sample of $CaCO_3$ has Ca = 40%, C = 12% and O = 48% by mass. If the law of constant proportions is true, then the mass of Ca in 5 g of $CaCO_3$ from another source will be:
(A) 2 g (B) 0.2 g (C) 0.02 g (D) 20 g

**8.** In compound A, 1 g nitrogen combine with 0.57 g oxygen. In compound B, 2 g nitrogen combine with 2.28 g oxygen and in compound C, 3 g nitrogen combine with 5.13 g oxygen. These results obey the law of:
(A) multiple proportions (B) constant proportions
(C) mixed proportions (D) none of these

**9.** The respective ratio of weight of oxygen in samples of pure CuO and $Cu_2O$, if both samples contain the same mass of copper, is :
(A) 1 : 2 (B) 1 : 1 (C) 2 : 1 (D) none of these

**10.** Find the relative density of $SO_3$ gas with respect to methane.

**11.** The density of air at STP is 0.001287 g $mL^{-1}$. Its vapour density is :
(A) 143 (B) 14.3 (C) 1.43 (D) 0.143
[**Hint :** Divide with the density of hydrogen at STP, i.e., 0.00009 g $mL^{-1}$]

**12.** The atomic mass of a metal is 27. If its valency is 3, the vapour density of the volatile metal chloride will be:
(A) 66.75 (B) 6.675 (C) 667.5 (D) 81

# Answer Key

## DPP No. # 3

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **1.** | (C)<br>(A) | **2.** | (B) | **3.** | (A – r ; B – p, s ; C – q ; D – p). | | | **4.** | |
| **5.** | (B) | **6.** | (A) | **7.** | (A) | **8.** | (A) | **9.** | (C) |
| **10.** | 5. | **11.** | (B) | **12.** | (A) | | | | |

# Hints & Solutions

## DPP No. # 3

**1.** For 24 carat, no of gold atoms $= \frac{300\times10^{-3}}{197}\times N_A$

For 20 carat, no of gold atoms $= \frac{300\times10^{-3}}{197}\times\frac{20\times N_A}{24}$

$= 7.64 \times 10^{20}$ परमाणु

**2.** Removed mass $= \frac{11.2}{22.4} \times 32 + \frac{6.02\times10^{23}}{6.02\times10^{23}}\times16 = 32$ g

mass left = 64 – 32 = 32 g.

**3.** (A) 32 g each of $O_2$ and S $= \frac{32}{32} = 1$ mole

(B) 2 gram-molecule of $K_3[Fe(CN)_6] \Rightarrow$ has 2 moles of Fe $\Rightarrow$ and 12 moles of C-atom

(C) 144 g of oxygen atom $= \frac{144}{16} = 9$ mole of 'O' atom ; $\therefore$ Moles of $O_3 = \frac{9}{3} = 3$

(D) from 168 g i.e. 3 moles Fe $\Rightarrow$ 1 mole Fe is removed i.e. $\Rightarrow$ 2 moles of Fe is left.

**4.** In $Fe_2(SO_4)_3$:
Moles of O– atoms : Moles of S– atoms = 12 : 3

$$\text{Moles of S– atoms} = \frac{3}{12} \times 7.2 = 1.8$$

No. of S– atoms = $1.8\ N_A$

**5.** Mass of C = Moles of C × At. mass of C
= Moles of $CO_2$ × At. mass of C
= 10 × 12 = 120 g

Moles of O– atoms = $2 \times n_{CO_2}$
= 2 × 10
= 20 = g – atoms of O.
No. of O– atoms = $20 \times N_A = 1.2044 \times 10^{25}$
No. of molecules of $CO_2$ = Moles of $CO_2 \times N_A = 10 \times N_A$

**6.** Let atomic mass of X is 'a' amu

$(4a + 96)$ g $X_4O_6$ ——————— 4a g X

$\therefore$ 10 g $X_4O_6$ has ——————— $\left(\frac{4a \times 10}{4a + 96}\right)$ g X

$$\frac{4a \times 10}{4a + 96} = 5.72 \quad \Rightarrow \quad a = 32.$$

**7.** $$\text{Mass of Ca} = 5 \times \frac{40}{100} = 2\text{g}.$$

**8.**

| | | | |
|---|---|---|---|
| N → | 1g | 2g | 3g |
| O → | 0.57g | 2.24g | 5.11g |

$$\text{O} \rightarrow \quad \frac{0.57}{1} \quad \frac{2.24}{2}\text{g} \quad \frac{5.11}{3}\text{g}$$

$$\text{O} \rightarrow \quad \frac{0.57}{1} \quad \frac{0.57 \times 2}{1} \quad \frac{0.57 \times 3}{1}$$

So, the mass ratio of oxygen combined with 1 g of nitrogen is simple ratio 1,2,3.

**9.** Ratio of weight of oxygen in samples = Ratio of valency of Cu in two compounds
= 2 : 1

**10.** $$\text{R.D.} = \frac{M_{SO_3}}{M_{CH_4}} = \frac{80}{16} = 5.$$

**11.** Molar mass of air at STP = 0.001293 g $mL^{-1}$ × 22400 mL = 28.7 g

$$\text{so V.D.} = \frac{28.7}{2} \approx 14.3$$

**12.** Element must be Al

Hence, volatile chloride will be $AlCl_3$ so $\text{V.D.} = \frac{M_{AlCl_3}}{2} = \frac{133.5}{2} = 66.75$