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) 4.5×10^{20} (B) 6.8×10^{15} (C) 7.6×10^{20} (D) 9.5×10^{20}

2. From a container having 64 g Oxygen, 11.2 L Oxygen gas at S.T.P. and 6.022×10^{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, 6.022×10^{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) 6.022×10^{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) (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 $\text{V.D.} = \frac{M_{AlCl_3}}{2} = \frac{133.5}{2} = 66.75$