PHYSICAL CHEMISTRY

DPP
DAILY PRACTICE PROBLEMS

DPP No. 1

Total Marks : 28

Max. Time : 30 min.

Topic : Mole Concept

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.5, 6, 8	(3 marks, 3 min.)	[9, 9]
Multiple choice objective ('–1' negative marking) Q.1 to Q.2	(4 marks, 4 min.)	[8, 8]
Short Subjective Questions ('–1' negative marking) Q.3	(3 marks, 3 min.)	[3, 3]
Match the Following (no negative marking) (2 × 4) Q.7	(8 marks, 10 min.)	[8, 10]

1.* 124 amu of P_4 will contain : (At. mass of P = 31)

(A) $4N_A$ atoms of phosphorus (B) 4 atoms of phosphorus

(C) 1 molecule of phosphorus (D) N_A molecules of phosphorus

2.* In which of the following pairs do 1 g of each have an equal number of molecules :

(A) N_2O and CO (B) N_2 and C_3O_2 (C) N_2 and CO (D) N_2O and CO_2

3._ How many atoms are present in '64 amu' of oxygen.

4. Fill the blanks in the table (where N_A is Avogadro number)

S.No.	Sample	Gram Atomic mass of sample	Moles of sample	No. of atoms present in the sample	Mass removed from the sample	Mole removed from the sample	Atoms removed from the sample	Mass of same no. of C atom as no. of atoms present in the original sample
1.	8 g O	– – –	– – –	– – –	– – –	– – –	– – –	– – –
	For Example	16 g	½ mole	$\frac{N_A}{2}$	2 g	$\frac{1}{8}$ mole	$\frac{N_A}{8}$	6 g
2.	230 g Na				46 g			
3.	60 g Ca					1 mole		
4.	20 g He					3 mole		
5.	56 g N					½ mole		
6.	12 g Mg						$\frac{N_A}{4}$	
7.	128 g S						N_A	
8.	93 g P						$\frac{3N_A}{2}$	

5. If the mass of 0.25 moles of an element X is 2.25 g, the mass of one atom of X is about :

(A) 1.5×10^{-24} g (B) 2.5×10^{-23} g (C) 1.5×10^{-23} g (D) 2.5×10^{-24} g

6. From 392 mg of H_2SO_4, 1.204×10^{21} molecules of H_2SO_4 are removed. How many moles of H_2SO_4 are left:

(A) 2×10^{-3} (B) 1.2×10^{-3} (C) 4×10^{-3} (D) 1.5×10^{-3}.

7.

	Column - I		**Column - II**
(A)	49 g H_2SO_4	(p)	0.5 mole of given unit
(B)	20 g NaOH	(q)	1.5 N_A atoms
(C)	11.2 L of CO_2 at STP	(r)	0.5 N_A molecules
(D)	6.022×10^{23} atoms of Oxygen	(s)	2 mole of 'O' atom

8. If all the O-atoms from 4.4 g CO_2, 6.022×10^{22} molecules of N_2O_5, 0.2 moles of CO and 1.12 L of SO_2 gas at NTP are removed and combined to form O_2 gas, then the resulting gas occupies a volume of ..... at NTP.

(A) 22.4 L (B) 44.8 L (C) 33.6 L (D) 11.2 L

Answer Key

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1.* (BC) **2.*** (CD) **3.** 4

4.

S.No.	Sample	Relative Atomic Mass for the element	Gram Atomic mass of sample	Moles of sample	No. of atoms of sample	Mass removed from the sample	Mole removed	Atoms removed	Mass of same no. of C atom as no. of atoms present in the original sample
1.	8 g **O**	16	---	---	---	---	---	---	---
	For Example	16	**16 g**	**½ Mole**	$\frac{N_A}{2}$	**2 g**	**⅛ Mole**	$\frac{N_A}{8}$	**6 g**
2.	230 g **Na**	23	**23g**	10 Mole	10 N_A	46 g	2 Mole	2 N_A	120 g
3.	60 g **Ca**	40	**40 g**	3/2 Mole	3/2 N_A	40 g	1 Mole	N_A	16 g
4.	20 g **He**	4	**4 g**	5 Mole	5 N_A	12 g	3 Mole	3 N_A	60 g
5.	56 g **N**	14	**14 g**	4 Mole	4 N_A	7 g	½ Mole	$\frac{N_A}{2}$	48 g
6.	12 g **Mg**	24	**24 g**	½ Mole	$\frac{N_A}{2}$	6 g	¼ Mole	$\frac{N_A}{4}$	6 g
7.	128 g **S**	32	**32 g**	4 Mole	4 N_A	32 g	1 Mole	N_A	48 g
8.	93 g **P**	31	**31 g**	3 Mole	3 N_A	46.5 g	3/2 Mole	$\frac{3N_A}{2}$	36 g

5. (C) **6.** (A) **7.** (A - p, s, r), (B - p, q, r), (C - p, q, r), (d - r).

8. (D)

Hints & Solutions

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1.* Molecular mass of $P_4 = 4 \times 31 = 124$ amu
$\therefore$ 124 amu of P_4 contains 1 molecule of P_4
1 molecule of P_4 contains 4 atoms of P.

2.* (A) No. of molecules $(N_2O) = \frac{1}{44} \times N_A$; No. of molecules $(CO) = \frac{1}{28} \times N_A$

(B) No. of molecules $(N_2) = \frac{1}{28} \times N_A$; No. of molecules $(C_3O_2) = \frac{1}{68} \times N_A$

(C) No. of molecules $(N_2) = \frac{1}{28} \times N_A$; No. of molecules $(CO) = \frac{1}{28} \times N_A$

(D) No. of molecules $(N_2O) = \frac{1}{44} \times N_A$; No. of molecules $(CO_2) = \frac{1}{44} \times N_A$

4.

S.No.	Sample	Relative Atomic Mass for the element	Gram Atomic mass of sample	Moles of sample	No. of atoms of sample	Mass removed from the sample	Mole removed
1.	8 g O	16	– – –	– – –	– – –	– – –	– – –
	For Example	16	16 g	½ Mole	$\frac{N_A}{2}$	2 g	$\frac{1}{8}$ Mole
2.	230 g Na	23	23g	10 Mole	10 N_A	46 g	2 Mole
3.	60 g Ca	40	40 g	3/2 Mole	3/2 N_A	40 g	1 Mole
4.	20 g He	4	4 g	5 Mole	5 N_A	12 g	3 Mole
5.	56 g N	14	14 g	4 Mole	4 N_A	7 g	½ Mole
6.	12 g Mg	24	24 g	½ Mole	$\frac{N_A}{2}$	6 g	¼ Mole
7.	128 g S	32	32 g	4 Mole	4 N_A	32 g	1 Mole
8.	93 g P	31	31 g	3 Mole	3 N_A	46.5 g	3/2 Mole

5. Mass of 0.25 N_A atoms of X is 2.25 gram

so, mass of 1 atom is = $\frac{2.25}{0.25N_A}$ gram $= 1.5 \times 10^{-23}$ gram

6. $^{w}H_2SO_4 = 392 \text{ mg} = 392 \times 10^{-3}$ g

$M_{H_2SO_4} = 98$

Left moles = Total moles – removed moles = $\frac{392 \times 10^{-3}}{98} - \frac{1.204 \times 10^{21}}{6.022 \times 10^{23}}$

Left moles = $4 \times 10^{-3} - 2 \times 10^{-3} = 2 \times 10^{-3}$ moles.

7. (A - p, s, r), (B - p, q, r), (C - p, q, r), (d - r).

8. Total number of moles of O-atoms = $2 \times n_{CO_2} + 5 \times n_{N_2O_5} + 1 \times n_{CO} + 2 \times n_{SO_2}$

$$= 2 \times \left(\frac{4.4}{44}\right) + 5 \times \left(\frac{6.022 \times 10^{22}}{N_A}\right) + 1 \times 0.2 + 2 \times \frac{1.12}{22.4} = 1$$

$\therefore$ Moles of O_2 gas = $\frac{1}{2}$

$\therefore$ Vol. of O_2 gas at NTP = $\frac{1}{2} \times 22.4 = 11.2$ L