DPP - Daily Practice Problems

Date : | Start Time : | End Time :

CHEMISTRY CC01

SYLLABUS : Some Basic Concepts of Chemistry

Max. Marks : 120 **Marking Scheme :** + 4 for correct & (–1) for incorrect **Time : 60 min.**

INSTRUCTIONS : This Daily Practice Problem Sheet contains 30 MCQ's. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.

1. In compound A, 1.00g of nitrogen unites with 0.57g of oxygen. In compound B, 2.00g of nitrogen combines with 2.24g of oxygen. In compound C, 3.00g of nitrogen combines with 5.11g of oxygen. These results obey the following law

(a) law of constant proportion
(b) law of multiple proportion
(c) law of reciprocal proportion
(d) Dalton's law of partial pressure

2. 10^{21} molecules are removed from 200 mg of CO_2. The moles of CO_2 left are :

(a) 2.88×10^{-3} (b) 28.8×10^{-3}
(c) 288×10^{-3} (d) 28.8×10^{3}

3. What volume of hydrogen gas, at 273 K and 1 atm. pressure will be consumed in obtaining 21.6 g of elemental boron (atomic mass = 10.8) from the reduction of boron trichloride by hydrogen ?

(a) 67.2 L (b) 44.8 L
(c) 22.4 L (d) 89.6 L

4. Number of g of oxygen in 32.2 g $Na_2SO_4.10\,H_2O$ is

(a) 20.8 (b) 2.24
(c) 22.4 (d) 2.08

RESPONSE GRID	1. ⓐⓑⓒⓓ	2. ⓐⓑⓒⓓ	3. ⓐⓑⓒⓓ	4. ⓐⓑⓒⓓ

5. 6.02×10^{20} molecules of urea are present in 100 ml of its solution. The concentration of urea solution is

(a) 0.02 M (b) 0.01 M
(c) 0.001 M (d) 0.1 M

(Avogadro constant, $N_A = 6.02 \times 10^{23}$ mol^{-1})

6. If we consider that 1/6, in place of 1/12, mass of carbon atom is taken to be the relative atomic mass unit, the mass of one mole of the substance will

(a) be a function of the molecular mass of the substance
(b) remain unchanged
(c) increase two fold
(d) decrease twice

7. The weight of NaCl decomposed by 4.9g of H_2SO_4, if 6 g of sodium hydrogen sulphate and 1.825 g of HCl, were produced in the reaction is:

(a) 6.921 g (b) 4.65 g
(c) 2.925 g (d) 1.4 g

8. Which one of the following is the lightest?

(a) 0.2 mole of hydrogen gas
(b) 6.023×10^{22} molecules of nitrogen
(c) 0.1 g of silver
(d) 0.1 mole of oxygen gas

9. How many moles of magnesium phosphate, $Mg_3(PO_4)_2$ will contain 0.25 mole of oxygen atoms?

(a) 1.25×10^{-2} (b) 2.5×10^{-2}
(c) 0.02 (d) 3.125×10^{-2}

10. The density (in g mL^{-1}) of a 3.60 M sulphuric acid solution that is 29% H_2SO_4 (molar mass = 98 g mol^{-1}) by mass will be

(a) 1.45 (b) 1.64
(c) 1.88 (d) 1.22

11. A gas occupies a volume of 300 cc at 27°C and 620 mm pressure. The volume of gas at 47°C and 640 mm pressure is:

(a) 260 cc (b) 310 cc
(c) 390 cc (d) 450 cc

12. Haemoglobin contains 0.33% of iron by weight. The molecular weight of haemoglobin is approximately 67200. The number of iron atoms (at. wt. of Fe = 56) present in one molecule of haemoglobin is

(a) 6 (b) 1
(c) 2 (d) 4

13. The volume of 20 volume H_2O_2 required to get 5 litres of O_2 at STP is

(a) 250 ml (b) 125 ml
(c) 100 ml (d) 50 ml.

14. In the reaction,

$$2Al(s) + 6HCl(aq) \rightarrow 2Al^{3+}(aq) + 6Cl^-(aq) + 3H_2(g)$$

(a) 11.2 L $H_2(g)$ at STP is produced for every mole HCl(aq) consumed
(b) 6 L HCl(aq) is consumed for every 3 L $H_2(g)$ produced
(c) 33.6 L $H_2(g)$ is produced regardless of temperature and pressure for every mole Al that reacts
(d) 67.2 $H_2(g)$ at STP is produced for every mole Al that reacts.

RESPONSE GRID					
	5. ⓐⓑⓒⓓ	6. ⓐⓑⓒⓓ	7. ⓐⓑⓒⓓ	8. ⓐⓑⓒⓓ	9. ⓐⓑⓒⓓ
	10. ⓐⓑⓒⓓ	11. ⓐⓑⓒⓓ	12. ⓐⓑⓒⓓ	13. ⓐⓑⓒⓓ	14. ⓐⓑⓒⓓ

15. The concentrated sulphuric acid that is peddled commercial is 95% H_2SO_4 by weight. If the density of this commercial acid is 1.834 g cm^{-3}, the molarity of this solution is
(a) 17.8 M (b) 12.0 M
(c) 10.5 M (d) 15.7 M

16. What is the mass of precipitate formed when 50 mL of 16.9% solution of $AgNO_3$ is mixed with 50 mL of 5.8% NaCl solution ?
(Ag = 107.8, N = 14, O = 16, Na = 23, Cl = 35.5)
(a) 28 g (b) 3.5 g
(c) 7 g (d) 14 g

17. Number of valence electrons in 4.2 gram of N_3^- ion is
(a) 4.2 N_A (b) 0.1 N_A
(c) 1.6 N_A (d) 3.2 N_A

18. A transition metal *M* forms a volatile chloride which has a vapour density of 94.8. If it contains 74.75% of chlorine the formula of the metal chloride will be
(a) MCl_3 (b) MCl_2
(c) MCl_4 (d) MCl_5

19. A gaseous hydrocarbon gives upon combustion 0.72 g of water and 3.08 g. of CO_2. The empirical formula of the hydrocarbon is :
(a) C_2H_4 (b) C_3H_4
(c) C_6H_5 (d) C_7H_8

20. Following is the composition of a washing soda sample :

Substance	Molecular Wt.	Mass percent
Na_2CO_3	106.0	84.8
$NaHCO_3$	84.0	8.4
NaCl	58.5	6.8

On complete reaction with excess HCl, one kilogram of the washing soda will evolve:
(a) 9 mol of CO_2 (b) 16 mol of CO_2
(c) 17 mol of CO_2 (d) 18 mol of CO_2

21. Arrange the numbers in increasing no. of significant figures.
0.002600, 2.6000, 2.6, 0.260
(a) 2.6 < 0.260 < 0.002600 < 2.6000
(b) 2.6000 < 2.6 < 0.002600 < 0.260
(c) 0.260 < 2.6 < 0.002600 < 2.6000
(d) 0.002600 < 0.260 < 2.6 < 2.6000

22. Dissolving 120 g of a compound (mol. wt. 60) in 1000 g of water gave a solution of density 1.12 g/mL. The molarity of the solution is:
(a) 1.00 M (b) 2.00 M
(c) 2.50 M (d) 4.00 M

23. A gaseous compound of nitrogen and hydrogen contains 12.5% (by mass) of hydrogen. The density of the compound relative to hydrogen is 16. The molecular formula of the compound is:
(a) NH_2 (b) N_3H
(c) NH_3 (d) N_2H_4

24. The amount of $BaSO_4$ formed upon mixing 100 mL of 20.8% $BaCl_2$ solution with 50 mL of 9.8% H_2SO_4 solution with 50 mL of 9.8% H_2SO_4 solution will be:
(Ba = 137, Cl = 35.5, S = 32, H = 1 and O = 16)
(a) 23.3 g (b) 11.65 g
(c) 30.6 g (d) 33.2 g

RESPONSE GRID					
	15. ⓐⓑⓒⓓ	16. ⓐⓑⓒⓓ	17. ⓐⓑⓒⓓ	18. ⓐⓑⓒⓓ	19. ⓐⓑⓒⓓ
	20. ⓐⓑⓒⓓ	21. ⓐⓑⓒⓓ	22. ⓐⓑⓒⓓ	23. ⓐⓑⓒⓓ	24. ⓐⓑⓒⓓ

25. 2 g of a mixture of CO and CO_2 on reaction with excess I_2O_5 produced 2.54 g of I_2. What will be the mass % of CO_2 in the original mixture ?

(a) 35 (b) 70

(c) 30 (d) 60

26. 7.5 grams of a gas occupy 5.6 litres of volume at STP. The gas is

(a) N_2O (b) NO

(c) CO (d) CO_2

27. Number of moles of $KMnO_4$ required to oxidize one mole of $Fe(C_2O_4)$ in acidic medium is

(a) 0.167 (b) 0.6

(c) 0.2 (d) 0.4

28. What is the weight of oxygen required for the complete combustion of 2.8 kg of ethylene ?

(a) 2.8 kg (b) 6.4 kg

(c) 9.6 kg (d) 96 kg

29. A gas mixture of 3 litres of propane (C_3H_8) and butane (C_4H_{10}) on complete combustion at 25° C produced 10 litre CO_2. Find out the composition of gas mixture (Propane : Butane)

(a) 2 : 1 (b) 1 : 2

(c) 1.5 : 1.5 (d) 0.5 : 2.5

30. An organic compound contains 49.3% carbon, 6.84% hydrogen and its vapour density is 73. Molecular formula of the compound is :

(a) $C_3H_5O_2$ (b) $C_4H_{10}O_2$

(c) $C_6H_{10}O_4$ (d) $C_3H_{10}O_2$

RESPONSE GRID	25. ⓐⓑⓒⓓ 26. ⓐⓑⓒⓓ 27. ⓐⓑⓒⓓ 28. ⓐⓑⓒⓓ 29. ⓐⓑⓒⓓ 30. ⓐⓑⓒⓓ

DAILY PRACTICE PROBLEM DPP CHAPTERWISE 1 - CHEMISTRY			
Total Questions	30	Total Marks	120
Attempted		Correct	
Incorrect		Net Score	
Cut-off Score	37	Qualifying Score	52
Success Gap = Net Score – Qualifying Score			
Net Score = (Correct × 4) – (Incorrect × 1)			

1. **(b)**

2. **(a)** No. of moles = $\frac{\text{Wt. in g}}{\text{Mol. wt}}$

No. of moles in 200 mg = $\frac{200}{1000 \times 44}$

$= 4.5 \times 10^{-3}$ moles

No. of moles in 10^{21} molecules

$= \frac{10^{21}}{6.02 \times 10^{23}} = 1.67 \times 10^{-3}$ moles

No. of moles left = $(4.5 - 1.67) \times 10^{-3} = 2.88 \times 10^{-3}$

3. **(a)** $2BCl_3 + 3H_2 \rightarrow 2B + 6HCl$

or $BCl_3 + \frac{3}{2}H_2 \rightarrow B + 3HCl$

Now, since 10.8 gm boron requires hydrogen

$= \frac{3}{2} \times 22.4 L$ at N.T.P

hence 21.6 gm boron requires hydrogen

$\frac{3}{2} \times \frac{22.4}{10.8} \times 21.6 = 67.2 L$ at N.T. P.

4. **(c)** M. Wt of $Na_2SO_4.10\,H_2O$ is 322 g which contains 224 g oxygen. $\therefore$ 32.2 g will contain 22.4 g oxygen.

5. **(b)** Moles of urea present in 100 ml of sol.= $\frac{6.02 \times 10^{20}}{6.02 \times 10^{23}}$

$\therefore M = \frac{6.02 \times 10^{20} \times 1000}{6.02 \times 10^{23} \times 100} = 0.01M$

[$\because$ M = Moles of solute present in 1L of solution]

6. **(d)** Relative atomic mass =

$\frac{\text{Mass of one atom of the element}}{1/12^{th} \text{ part of the mass of one atom of Carbon} - 12}$

or $\frac{\text{Mass of one atom of the element}}{\text{mass of one atom of the C} - 12} \times 12$

Now if we use $^1/_6$ in place of $^1/_{12}$ the formula becomes

Relative atomic mass =

$\frac{\text{Mass of one atom of element}}{\text{Mass of one atom of carbon}} \times 6$

$\therefore$ Relative atomic mass decrease twice

7. **(c)** $\underset{x\,g}{NaCl} + \underset{4.9\,g}{H_2SO_4} \longrightarrow \underset{6\,g}{NaHSO_4} + \underset{1.825\,g}{HCl}$

According to law of conservation of mass "*mass is neither created nor destroyed during a chemical change*"

$\therefore$ Mass of the reactants = Mass of products

$x + 4.9 = 6 + 1.825$

or $x = 2.925$ g

8. **(c)** (a) Weight of H_2 = mole × molecular wt.

$= 0.2 \times 2 = 0.4$ g

(b) $6.023 \times 10^{23} = 1$ mole

Thus $6.023 \times 10^{22} = 0.1$ mole

Weight of $N_2 = 0.1 \times 28 = 2.8$ g

(c) Weight of silver = 0.1 g

(d) Weight of oxygen = $32 \times 0.1 = 3.2$ g

9. **(d)** 1 Mole of $Mg_3(PO_4)_2$ contains 8 mole of oxygen atoms

$\therefore$ 8 mole of oxygen atoms ≡ 1 mole of $Mg_3(PO_4)_2$ mole of $Mg_3(PO_4)_2$

0.25 mole of oxygen atom ≡ $\frac{1}{8} \times 0.25$ mole of $Mg_3(PO_4)_2$

$= 3.125 \times 10^{-2}$ mole of $Mg_3(PO_4)_2$

10. **(d)** Since molarity of solution is 3.60 M. It means 3.6 moles of H_2SO_4 is present in its 1 litre solution.

Mass of 3.6 moles of H_2SO_4

= Moles × Molecular mass

$= 3.6 \times 98$ g = 352.8 g

$\therefore$ 1000 ml solution has 352.8 g of H_2SO_4

Given that 29 g of H_2SO_4 is present in = 100 g of solution

$\therefore$ 352.8 g of H_2SO_4 is present in

$= \frac{100}{29} \times 352.8$ g of solution

= 1216 g of solution

Density = $\frac{\text{Mass}}{\text{Volume}} = \frac{1216}{1000} = 1.216$ g/ml = 1.22 g/ml

11. **(b)** From $\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$

$\frac{V_1 \times 640}{(273+47)} = \frac{620 \times 300}{(273+27)}$

$V_1 = \frac{620 \times 300 \times 320}{640 \times 300} = 310$ cc

12. **(d)** Weight of Iron in 67200 = $\frac{0.33}{100} \times 67200 = 221.76$

Number of atoms of Iron = $\frac{221.76}{56} = 3.96 \equiv 4$

13. **(a)** 20 volume H_2O_2 means that 1mL of this H_2O_2 solutions produces 20 mL of O_2 at N.T.P. on decomposition by heat.

$\therefore$ For 20 mL of O_2, the volume of 20 volume H_2O_2 required = 1mL

For 1 mL of O_2, the volume of 20 volume

H_2O_2 required = $\frac{1}{20}$ mL

For 5000 mL or 5L of O_2, the volume of 20

volume H_2O_2 required = $\frac{1}{20} \times 5000$ mL = 250 mL

14. **(a)** $2Al(s) + 6HCl(aq) \rightarrow 2Al^{3+}(aq) + 6Cl^-(aq) + 3H_2(g)$

$\because$ 6 moles of HCl produces = 3 moles of H_2

$= 3 \times 22.4$ L of H_2 at S.T.P

$\therefore$ 1 mole of HCl produces $= \frac{3 \times 22.4}{6}$ L

of H_2 at S.T.P

$= 11.2$ L of H_2 at STP

15. (a) 95% H_2SO_4 by weight means 100g H_2SO_4 solution contains 95g H_2SO_4 by mass.

Molar mass of $H_2SO_4 = 98\text{g mol}^{-1}$

Moles in 95g $= \frac{95}{98} = 0.969$ mole

Volume of 100g H_2SO_4

$= \frac{\text{mass}}{\text{density}} = \frac{100\text{g}}{1.834\text{g cm}^{-3}}$

$= 54.52 \text{ cm}^3 = 54.52 \times 10^{-3}$ L

$$\text{Molarity} = \frac{\text{Moles of solute}}{\text{Volme of solute in L}}$$

$$= \frac{0.969}{54.52 \times 10^{-3}} = 17.8 \text{ M}$$

16. (c) 50 ml of 16.9% solution of $AgNO_3$

$\left(\frac{16.9}{100} \times 50\right) = 8.45$ g of $AgNO_3$

$$n_{mole} = \frac{8.45\text{g}}{(107.8 + 14 + 16 \times 3)\text{ g/mol}} = \left(\frac{8.45\text{ g}}{169.8\text{g/mol}}\right)$$

$= 0.0497$ moles

50 ml of 5.8% solution of NaCl contain

$$NaCl = \left(\frac{5.8}{100} \times 50\right) = 2.9 \text{ g}$$

$$n_{NaCl} = \frac{2.9\text{g}}{(23 + 35.5)\text{g/mol}} = 0.0495 \text{ moles}$$

$$AgNO_3 + NaCl \rightarrow AgCl\downarrow + Na^{\oplus} + Cl^{\ominus}$$

1 mole 1 mole 1 mole

$\therefore$ 0.049 mole 0.049 mole 0.049 mole of AgCl

$n = \frac{w}{M} \rightarrow w = (n_{AgCl}) \times$ Molecular Mass

$= (0.049) \times (107.8 + 35.5)$

$= 7.02$ g

17. (b) Number of valence electrons in a N_3^- ion $= 1$

Now, 1 mol or 42 g of N_3^- has $= 6.023 \times 10^{23}$ ions

So, 42 g of N_3^- has $6.023 \times 4 \times 10^{23}$ valence e^-

1 g of N_3^- has $\frac{6.023 \times 1 \times 10^{23}}{42}$ valence e^-

4.2 g of N_3^- has $\frac{4.2 \times 6.023 \times 1 \times 10^{23}}{42}$ valence e^- i.e., 0.1 N_A valence e^-.

18. (c) 74.75% of chlorine means 74.75g chlorine is present in 100g of metal chloride.

Weight of metal = 100g – 74.75g

= 25.25g

Equivalent weight

$$= \frac{\text{weight of metal}}{\text{weight of chlorine}} \times 35.5$$

$$= \frac{25.25}{74.75} \times 35.5 = 12$$

$$\text{Valency of metal} = \frac{2 \times \text{V.D.}}{\text{Equivalent wt. of metal} + 35.5}$$

$$= \frac{2 \times 94.8}{12 + 35.5} = 4$$

$\therefore$ Formula of compound $= MCl_4$

19. (d) $\because$ 18 gm, H_2O contains = 2 gm H

$\therefore$ 0.72 gm H_2O contains

$= \frac{2}{18} \times 0.72 \text{ gm} = 0.08$ gm H

$\because$ 44 gm CO_2 contains = 12 gm C

$\therefore$ 3.08 gm CO_2 contains

$= \frac{12}{44} \times 3.08 = 0.84$ gm C

$\therefore C : H = \frac{0.84}{12} : \frac{0.08}{1}$

$= 0.07 : 0.08 = 7 : 8$

$\therefore$ Empirical formula $= C_7H_8$

20. (a)

$$\underset{1\text{ mol}}{Na_2CO_3} + 2HCl \longrightarrow 2NaCl + H_2O + \underset{1\text{ mol}}{CO_2}$$

$$\underset{1\text{ mol}}{NaHCO_3} + HCl \longrightarrow NaCl + H_2O + \underset{1\text{ mol}}{CO_2}$$

$$\underbrace{\underset{\substack{848\text{g} \\ 8\text{ mol}}}{Na_2CO_3} + \underset{\substack{84\text{g} \\ 1\text{mol}}}{NaHCO_3}}_{1\text{ kg washing soda}} + \underset{68\text{g (excess)}}{NaCl + HCl} \longrightarrow$$

$$\longrightarrow \underset{\text{from} Na_2CO_3}{8CO_2} + \underset{\text{from } NaHCO_3}{CO_2}$$

Thus, on complete reaction with HCl, 1kg of washing soda will evolve 9 mol of CO_2.

21. (a) 2.6 has two significant figures.

0.260 has three significant figures.

0.002600 has four significant figures.

2.6000 has five significant figures.

22. (b) Given

mass of solute (w) = 120 g

mass of solvent (w) = 1000 g

Mol. mass of solute = 60 g

density of solution = 1.12 g/ml

From the given data,

Mass of solution = 1000 + 120 = 1120 g

$\because \quad d = \frac{\text{Mol. mass}}{V}$ or $V = \frac{\text{Mol. mass}}{d}$

Volume of solution $V = \frac{1120}{1.12} = 1000$ ml or = 1 litre

$$\text{Now molarity (M)} = \frac{W}{\text{Mol. mass} \times V(\text{lit})} = \frac{120}{60 \times 1} = 2\text{M}$$

23. (d) In an unknown compounds containing N and H given % of H = 12.5%

$\therefore$ % of N = 100 – 12.5 = 87.5%

Element	Percentage	Atomic ratio	Simple ratio
H	12.5%	$\frac{12.5}{1} = 12.5$	$\frac{12.5}{6.25} = 2$
N	87.5	$\frac{87.5}{14} = 6.25$	$\frac{6.25}{6.25} = 1$

$2 \times$ vapour density = Mol. wt = mol wt. = $16 \times 2 = 32$.

Molecular formula = $n \times$ empirical formula mass

$$n = \frac{32}{16} = 2$$

$\therefore$ Molecular formula of the compound will be = $(NH_2)_2$
$= N_2H_4$

24. (a) $BaCl_2 + H_2SO_4 \longrightarrow BaSO_4 + 2HCl$

208 g	98 g	233 g	73 g
20.8 g	9.8 g	23.3 g	7.3 g

25. (c) $5CO + I_2O_5 \rightarrow 5CO_2 + I_2$

Moles of $I_2O_5 = \frac{25.4}{254}$

$= 0.01 \equiv 0.05$ moles of CO

Weight of CO $= 0.05 \times 28 = 1.4$ g;

Weight of $CO_2 = 2 - 1.4 = 0.6$ g

Hence % of $CO_2 = \frac{0.6}{2} \times 100 = 30\%$

26. (b) $PV = nRT \quad \therefore 5.6 \times 1 = \frac{7.5}{M.Wt.} \times 0.0821 \times 273$

M. Wt = 30.12 Hence gas is NO.

27. (b) The required equation is

$$2KMnO_4 + 3H_2SO_4 \longrightarrow K_2SO_4 + 2MnSO_4 + 3H_2O + 5[O]$$

nascent oxygen

$$2Fe(C_2O_4) + 3H_2SO_4 + 3[O] \longrightarrow Fe_2(SO_4)_3 + 2CO_2 + 3H_2O$$

[O] required for 1 mol. of $Fe(C_2O_4)$ is 1.5, 5 [O] are obtained from 2 moles of $KMnO_4$

$\therefore$ 1.5 [O] will be obtained from

$= \frac{2}{5} \times 1.5 = 0.6$ moles of $KMnO_4$.

28. (c) $C_2H_4 + 3O_2 \longrightarrow 2CO_2 + 2H_2O$

28 g 96 g

$\because$ 28 g of C_2H_4 undergo complete combustion by $= 96$ g of O_2

$\therefore$ 2.8 kg of C_2H_4 undergo complete combustion by $= 9.6$ kg of O_2.

29. (a) $C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

a 3a

$C_4H_{10} + \frac{13}{2}O_2 \rightarrow 4CO_2 + 5H_2O$

(3 – a) 4 (3 – a)

But, $3a + 4(3 - a) = 10$

$\therefore$ a = 2 (Propane) and 3 – 2 = 1 (Butane)

30. (c)

Element	%	Relative no. of atoms	Simplest ratio of atoms
C	49.3	49.3/12 = 4.1 1.5 × 2 = 3	4.1/2.74 = 1.5
H	6.84	6.84/1 = 6.84 = 2.5 × 2 = 5	6.84/2.74 = 2.5
O	43.86	43.86/16 = 2.74 1 × 2 = 2	2.74/2.74 = 1

$\therefore$ Empirical formula = $C_3H_5O_2$

Empirical formula mass

$= (3 \times 12) + (5 \times 1) + (2 \times 16) = 36 + 5 + 32 = 73$

Molecular mass = $2 \times$ Vapour density

$= 2 \times 73 = 146$

$$n = \frac{\text{molecular mass}}{\text{empirical formula mass}} = 146/73 = 2$$

Molecular formula = Empirical formula × 2

$= (C_3H_5O_2) \times 2 = C_6H_{10}O_4$