DPP - Daily Practice Problems

Chapter-wise Sheets

Date : Start Time : End Time :

CHEMISTRY CC01

SYLLABUS : Some Basic Concepts of Chemistry

Max. Marks : 180 **Marking Scheme :** + 4 for correct & (–1) for incorrect **Time : 60 min.**

INSTRUCTIONS : This Daily Practice Problem Sheet contains 45 MCQ's. For each question only one option is correct. Darken the correct circle/ bubble in the Response Grid provided on each page.

1. Given thenumbers : 161 cm, 0.161 cm, 0.0161 cm. Thenumber of significant figures for the three numbers are
(a) 3, 4 and 5 respectively (b) 3, 3 and 4 respectively
(c) 3, 3 and 3 respectively (d) 3, 4 and 4 respectively

2. If the true value for an experimental result is 6.23 and the results reported by three students X, Y and Z are :
X : 6.18 and 6.28
Y : 6.20 and 6.023
Z : 6.22 and 6.24
Which of the following option is correct :
(a) X precise, Y accurate, Z precise and accurate.
(b) X precise and accurate, Y not precise, Z precise
(c) Both X & Z precise & accurate, Y not precise.
(d) Both X & Y neither precise nor accurate, Z both precise and accurate.

3. Number of grams 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

4. 3 g of an oxide of a metal is converted to chloride completely and it yielded 5 g of chloride. The equivalent weight of the metal is
(a) 3.325 (b) 33.25
(c) 12 (d) 20

5. 1 cc. N_2O at NTP contains :
(a) $\frac{1.8}{224}\times 10^{22}$ atoms (b) $\frac{6.02}{22400}\times 10^{23}$ molecules
(c) $\frac{1.32}{224}\times 10^{23}$ electrons (d) All of the above

RESPONSE GRID	1. ⓐⓑⓒⓓ	2. ⓐⓑⓒⓓ	3. ⓐⓑⓒⓓ	4. ⓐⓑⓒⓓ	5. ⓐⓑⓒⓓ

Space for Rough Work

6. One of the following combination which illustrates the law of reciprocal proportions ?
(a) N_2O_3, N_2O_4, N_2O_5 (b) NaCl, NaBr, NaI
(c) CS_2, CO_2, SO_2 (d) PH_3, P_2O_3, P_2O_5

7. An aqueous solution of oxalic acid dihydrate contains its 6.3g in 250 mL. The volume of 0.1 N NaOH required to completely neutralize 10 mL of this solution
(a) 4mL (b) 20mL (c) 2mL (d) 40mL

8. The density of 3M solution of sodium chloride is 1.252 g mL^{-1}. The molality of the solution will be :
(molar mass, NaCl = 58.5 g mol^{-1})
(a) 260m (b) 2.18m (c) 2.79m (d) 3.00m

9. The number of atoms in 0.1 mole of a triatomic gas is :
($N_A = 6.02 \times 10^{23}$ mol^{-1})
(a) 6.026×10^{22} (b) 1.806×10^{23}
(c) 3.600×10^{23} (d) 1.800×10^{22}

10. Match the columns.

	Column-I		Column-II
A.	88 g of CO_2	I.	0.25 mole
B.	6.022×10^{23} molecules of H_2O	II.	2 mole
C.	5.6 litres of O_2 at STP	III.	1 mole
D.	96 g of O_2	IV.	6.022×10^{23} molecules
E	1 mol of any gas	V.	3 mole

(a) A – II; B – III; C – I; D – V; E – VI
(b) A – III; B – II; C – I; D – V; E – IV
(c) A – II; B – I; C – III; D – V; E – IV
(d) A – II; B – III; C – I; D – IV; E – V

11. The simplest formula of a compound containing 50% of element X (atomic mass 10) and 50% of element Y (atomic mass 20) is
(a) XY (b) XY_3 (c) X_2Y (d) X_2Y_3

12. 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

13. If N_A is Avogadro's number then number of valence electrons in 4.2 g of nitride ions (N^{3-}) is
(a) $4.2N_A$ (b) $2.4N_A$
(c) $1.6N_A$ (d) $3.2N_A$

14. The set of numerical coefficients that balances the equation
$K_2CrO_4 + HCl \longrightarrow K_2Cr_2O_7 + KCl + H_2O$ is
(a) 2, 2, 1, 2, 1 (b) 2, 2, 1, 1, 1
(c) 2, 1, 1, 2, 1 (d) 1, 1, 2, 2, 1

15. Match the columns

	Column-I (Number)		Column-II (Significant figures)
A.	29900.	I.	2
B.	290	II.	1
C.	1.23×1.331	III.	4
D.	20.00	IV.	3
E	$2.783 - 1$	V.	5

(a) A – III; B – II; C – V; D – I; E – IV
(b) A – V; B – I; C – IV; D – III; E – II
(c) A – I; B – V; C – IV; D – III; E – II
(d) A – V; B – IV; C – III; D – II; E – I

16. The maximum number of molecules are present in
(a) 15 L of H_2 gas at STP (b) 5 L of N_2 gas at STP
(c) 0.5 g of H_2 gas (d) 10 g of O_2 gas

17. The number of moles of oxygen in one litre of air containing 21% oxygen by volume, under standard conditions are
(a) 0.0093 mole (b) 0.21 mole
(c) 2.10 mole (d) 0.186 mole

18. Assuming fully decomposed, the volume of CO_2 released at STP on heating 9.85 g of $BaCO_3$ (Atomic mass, Ba = 137) will be
(a) 1.12 L (b) 2.24 L
(c) 4.06 L (d) 0.84 L

RESPONSE GRID					
	5. ⓐⓑⓒⓓ	6. ⓐⓑⓒⓓ	7. ⓐⓑⓒⓓ	8. ⓐⓑⓒⓓ	9. ⓐⓑⓒⓓ
	10. ⓐⓑⓒⓓ	11. ⓐⓑⓒⓓ	12. ⓐⓑⓒⓓ	13. ⓐⓑⓒⓓ	14. ⓐⓑⓒⓓ
	15. ⓐⓑⓒⓓ	16. ⓐⓑⓒⓓ	17. ⓐⓑⓒⓓ	18. ⓐⓑⓒⓓ	19. ⓐⓑⓒⓓ

Space for Rough Work

19. The ratio of the molar amounts of H_2S needed to precipitate the metal ions from 20 mL each of 1 M $Ca(NO_3)_2$ and 0.5M $CuSO_4$ is
(a) 1 : 1 (b) 2 : 1 (c) 1 : 2 (d) indefinite

20. Consider the following statements.
(i) Atoms of H, O, N and C have identical properties but different mass.
(ii) Matter is divisible into atoms which are further indivisible.
(iii) The ratio of N: H in NH_3 is 1 : 3 and N : O in nitric oxide is 2 : 1.
(iv) Dalton's atomic theory support law of conservation of mass.
Which of the following pairs of statements is true according to Dalton's atomic theory ?
(a) (i)and (ii) (b) (ii)and(iii)
(c) (ii) and (iv) (d) (i) and (iv)

21. How many moles of $Al_2(SO_4)_3$ would be in 50 g of the substance ?
(a) 0.083 mole (b) 0.952 mole
(c) 0.481 mole (d) 0.140 mole

22. Experimentally it was found that a metal oxide has formula $M_{0.98}O$. Metal M, present as M^{2+} and M^{3+} in its oxide. Fraction of the metal which exists as M^{3+} would be :
(a) 7.01% (b) 4.08% (c) 6.05% (d) 5.08%

23. 20.0 g of a magnesium carbonate sample decomposes on heating to give carbon dioxide and 8.0 g magnesium oxide. What will be the percentage purity of magnesium carbonate in the sample?
(a) 75 (b) 96 (c) 60 (d) 84

24. A sample of AlF_3 contains 3.0×10^{24} F^- ions. The number of formula unit of this sample are
(a) 9×10^{24} (b) 3×10^{24}
(c) 0.75×10^{24} (d) 1.0×10^{24}

25. Read the following and choose the incorrect statements.
(i) Both weight and mass are same quantities used for measurement of amount of matter present in a substance
(ii) Mass and weight of a substance vary from one place to another due to change in gravity.
(iii) SI unit of mass is kilogram and while SI unit of weight is gram.
(a) (i) and (iii) (b) (ii) and (iii)
(c) (i)and (ii) (d) All of these

26. Number of atoms in 558.5 grams of Fe (at. wt. of Fe= 55.85 g mol^{-1}) is
(a) twice that in 60 g carbon
(b) 6.023×10^{22}
(c) half that in 8 g He
(d) $558.5 \times 6.023 \times 10^{23}$

27. 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

28. Which of the following option represents correct limiting reagents in reactions (i), (ii) and (iii) respectively.
(i) C (26g) + O_2 (20g) $\rightarrow$ CO_2
(ii) N_2 (60g) + $3H_2$ (80g) $\rightarrow$ $2NH_3$
(iii) P_4 (100g) + $3O_2$ (200g) $\rightarrow$ P_4O_6
(a) C, N_2, O_2 (b) C, N_2, P_4
(c) O_2, H_2, P_4 (d) O_2, N_2, P_4

29. A compound made up of two elements A and B is found to contain 25% A (atomic mass= 12.5) and 75% B (atomic mass = 37.5). The simplest formula of the compound is
(a) AB (b) AB_2 (c) AB_3 (d) A_3B

30. On analysis a certain compound was found to contain iodine and oxygen in the ratio of 254 g of iodine (atomic mass 127) and 80 g oxygen (at mass = 16). What is the formula of the compound.
(a) IO (b) I_2O
(c) I_5O_3 (d) I_2O_5

31. The following equation is a completely balanced equation :
$3Sn + 12HCl + 4HNO_3 \longrightarrow 3SnCl_4 + 4NO + 8H_2O$
In the above reaction, the number of equivalent per formula weight of HNO_3 is
(a) 3 (b) 4 (c) 1 (d) 2

RESPONSE GRID					
	20. ⓐⓑⓒⓓ	21. ⓐⓑⓒⓓ	22. ⓐⓑⓒⓓ	23. ⓐⓑⓒⓓ	24. ⓐⓑⓒⓓ
	25. ⓐⓑⓒⓓ	26. ⓐⓑⓒⓓ	27. ⓐⓑⓒⓓ	28. ⓐⓑⓒⓓ	29. ⓐⓑⓒⓓ
	30. ⓐⓑⓒⓓ	31. ⓐⓑⓒⓓ			

Space for Rough Work

32. In a compound C, H and N are present in 9 : 1 : 3.5 by weight. If molecular weight of the compound is 108, then the molecular formula of the compound is :
(a) $C_2H_6N_2$ (b) C_3H_4N (c) $C_6H_8N_2$ (d) $C_9H_{12}N_3$

33. 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

34. How many moles of lead (II) chloride will be formed from a reaction between 6.5 g of PbO and 3.2 g of HCl ?
(a) 0.044 (b) 0.333
(c) 0.011 (d) 0.029

35. Equal weights of NaCl and KCl are dissolved separately in equal volumes of solutions. Molarity of the two solutions will be:
(a) equal
(b) that of NaCl will be less than that of KCl
(c) that of NaCl will be more than that of KCl solution
(d) that of NaCl will be about half of that of KCl solution

36. Gastric juice contains 3.0 g of HCl per litre. If a person produces 2.5 litre of gastric juice per day. How many antacid tablets each containing 400 mg of $Al(OH)_3$ are needed to neutralize all the HCl produced in one day ?
(a) 18 (b) 14 (c) 20 (d) 17

37. Which of the following is the correct empirical and molecular formulae of a compound, if the molecular mass of a compound is 80 and compound contains 60% of C, 5% of H and 35% of N ?
(a) C_2H_2N ; $C_4H_4N_2$ (b) $C_3H_4N_2$; $C_6H_8N_4$
(c) $C_2H_4N_2$; $C_4H_8N_4$ (d) C_2H_2N ; C_2H_2N

38. 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

39. Arrange the following in the order of increasing mass (atomic mass: O = 16, Cu = 63, N = 14)
I. one atom of oxygen
II. one atom of nitrogen
III. 1×10^{-10} mole of oxygen
IV. 1×10^{-10} mole of copper
(a) II < I < III < IV (b) I < II < III < IV
(c) III < II < IV < I (d) IV < II < III < I

40. When 30 litres of H_2 and 30 litres of N_2 are reacted NH_3 is formed and the yield is only 50%. The composition of the gaseous mixture will be
(a) 5L of N_2, 5L of H_2 and 5 L of NH_3.
(b) 5L of N_2, 10L of H_2 and 10 L of NH_3.
(c) 10L of N_2, 15L of H_2 and 5 L of NH_3.
(d) 5L of N_2, 15L of H_2 and 10 L of NH_3.

41. 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}

42. 1.12 ml of a gas is produced at S.T.P. by the action of 4.12 mg of alcohol ROH with methyl magnesium Iodide. The molecular mass of alcohol is
(a) 16.0 (b) 41.2
(c) 82.4 (d) 156.0

43. If 224 mL of a triatomic gas has a mass of 1 g at 273K and 1 atmospheric pressure then the mass of one atom is
(a) 8.30×10^{-23} g (b) 2.08×10^{-23} g
(c) 5.53×10^{-23} g (d) 6.24×10^{-23} g

44. A compound contains atoms of three elements as A, B and C. If the oxidation number of A is +2, B is +5 and that of C is −2, the possible formula of the compound is
(a) $A_3(B_4C)_2$ (b) $A_3(BC_4)_2$
(d) ABC_2 (d) $A_2(BC_3)_2$

45. 5 moles of SO_2 and 5 moles of O_2 react to form SO_3. Number of moles left in total when only 60% SO_2 is used is
(a) 6.5 (b) 10
(c) 8 (d) 8.5

RESPONSE GRID					
	32. ⓐⓑⓒⓓ	33. ⓐⓑⓒⓓ	34. ⓐⓑⓒⓓ	35. ⓐⓑⓒⓓ	36. ⓐⓑⓒⓓ
	37. ⓐⓑⓒⓓ	38. ⓐⓑⓒⓓ	39. ⓐⓑⓒⓓ	40. ⓐⓑⓒⓓ	41. ⓐⓑⓒⓓ
	42. ⓐⓑⓒⓓ	43. ⓐⓑⓒⓓ	44. ⓐⓑⓒⓓ	45. ⓐⓑⓒⓓ	

Space for Rough Work

DAILY PRACTICE PROBLEMS — CHEMISTRY SOLUTIONS — DPP/CC01

1. **(c)** Each has three significant figures. When zero is used to locate the decimal point it is not considered as significant figure.

2. **(d)** Both Y and X are neither precise nor accurate as the two values in each of them are not close. With respect to X & Y, the values of Z are close & agree with the true value. Hence, both precise & accurate.

3. **(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.

4. **(b)** $$\frac{\text{Wt. of metal oxide}}{\text{Wt. of metal chloride}}$$

$$=\frac{\text{Eq. wt of metal + Eq. wt of oxygen}}{\text{Eq. wt of metal + Eq. wt of chlorine}}$$

$$\frac{3}{5}=\frac{E+8}{E+35.5} \qquad \therefore E=33.25$$

5. **(d)** At NTP 22400 cc of $N_2O = 6.02\times10^{23}$ molecules

$$\therefore \text{ 1 cc } N_2O=\frac{6.02\times10^{23}}{22400}\text{ molecules}$$

$$=\frac{3\times6.02\times10^{23}}{22400}\text{ atoms }=\frac{1.8}{224}\times10^{22}\text{ atoms}$$

No. of electrons in a molecule of $N_2O = 7+7+8=22$

Hence no. of electrons

$$=\frac{6.02\times10^{23}}{22400}\times22\text{ electrons }\bullet\ \frac{1.32\bullet\ 10^{23}}{224}$$

6. **(c)** In law of reciprocal proportions, the two elements combining with the third element, must combine with each other in the same ratio or multiple of that ratio of S and O when combine with C is 2 : 1. Ratio of S and O in SO_2 is 1 : 1

7. **(d)** Normality of oxalic acid solution

$$=\frac{6.3\times1000}{63\times250}=0.4\text{ N}$$

Now from

$N_1V_1 = N_2V_2$

$0.4\times10 = 0.1\times V_2$

$V_2 = 40$ mL

8. **(c)** The relation between molarity (M) and molality (m) is

$$d = M\left(\frac{1}{m}+\frac{M_2}{1000}\right),\ M_2 = \text{Mol. mass of solute}$$

On putting value

$$1.252 = 3\left(\frac{1}{m}+\frac{58.5}{1000}\right)$$

on solving m = 2.79 molal.

9. **(b)** The number of atoms in 0.1 mole of a triatomic gas $=0.1\times3\times6.023\times10^{23}$.

$=1.806\times10^{23}$

10. **(a)**

11. **(c)** 50% of X (Atomic mass 10), 50% of Y (Atomic mass 20).

Relative number of atoms of $X=\frac{50}{10}=5$ and than $Y=\frac{50}{20}=2.5$

Simple Ratio 2 : 1. Formula X_2Y

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

$= 0.2\times2 = 0.4$ g

(b) $6.023\times10^{23} = 1$ mole

Thus $6.023\times10^{22} = 0.1$ mole

Weight of $N_2 = 0.1\times28 = 2.8$ g

(c) Weight of silver = 0.1 g

(d) Weight of oxygen $= 32\times0.1 = 3.2$ g

13. **(b)** Moles of nitride ion

$$=\frac{4.2}{14}=0.3\text{ mole}=0.3\times N_A\text{ nitride ions.}$$

Valence electrons $=8\times0.3\ N_A = 2.4\ N_A$ (5 + 3 due to charge). One N^{3-} ion contains 8 valence electrons.

14. **(a)** $$\underset{2}{2K_2CrO_4}+\underset{2}{2HCl}\longrightarrow\underset{1}{K_2Cr_2O_7}+\underset{2}{2KCl}+\underset{1}{H_2O}$$

15. **(b)** Terminal zeros are not significant if there is no decimal i.e., 290 contains two significant figures whereas in 29900. there are 5 significant figures; $1.23\times1.331 = 1.63713$ but keeping the mind the 1.23 has only few significant figures i.e., only three significant figures, so result should also be reported in three significant figures only. Thus 1.6373 should be rounded off to 1.64. Value 1.783 is rounded off to 2, so has only one significant figure.

16. **(a)** No. of molecules in different cases

(a) $\because$ 22.4 litre at STP contains

$= 6.023\times10^{23}$ molecules of H_2

$$\therefore \text{ 15 litre at STP contains}=\frac{15}{22.4}\times6.023\times10^{23}$$

$= 4.03\times10^{23}$ molecules of H_2

(b) $\because$ 22.4 litre at STP contains

$=6.023\times10^{23}$ molecules of N_2

$$\because \text{ 5 litre at STP contains}=\frac{5}{22.4}\times6.023\times10^{23}$$

$= 1.344\times10^{23}$ molecules of N_2

(c) $\because$ 2 g mol of $H_2 = 6.023\times10^{23}$ molecules of H_2

$\because$ 0.5 gm of $H_2 = \frac{0.5}{2} \times 6.023 \times 10^{23}$

$= 1.505 \times 10^{23}$ molecules of H_2

(d) Similarly 10 g of O_2 gas

$= \frac{10}{32} \times 6.023 \times 10^{23}$ molecules of O_2

$= 1.88 \times 10^{23}$ molecules of O_2

Thus (a) will have maximum number of molecules.

17. (a) 21% of 1 litre is 0.21 litre.
22.4 litres = 1 mole at STP

$\therefore$ 0.21 litre $= \frac{0.21}{22.4} = 0.0093$ mole

18. (a) $BaCO_3 \longrightarrow BaO + CO_2$

192 g of $BaCO_3$ 1 gives mole of $CO_2 = 22.4$ L
9.85 g of $BaCO_3$ will give 0.05 mole of CO_2 which is equal to 1.12 litre.

19. (b) Moles of Ca^{2+} to be precipitated $= \frac{20 \times 1}{1000} = 0.02$

Moles of Cu^{2+} to be precipitated $= \frac{20 \times 0.5}{1000} = 0.01$

Hence molar amount of H_2S will be in the ratio 2 : 1

$\left(\text{Remember Moles} = \frac{\text{Molarity} \times \text{volume in ml}}{1000}\right)$

20. (c) For statement (i) : H, O, C, N = All have different chemical properties.
For statement (ii) : It is true as per Dalton's postulate.
For statement (iii) : N : O = 1 : 1 (NO)
For statement (iv) : Dalton's postulates says, atoms can neither be created nor destroyed.

21. (d) No. of moles $= \frac{\text{weight}}{\text{mol. wt.}} = \frac{50}{342} = 0.14$ mole

22. (b) For one mole of the oxide
Moles of M = 0.98
Moles of $O^{2-} = 1$
Let moles of $M^{3+} = x$
$\therefore$ Moles of $M^{2+} = 0.98 - x$

on balancing charge
$(0.98 - x) \times 2 + 3x - 2 = 0$
$x = 0.04$

$\therefore$ % of $M^{3+} = \frac{0.04}{0.98} \cdot 100 \cdot 4.08\%$

23. (d) $MgCO_3 \cdot \cdot\cdot MgO \cdot CO_2$

84 g of $MgCO_3$ form 40 g of MgO

$\therefore$ 20g of $MgCO_3$ form $\frac{40 \cdot 20}{84}$ g of MgO

$= 9.52$ g of MgO
Since 8.0 g of MgO is formed

Purity of sample $\cdot \frac{8}{9.52} \cdot 100 = 84.0\%$

24. (d) In, AlF_3 the number of F is 3, for one AlF_3 molecule
$3F^- \equiv 1$ formula unit of AlF_3

$3.0 \times 10^{24}\ F^- \equiv \frac{1}{3} \times 3.0 \times 10^{24}\ AlF_3$ units

25. (d) Mass of a substance is the amount of matter present in it while weight is the force exerted by gravity on an object.
Mass is constant while weight may vary from one place to another due to gravity.
SI unit of both mass and weight is kilogram.

26. (a) Fe (no. of moles) $= \frac{558.5}{55.85} = 10$ moles $= 10\ N_A$ atoms.
No. of moles in 60 g of C = 60/12 = 5 moles = $5\ N_A$ atoms.

27. (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

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

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

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

1 mole 1 mole 1 mole

$\therefore$ 0.049 mole 0.049mole 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

28. (d) $n_C = \frac{26\text{g}}{12\text{g/mol}} = 2.16$

$n_{O_2} = \frac{20\text{g}}{32\text{g/mol}} = 0.625$

O_2 will be a limiting reagent in reaction (i)

$$n_{N_2} = \frac{60g}{28g/mol} = 2.14$$

$$n_{H_2} = 40$$

According to balanced equation,
1 mole of N_2 requires 3 mole of H_2
2.14 mole of N_2 require 6.42 mole of H_2
N_2 will be a limiting reagent in reaction (ii)

$$n_{P_4} = \frac{100g}{4\times 31} = 0.86 \qquad n_{O_2} = 6.25$$

According to balanced equation
1 mole of P_4 require 3 mole of O_2
0.86 mole of P_4 require 2.58 mole of O_2
So P_4 is a limiting reagent in reaction (iii)

29. (a) Proceed as follows :

Element	%	At.wt.	RNA	Simplest ratio
A	25	12.5	$\frac{25}{12.5}=2$	1
B	75	37.5	$\frac{75}{37.5}=2$	1

$\therefore$ The simplest formula of compound is AB

30. (d) Moles of Iodine present $= \frac{254}{127} = 2$

Moles of oxygen $= \frac{80}{16} = 5$

$\therefore$ The molecular formula is $= I_2O_5$

31. (a) Change in O.N. of N in HNO_3 is 3, hence one formula weight has 3 equivalents.

$$3Sn + 12HCl + 4\overset{+5}{H}N\bullet_3 \longrightarrow 3SnCl_4 + 4\overset{+2}{N}\bullet + 8H_2\bullet$$
$$\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad +3e^-$$

Since change in O.N. = 3

32. (c) Ratio of no. of atoms in the molecule

$$= \frac{9}{12} : \frac{1}{1} : \frac{3.5}{14} = 0.75 : 1 : 0.25 = 3 : 4 : 1$$

Empirical formula $= C_3H_4N$;

M.F. $= (C_3H_4N)_n$

n × Empirical formula mass = Molecular mass
$n(3\times 12 + 4 + 14) = 108$
$n \times 54 = 108$
$n = 2$

M.F. $= C_6H_8N_2$

33. (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.

34. (d) Writing the equation for the reaction, we get

PbO	+	2HCl	⟶	$PbCl_2$	+	H_2O
207 + 16		2 × 36.5		207 + 71		
= 223 g		= 73g		= 278g		

No. of moles of PbO $= \frac{6.5}{223} = 0.029$

No. of moles of HCl $= \frac{3.2}{36.5} = 0.0877$

Thus PbO is the limiting reactant 1 mole of PbO produce 1 mole $PbCl_2$.
0.029 mole PbO produces 0.029 mole $PbCl_2$.

35. (c) When the weight of different solutes are equal in equal volumes of solutions, the molarity is inversely related to molecular mass of the solute. Mol. mass of NaCl is less than KCl. Hence, molarity of NaCl solution will be more.

36. (b) geq of HCl $= \frac{3}{36.5}\times 2.5 = 0.20548 =$ geq of $Al(OH)_3$

Weight of $Al(OH)_3 = \frac{0.20548\times 78}{3}$
$= 5.342\ g = 5342\ mg$

$\therefore$ No of tablets $= \frac{5342}{400} = 13.35 \approx 14$

37. (a) Let 100 g of compound be there.

Number of moles of Nitrogen $= \frac{35}{14} = 2.5$

Number of moles of Hydrogen $= \frac{5}{1.008} = 4.9$

Number of moles of Carbon $= \frac{60}{12.01} = 4.9$

Since 2.5 is the smallest value division by it give ratio
N : H : C
1 : 1.96 : 1.96
= 1 : 2 : 2
Empirical formula $= C_2H_2N$
Empirical formula weight $= 2\times 12 + 2 + 14 = 40$
Molecular mass = 80
Molecular formulae $= n\ (C_2H_2N)$

$$\because = 2\ (C_2H_2N)\left(n = \frac{80}{40}\right) = C_4H_4N_2$$

38. (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)

39. (a) Mass of 6.023×10^{23} atoms of oxygen = 16 g
Mass of one atom of oxygen

$= \frac{16}{6.023 \times 10^{23}} = 2.66 \times 10^{-23}$ g

Mass of 6.023×10^{23} atoms of nitrogen = 14 g

Mass of one atom of nitrogen

$= \frac{14}{6.023 \times 10^{23}} = 2.32 \times 10^{-23}$ g

Mass of 1×10^{-10} mole of oxygen = 16×10^{-10}

Mass of 1 mole of copper = 63 g

Mass of 1 mole of oxygen = 16 g

Mass of 1×10^{-10} mole of copper = $63 \times 1 \times 10^{-10}$

$= 63 \times 10^{-10}$

So, the order of increasing mass is II < I < III < IV.

40. (d) $N_2(g) + 3H_2(g) \longrightarrow 2NH_3(g)$;

N_2 is the limiting reagent in this reaction. 10 L N_2 will react with 30 L H_2 to produce 20 L of NH_3. As the yield of reaction is 50% composition of resultant mixture will be 5 L of N_2, 15 L of H_2 and 10 L of NH_3.

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

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

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

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

42. (c) Let the alcohol be ROH and x its molecular weight

$$\underset{x\,g}{ROH} + CH_3MgI \rightarrow \underset{16\,g}{CH_4} + ROMgI$$

$\frac{4.12}{1000}$ g of alcohol will produce $\frac{16}{x} \times \frac{4.12}{1000}$ g of methane

Methane actually obtained is = $\frac{16 \times 1.12}{22400}$ g

equal = $\frac{16 \times 4.12}{x \times 1000} = \frac{16 \times 1.12}{22400}$ $\therefore$ x = 82.4

43. (c) The conditions given are standard conditions

224 mL has mass = 1 g;

22400 mL will have mass = 100 g. This is mol. wt of gas

6.023×10^{23} molecules have $3 \times 6.023 \times 10^{23}$ atoms since gas is triatomic

$\therefore$ weight of one atom

$= \frac{100}{3 \times 6.023 \times 10^{23}} = 5.5 \times 10^{-23}$ g

44. (b) Sum of oxidation states must be equal to zero which is given by $A_3(BC_4)_2 = A_3B_2C_8$ (6 + 10 – 16 = 0)

45. (d)

$$SO_2 + \frac{1}{2}O_2 \rightleftharpoons SO_3$$

Initial	5 mole	5mole	0mole
Final	5 – 3 = 2 mole	5 – 1.5 mole = 3.5 mole	3 mole

Total number of moles = 2 + 3.5 + 3.0 = 8.5