

Some Basic Concepts of Chemistry

, ,	Topic-1: Measurement, Mole Co	once	ept and Percentage Composition
() 1.	1MCQs with One Correct AnswerThe number of molecules and moles in 2.8375 litres of O_2 at STP are respectively[Main April 10, 2023 (I)](a) 7.527 × 10 ²² and 0.250 mol		 (a) Chemical reactions involve reorganization of atoms. These are neither created nor destroyed in a chemical reaction. (b) All the atoms of a given element have identical properties including identical mass. Atoms of different elements differ in mass.
2.	(b) 1.505×10^{23} and 0.250 mol (c) 7.527×10^{23} and 0.125 mol (d) 7.527×10^{22} and 0.125 mol Which of the following have same number of significant figures ? [Main April 08, 2023 (II)] (A) 0.00253 (B) 1.0003 (C) 15.0 (D) 163	8. 9.	 (c) When gases combine or reproduced in a chemical reaction they do so in a simple ratio by volume, provided all gases are at the same <i>T & P</i>. (d) Matter consists of indivisible atoms. The percentage composition of carbon by mole in methane is: [Main April 8, 2019 (II)] (a) 75% (b) 80% (c) 25% (d) 20% An unknown chlorohydrocarbon has 3.55% of chlorine. If
3.	Choose the correct answer from the options given below (a) A, B and C only (b) C and D only (c) A, C and D only (d) B and C only A metal chloride contains 55.0% of chlorine by weight. 100 mL vapours of the metal chloride at STP weight 0.57 g. The molecular formula of the metal chloride is (Given : Atomic mass of chlorine is 35.5u)	10.	each molecule of the hydrocarbon has one chlorine atom only, chlorine atoms present in 1g of chlorohydrocarbon are: (Atomic wt. of Cl = 35.5 u; Avogadro constant = $6.023 \times 10^{23} \text{ mol}^{-1}$) (a) 6.023×10^9 (b) 6.023×10^{23} (c) 6.023×10^{21} (d) 6.023×10^{20} 5 moles of AB ₂ weigh 125 × 10^{-3} kg and 10 moles of A ₂ B ₂
4.	(a) MCl_2 (b) MCl_4 (c) MCl_3 (d) MCl Hemoglobin contains 0.34% of iron by mass. The number of Fe atoms in 3.3 g of hemoglobin is : (Given : Atomic mass of Fa is 56 u N in 6.022 × 10 ²³ mol ⁻¹)	n	weigh 300×10^{-3} kg. The molar mass of A (M _A) and molar mass of B (M _B) in kg mol ⁻¹ are: [Main April 12, 2019 (I)] (a) M _A = 10×10^{-3} and M _B = 5×10^{-3} (b) M _A = 50×10^{-3} and M _B = 25×10^{-3}
5.	$[Main July 26, 2022 (II)] (a) 1.21 \times 10^{5} (b) 12.0 \times 10^{16} (c) 1.21 \times 10^{20} (d) 3.4 \times 10^{22} Using the rules for significant figures, the correct answer for the expression \frac{0.02858 \times 0.112}{0.5702} will be :[Main June 29, 2022 (II)]$	11. 12.	(c) $M_A = 25 \times 10^{-3}$ and $M_B = 50 \times 10^{-3}$ (d) $M_A = 5 \times 10^{-3}$ and $M_B = 10 \times 10^{-3}$ Which has maximum number of atoms? [2003S] (a) 24 g of C (12) (b) 56 g of Fe (56) (c) 27 g of Al (27) (d) 108 g of Ag (108) How many moles of electron weigh one kilogram?
6.	(a) 0.005613 (b) 0.00561 (c) 0.0056 (d) 0.006 Compound A contains 8.7% Hydrogen, 74% Carbon and 17.3% Nitrogen. The molecular formula of the compound is, Given : Atomic masses of C, H and N are 12, 1 and 14 amu respectively. [Main June 28, 2022 (II)] The molar mass of the compound A is 162 g mol ⁻¹ . (a) $C_4H_6N_2$ (b) C_2H_3N (c) C_5H_7N (d) $C_{10}H_{14}N_2$	13.	(a) 6.023×10^{23} (b) $\frac{1}{9.108} \times 10^{31}$ (c) $\frac{6.023}{9.108} \times 10^{54}$ (d) $\frac{1}{9.108 \times 6.023} \times 10^{8}$ If two compounds have the same empirical formula but different molecular fomulae they must have (a) different percentage composition [1987 - 1 Mark] (b) different molecular weight (c) same unequive
7.	Amongst the following statements, that which was not proposed by Dalton was: [Main Jan. 07, 2020 (I)]		(c) same viscosity(d) same vapour density

Α2

- [1979] 14. The largest number of molecules is in (b) 28 g of carbon monoxide (a) 36 g of water (c) 46 g of ethyl alcohol (d) 54 g of nitrogen pentoxide 15. The total number of electrons in one molecule of carbon
 - dioxide is [1979] (a) 22 (d) 88 (b) 44 (c) 66
- **16.** A gaseous mixture contains oxygen and nitrogen in the ratio of 1:4 by weight. Therefore, the ratio of their number of molecules is [1979] (a) 1:4 (b) 1:8 (c) 7:32 (d) 3:16
- 17. A compound was found to contain nitrogen and oxygen in the ratio 28 g and 80 g respectively. The formula of compound is [1978]
 - (a) NO (b) N_2O_3 (c) N_2O_5 (d) N_2O_4
- Numeric / New Stem Based Questions 3
- An organic compound gives 0.220 g of CO₂ and 0.126 g of 18. H₂O on complete combustion If the % of carbon is 24 then the % hydrogen is $\times 10^{-1}$. (Nearest integer)

[Main April 13, 2023 (I)]

19. A sample of a metal oxide has formula $M_{0.83}O_{1.00}$. The metal M can exist in two oxidation states +2 and +3. In the sample of $M_{0.83}O_{1.00}$, the percentage of metal ions existing in +2 oxidation state is % (nearest integer)

[Main Jan. 31, 2023 (II)]

- Number of hydrogen atoms per molecule of a hydrocarbon 20. A having 85.8% carbon is (Given : Molar mass $of A = 84 g mol^{-1}$) [Main Jan. 25, 2023 (II)]
- 21. Chlorophyll extracted from the crushed green leaves was dissolved in water to make 2L solution of Mg of concentration 48 ppm. The number of atoms of Mg in this solution is $x \times 10^{20}$ atoms. The value of x is (Nearest Integer)

(Given: Atomic mass of Mg is 24 g mol^{-1} ;

 $N_A = 6.02 \times 10^{23} \text{ mol}^{-1}$ [Main July 26, 2022 (I)] A protein 'A' contains 0.30% of glycine (molecular 22. weight 75). The minimum molar mass of the protein 'A' is $_$ × 10³ g mol⁻¹ [nearest integer]

[Main June 25, 2022 (II)]

- 23. Complete combustion of 750 g of an organic compound provides 420 g of CO₂ and 210 g of H₂O. The percentage composition of carbon and hydrogen in organic compound is 15.3 and respectively. (Round off to the Nearest Integer). [Main March 16, 2021 (I)]
- 24. The complete combustion of 0.492 g of an organic compound containing 'C', 'H' and 'O' gives 0.793g of CO₂ and 0.442 g of H₂O. The percentage of oxygen composition in the organic compound is

[Main June 28, 2022 (II)] (nearest integer) 25. Two elements A and B which form 0.15 moles of A₂B and AB₃ type compounds. If both A₂B and AB₃ weigh equally,

- then the atomic weight of A is _ _____ times of atomic [Main June 27, 2022 (I)] weight of B. 26. On complete combustion 0.30 g of an organic compound
- gave 0.20 g of carbon dioxide and 0.10 g of water. The

percentage of carbon in the given organic compound is (Nearest Integer) [Main June 26, 2022 (I)]

- The number of N atoms is 681 g of $C_7H_5N_3O_6$ is $x \times 10^{21}$. 27. $(N_A = 6.02 \times 10^{23} \text{ mol}^{-1})$ The value of x is _____ (Nearest Integer) [Main June 25, 2022 (I)]
- The number of atoms in 8 g of sodium is $x \times 10^{23}$. 28. ____. (Nearest integer) The value of x is [Given : $N_{\rm A} = 6.02 \times 10^{23} \, {\rm mol}^{-1}$ Atomic mass of Na = 23.0 u] [Main Sep. 1, 2021 (II)]
- The number of significant figures in 0.00340 is 29. [Main July 25, 2021 (II)]
- The number of significant figures in 50000.020 \times 10⁻³ is 30. [Main Feb. 26, 2021 (I)]
- The ratio of the mass percentages of 'C & H' and 'C & O' 31. of a saturated acyclic organic compound 'X' are 4: 1 and 3: 4 respectively. Then, the moles of oxygen gas required for complete combustion of two moles of organic compound 'X' is _____. [Main Sep. 02, 2020 (II)]
- If the value of Avogadro number is 6.023×10^{23} mol⁻¹ and 32. the value of Boltzmann constant is 1.380×10^{-23} J K⁻¹. then the number of significant digits in the calculated value of the universal gas constant is [Adv. 2014]
- The composition of a sample of Wurtzite is $Fe_{0.93}O_{1.00}$. 33. What percentage of the iron is present in the form of Fe (III)? [1994 - 2 Marks]
- 34. A compound contains 28 percent of nitrogen and 72 percent of metal by weight. 3 atoms of metal combine with 2 atoms of N. Find the atomic weight of metal. [1980]

Fill in the Blanks

- 35. The weight of 1×10^{22} molecules of CuSO₄.5H₂O is [1991 - 1 Mark]
- 36. The modern atomic mass unit is based on
- 37. The total number of electrons present in 18 mL of water is [1980]
- 6 MCQs with One or More than One Correct Answer
- 38. To check the principle of multiple proportions, a series of pure binary compounds $(P_m Q_n)$ were analyzed and their composition is tabulated below. The correct option(s) is (are) [Adv. 2022]

Compound	Weight % of P	Weight % of Q
1	50	50
2	44.4	55.6
3	40	60

- (a) If empirical formula of compound **3** is P_3Q_4 , then the empirical formula of compound 2 is P_3Q_5 .
- (b) If empirical formula of compound **3** is $\dot{P}_3 \dot{Q}_2$ and atomic weight of element P is 20, then the atomic weight of Q is 45.
- (c) If empirical formula of compound 2 is PQ, then the empirical formula of the compound **1** is P_5Q_4 .
- (d) If atomic weight of P and Q are 70 and 35, respectively, then the empirical formula of compound 1 is P_2Q .

Chemistry

[1980]

	7	Match the Following			
39.	Mat	ch List I with List II	[N	Iain April 10, 2023 (II)] List II	40
	(A)	$16g \text{ of } CH_4(g)$	(I)	Weighs 28g	
	(B)	$1 \text{g of H}_2(\text{g})$	(II)	60.2×10^{23} electrons	
	(C)	1 mole of $N_2(g)$	(III)	Weighs 32g	41
	(D)	$0.5 \text{ mol of } SO_2(g)$	(IV)	Occupies 11.4 L volume at STP	
	Cho	ose the correct answer fr	om th	e options given below:	
	(a)	A-I, B-III, C-II, D-IV	(b)	A-II, B-III, C-IV, D-I	
	(c)	A-II. B-IV. C-III. D-I	(d)	A-II, B-IV, C-I, D-III	

10 Subjective Problems

A plant virus is found to consist of uniform cylindrical particles of 150 Å in diameter and 5000 Å long. The specific volume of the virus is $0.75 \text{ cm}^3/\text{g}$. If the virus is considered to be a single particle, find its molar mass. [1999 - 3 Marks] [1980]

Find

(i) The total number of neutrons and

Molar Atomic mass $(g \mod -1): 0 = 16$

(ii) The total mass of neutron in 7 mg of 14 C.

(Assume that mass of neutron = mass of hydrogen atom)

Topic-2: Stoichiometry, Equivalent Concept, Neutralization and Redox Titration

6.

7.

9.

MCQs with One Correct Answer

What is the mass ratio of ethylene glycol ($C_2H_6O_2$, molar 1. mass = 62 g/mol) required for making 500 g of 0.25 molal aqueous solution and 250 mL of 0.25 molar aqueous solution ? [Main Jan. 25, 2023 (II)]

(a) 1:1 (b) 3:1 (c) 2:1
2.
$$C(s)+O_2(g) \rightarrow CO_2(g)+400 \text{ kJ}$$

$$C(s) + \frac{1}{2}O_2(g) \rightarrow CO(g) + 100 \text{ kJ}$$

[Main July 29, 2022 (II)]

(d) 1:2

When coal of purity 60% is allowed to burn in presence of insufficient oxygen, 60% of carbon is converted into 'CO' and the remaining is converted into ' CO_2 '.

(d) 6600 kJ

The heat generated when 0.6 kg of coal is burnt is (a) 1600 kJ (b) 3200 kJ

- (c) 4400 kJ
- 250 g solution of D-glucose in water contains 10.8% of 3. carbon by weight. The molality of the solution is nearest to

(Given: Atomic Weights are H, 1u; C, 12u; O, 16u) [Main July 27, 2022 (I)]

(a) 1.03 (b) 2.06 SO₂Cl₂ on reaction with excess of water results into acidic 4. mixture

 $SO_2Cl_2 + 2H_2O \rightarrow H_2SO_4 + 2HCl$

16 moles of NaOH is required for the complete neutralisation of the resultant acidic mixture. The number of moles of SO₂Cl₂ used is:

(b) 8 (c) 4 time
$$f(x) = \frac{1}{2} \int_{-\infty}^{\infty} \frac{1}{2} dx$$

(a) 16

5. Production of iron in blast furnace follows the following [Main June 29, 2022 (I)] equation $Fe_3O_4(s) + 4CO(g) \rightarrow 3Fe(1) + 4CO_2(g)$ when 4.640 kg of Fe₃O₄ and 2.520 kg of CO are allowed to react then the amount of iron (in g) produced is : [Given : Molar Atomic mass $(g \text{ mol}^{-1})$: Fe = 56

Molar Atomic mass $(g \mod -1)$: C = 12 (a) 1400 (b) 2200 (c) 3360 (d) 4200 A commercially sold conc. HCl is 35% HCl by mass. If the density of this commercial acid is 1.46 g/mL, the molarity of this solution is : [Main June 26, 2022 (I)] (Atomic mass : Cl = 35.5 amu, H = 1 amu) (a) 10.2 M (b) 12.5 M (c) 14.0 M (d) 18.2 MIf a rocket runs on a fuel $(C_{15} H_{30})$ and liquid oxygen, the weight of oxygen required and CO₂ released for every litre of fuel respectively are: [Main June 24, 2022 (I)] (Given: density of the fuel is 0.756 g/mL) (a) 1188 g and 1296 g (b) 2376 g and 2592 g (c) 2592g and 2376 g (d) 3429 g and 3142 g Complete combustion of 1.80 g of an oxygen containing compound $(C_{y}H_{y}O_{z})$ gave 2.64 g of CO₂ and 1.08 g of H₂O. The percentage of oxygen in the organic compound is:

[Main Feb. 25, 2021 (I)]

(a) 50.33 (b) 53.33

(c) 51.63 (d) 63.53

- The ammonia (NH₂) released on quantitative reaction of 0.6 g urea (NH₂CONH₂) with sodium hydroxide (NaOH) [Main Jan. 07, 2020 (II)] can be neutralized by:
- (a) 200 mL of 0.4 N HCl (b) 200 mL of 0.2 N HCl
- (c) 100 mL of 0.2 N HCl (d) 100 mL of 0.1 N HCl
- 10. The minimum amount of $O_2(g)$ consumed per gram of reactant is for the reaction : (Given atomic mass : Fe = 56, O = 16, Mg = 24, P = 31, C = 12, H = 1)

[Main April 10, 2019 (II)]

- (a) $4 \operatorname{Fe}(s) + 3 \operatorname{O}_2(g) \rightarrow 2 \operatorname{Fe}_2 \operatorname{O}_3(s)$
- (b) $P_4(s) + 5 O_2(g) \rightarrow P_4 O_{10}(s)$
- (c) $C_{3}H_{8}(g) + 5 O_{2}(g) \rightarrow 3 CO_{2}(g) + 4 H_{2}O(l)$
- (d) $2 \operatorname{Mg}(s) + \operatorname{O}_2(g) \rightarrow 2 \operatorname{MgO}(s)$

A3

11. A sample of NaClO₃ is converted by heat to NaCl with a loss of 0.16 g of oxygen. The residue is dissolved in water and precipitated as AgCl. The mass of AgCl (in g) obtained will be: (Given: Molar mass of AgCl = 143.5 g mol^{-1})

[Main	Online A	April 15	, 2018	(I)]
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- (a) 0.35 (b) 0.54 (c) 0.41 (d) 0.48 12. 1 gram of a carbonate (M_2CO_3) on treatment with excess HCl produces 0.01186 mole of CO₂. The molar mass of M_2CO_3 in g mol⁻¹ is : [Main 2017] (a) 1186 (b) 84.3
 - (c) 118.6 (d) 11.86
- 13. Excess of NaOH (aq) was added to 100 mL of FeCl₃ (aq) resulting into 2.14 g of Fe(OH)₃. The molarity of FeCl₃ (aq) is : [Main Online April 8, 2017] (Given molar mass of Fe=56 g mol⁻¹ and molar mass of Cl=35.5 g mol⁻¹)

(a) 0.2 M (b) 0.3 M (c) 0.6 M (d) 1.8 M

- 14. The volume of 0.1 N dibasic acid sufficient to neutralize 1 g of a base that furnishes 0.04 mole of OH⁻ in aqueous solution is : [Main Online April 10, 2016]
 (a) 400mL
 (b) 600mL
 (c) 200mL
 (d) 800mL
- **15.** 5 L of an alkane requires 25 L of oxygen for its complete combustion. If all volumes are measured at constant temperature and pressure, the alkane is :

[Main Online April 9, 2016; Similar Online April 25, 2013]

- (a) Isobutane (b) Ethane
- (c) Butane (d) Propane
- At 300 K and 1 atm, 15 mL of a gaseous hydrocarbon requires 375 mL air containing 20% O₂ by volume for complete combustion. After combustion the gases occupy 330 mL. Assuming that the water formed is in liquid form and the volumes were measured at the same temperature and pressure, the formula of the hydrocarbon is:

(a) C_4H_8 (b) C_4H_{10} (c) C_3H_6 (d) C_3H_8

17. The molecular formula of a commercial resin used for exchanging ions in water softening is C₈H₇SO₃⁻Na⁺ (Mol. wt. 206. What would be the maximum uptake of Ca²⁺ ions by the resin when expressed in mole per gram resin ?

(a)
$$\frac{2}{309}$$
 (b) $\frac{1}{412}$ (c) $\frac{1}{103}$ (d) $\frac{1}{206}$

A sample of a hydrate of barium chloride weighing 61 g was heated until all the water of hydration is removed. The dried sample weighed 52 g. The formula of the hydrated salt is : (atomic mass, Ba = 137 amu, Cl = 35.5 amu)

(a) $BaCl_2 \cdot 4H_2O$ (b) $BaCl_2 \cdot 3H_2O$

(c) $BaCl_2$. H_2O (d) $BaCl_2$. $2H_2O$

19. $A + 2B + 3C \rightleftharpoons AB_2C_3$ Reaction of 6.0 g of A, 6.0×10^{23} atoms of B, and 0.036 mol of C yields 4.8 g of compound AB_2C_3 . If the atomic

[Main Online April 11, 2015] (a) 50 amu (b) 60 amu (c) 70 amu (d) 40 amu Dissolving 120 g of a compound of mol. wt. 60 in 1000 g of **20**. water gave a solution of density 1.12 g/mL. The molarity of the solution is: [Main Online April 9, 2014] (a) 1.00 M (b) 2.00 M (c) 2.50 M (d) 4.00 M The amount of BaSO₄ formed upon mixing 100 mL of 20.8% 21. BaCl₂ solution with 50 mL of 9.8% H₂SO₄ solution will be: [Main Online April 12, 2014] (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 22. A gaseous hydrocarbon gives upon combustion 0.72 g of water and 3.08 g of CO₂. The empirical formula of the hydrocarbon is : [Main 2013] (a) C_2H_4 (b) $C_{3}H_{4}$ (c) C_6H_5 (d) C_7H_8 23. Mixture X = 0.02 mol of $[Co(NH_3)_5SO_4]Br$ and 0.02 mol of $[Co(NH_2)_5Br]SO_4$ was prepared in 2 litre of solution. [2003S]1 litre of mixture X + excess AgNO₃ \longrightarrow Y. 1 litre of mixture X + excess BaCl₂ $\longrightarrow Z$ No. of moles of *Y* and *Z* are (b) 0.02, 0.01 (a) 0.01, 0.01 (c) 0.01, 0.02 (d) 0.02, 0.02 24. An aqueous solution of 6.3 g oxalic acid dihydrate is made up to 250 mL. The volume of 0.1 N NaOH required to completely neutralize 10 mL of this solution is [2001S] (a) 40 mL (b) 20mL (c) 10mL (d) 4mL 25. In the standardization of Na₂S₂O₃ using K₂Cr₂O₇ by iodometry, the equivalent weight of K₂Cr₂O₇ is [2001S] (a) (molecular weight)/2 (b) (molecular weight)/6(c) (molecular weight)/3 (d) same as molecular weight 26. The normality of 0.3 M phosphorous acid (H_2PO_2) is, [1999 - 2 Marks] (a) 0.1 (b) 0.9 (c) 0.3 (d) 0.6 The equivalent weight of $MnSO_4$ is half of its molecular 27. weight when it is converted to : [1988 - 1 Mark] (b) MnO, (a) Mn_2O_3 (d) MnO_4^{2-} (c) MnO_4^- 28. In which mode of expression, the concentration of a solution remains independent of temperature? [1988 - 1 Mark] (a) Molarity (b) Normality (c) Formality (d) Molality 29. A molal solution is one that contains one mole of a solute

mass of A and C are 60 and 80 amu, respectively, the

atomic mass of B is (Avogadro no. = 6×10^{23}):

in:

[1986 - 1 Mark]

- (a) 1000 g of the solvent
- (b) one litre of the solvent
- (c) one litre of the solution
- (d) 22.4 litres of the solution

- If 0.50 mole of BaCl₂ is mixed with 0.20 mol of Na₂PO₄, the maximum number of moles of $Ba_3(PO_4)_2$ that can be formed is [1981 - 1 Mark]
 - (a) 0.70 (b) 0.50 (c) 0.20 (d) 0.10
- **31.** *M* is molecular weight of $KMnO_4$. The equivalent weight of $KMnO_4$ when it is converted into K_2MnO_4 is [1980] (c) *M*/5 (a) M (b) *M*/3 (d) M/7
- **32.** 2.76 g of silver carbonate on being strongly heated yields a residue weighing [1979] (a) 2.16 g (b) 2.48 g (c) 2.32 g(d) 2.64 g
- 33. 27 g of Al will react completely with how many grams of [1978] oxygen? (d) 24 g (a) 8 g (b) 16 g (c) 32 g

2 Integer Value Answer

- 34. The stoichiometric reaction of 516 g of dimethyldichlorosilane with water results in a tetrameric cyclic product X in 75% yield. The weight (in g) of X obtained is . [Adv. 2023] [Use, molar mass $(g \text{ mol}^{-1})$: H = 1, C = 12, O = 16, Si = 28, Cl = 35.5]
- H_2S (5 moles) reacts completely with acidified aqueous 35. potassium permanganate solution. In this reaction, the number of moles of water produced is x, and the number of moles of electrons involved is y. The value of (x + y) is [Adv. 2023]

Numeric / New Stem Based Questions 3

36. 1 g of a carbonate (M_2CO_3) on treatment with excess HCl produces 0.01 mol of CO₂. The molar mass of M₂CO₃ is

g mol⁻¹. (Nearest integer) [Main April 13, 2023 (II)]

The volume of hydrogen liberated at STP by treating 2.4 g 37. magnesium with excess of hydrochloric acid is $\times 10^{-2}$ L. Given: Molar volume of gas is 22.4 Lat STP.

Molar mass of magnesium is 24 g mol⁻¹. [Main April 11, 2023 (II)]

- **38**. A solution of sugar is obtained by mixing 200 g of its 25% solution and 500 g of its 40% solution (both by mass). The mass percentage of the resulting sugar solution is _ (Nearest integer) [Main April 11, 2023 (I)]
- **39.** 0.5 g of an organic compound (X) with 60% carbon will produce $___ \times 10^{-1}$ g of CO₂ on complete combustion.

[Main April 08, 2023 (I)]

- **40.** If 5 moles of BaCl₂ is mixed with 2 moles of Na_3PO_4 , the maximum number of moles of $Ba_3(PO_4)_2$ formed is..... (Nearest integer) [Main April 06, 2023 (I)]
- 41. On complete combustion, 0.492 g of an organic compound gave 0.792 g of CO₂. The % of carbon in the organic compound is (Nearest

integer) [Main Jan. 31, 2023 (I)]

42. Zinc reacts with hydrochloric acid to give hydrogen and zinc chloride. The volume of hydrogen gas produced at STP from the reaction of 11.5 g of zinc with excess HClis L(Nearest integer) (Given : Molar mass of Zn is 65.4g mol⁻¹ and Molar volume of H_2 at STP = 22.7L)

[Main Jan. 31, 2023 (I)]

43. Assume carbon burns according to following equation : $2C(s) + O_2(g) \rightarrow 2CO(g)$ When 12 g carbon is burnt in 48 g of oxygen, the volume of carbon monoxide produced is $___ \times 10^{-1}$ L at STP [nearest integer]

[Given : Assume CO as ideal gas, Mass of C is 12 g mol^{-1} , Mass of O is 16 g mol⁻¹ and molar volume of an ideal gas at STP is 22.7 L mol⁻¹] [Main Jan. 31, 2023 (II)]

44. A 300 mL bottle of soft drink has 0.2 M CO₂ dissolved in it. Assuming CO₂ behaves as an ideal gas, the volume of the dissolved CO₂ at STP is mL. (Nearest integer) Given: At STP, molar volume of an ideal gas is 22.7Lmo⁻¹.

[Main Jan. 30, 2023 (I)]

The strength of 50 volume solution of hydrogen peroxide **45**. g/L (Nearest integer). is Given: Molar mass of H_2O_2 is 34 g mol⁻¹

Molar volume of gas at STP = 22.7 L. [Main Jan. 30, 2023 (II)]

- 46. When 0.01 mol of an organic compound containing 60% carbon was burnt completely, 4.4 g of CO₂ was produced. The molar mass of compound is _____ g mol⁻¹ [Main Jan. 29, 2023 (II)] (Nearest integer)
- The volume of HCl, containing 73 g L^{-1} , required to 47. completely neutralise NaOH obtained by reacting 0.69 g of metallic sodium with water, is mL. (Nearest Integer) (Given : molar Masses of Na, Cl, O, H are 23, 35.5, 16 and 1 g mol⁻¹ respectively) [Main Jan. 29, 2023 (II)]
- 48. When $Fe_{0.93}O$ is heated in presence of oxygen, it converts to Fe₂O₃. The number of correct statement/s from the following is [Main Jan. 24, 2023 (I)]

A. The equivalent weight of $Fe_{0.93}O$ is Molecular weight

- B. The number of moles of Fe^{2+} and Fe^{3+} in 1 mole of $Fe_{0.93}O$ is 0.79 and 0.14 respectively.
- С. $Fe_{0.93}O$ is metal deficient with lattice comprising of cubic closed packed arrangement of O²⁻ ions.
- D. The % composition of Fe^{2+} and Fe^{3+} in $Fe_{0.93}O$ is 85% and 15% respectively.
- **49**. On complete combustion of 0.492 g of an organic compound containing C, H and O, 0.7938 g of CO₂ and 0.4428 g of H₂O was produced. The % composition of oxygen in the compound is

[Main July 28, 2022 (I)]

50. In the given reaction,

$$X + Y + 3Z \longrightarrow XYZ_3$$

if one mole of each of X and Y with 0.05 mol of Z gives compound XYZ₃. (Given : Atomic masses of X, Y and Z are 10, 20 and 30 amu, respectively). The yield of XYZ_3 is g. (Nearest integer) [Main July 28, 2022 (I)]

Chemistry

51. 56.0 L of nitrogen gas is mixed with excess of hydrogen gas and it is found that 20 L of ammonia gas is produced. The volume of unused nitrogen gas is found to be L. [Main July 25, 2022 (II)]

52. Blister copper is produced by reaction of copper oxide with copper sulphide. $2Cu_2O + Cu_2S \rightarrow 6Cu + SO_2$ When 2.86×10^3 g of Cu₂O and 4.77×10^3 g of Cu₂S are used for reaction, the mass of copper produced is g.

(nearest integer) [Main June 30, 2022 (I)] (Atomic mass of Cu = 63.5 a.m. u)

$$S = 32.0 a.m. u$$

- O = 16.0 a.m. u
- The neutralization occurs when 10 mL of 0.1 M acid 'A' is 53. allowed to react with 30 mL of 0.05 M base M(OH)₂. The basicity of the acid 'A' is _____ __. [M is a metal] [Main June 25, 2022 (II)]
- Number of grams of bromine that will completely react 54. $\times 10^{-2}$ g. with 5.0g of pent-1-ene is (Atomic mass of Br = 80 g/mol) (Nearest Integer) [Main June 25, 2022 (I)]
- 55. 1 L aqueous solution of H_2SO_4 contains 0.02 m mol H₂SO₄. 50% of this solution is diluted with deionized water to give 1 L solution (A). In solution (A), 0.01 m mol of H_2SO_4 are added. Total m mols of H_2SO_4 in the final solution is $_$ × 10³ m mols.

[Main June 25, 2022 (I)]

Sodium oxide reacts with water to produce sodium 56. hydroxide. 20.0 g of sodium oxide is dissolved in 500 mL of water. Neglecting the change in volume, the concentration of the resulting NaOH solution is \times 10⁻¹ M. (Nearest integer)

[Atomic mass : Na = 23.0, O = 16.0, H = 1.0]

[Main Aug. 31, 2021 (II)]

When 10 mL of an aqueous solution of Fe²⁺ ions was 57. titrated in the presence of dil H₂SO₄ using diphenylamine indicator, 15 mL of 0.02 M solution of K2Cr2O2 was required to get the end point. The molarity of the solution containing Fe^{2+} ions is $x \times 10^{-2}$ M. The value of x is . (Nearest integer)

[Main July 25, 2021 (I); Similar March 17, 2021 (I)]

58. If the concentration of glucose $(C_6H_{12}O_6)$ in blood is $0.72 \text{ g } \text{L}^{-1}$, the molarity of glucose in blood is $\times 10^{-3}$ M. (Nearest integer) [Given : Atomic mass of C = 12, H = 1, O = 16 u]

[Main July 22, 2021 (II)]

When 35 mL of 0.15 M lead nitrate solution is mixed with 59. 20 mL of 0.12 M chromic sulphate solution, _____ × 10^{-5} moles of lead sulphate precipitate out. (Round off to the Nearest Integer).

[Main March 16, 2021 (II)]

The NaNO₃ weighed out to make 50 mL of an aqueous **60**. solution containing 70.0 mg Na⁺ per mL is _____ (Rounded off to the nearest integer)

[Main Feb. 26, 2021 (II)]

[Given : Atomic weight in $g \mod^{-1}$ - Na : 23; N : 14; O : 16]

- 61. 4.5 g of compound A (MW = 90) was used to make 250 mLof its aqueous solution. The molarity of the solution is $x \times 10^{-1}$. The value of x is _____ (Rounded off to the nearest integer) [Main Feb. 24, 2021 (I)]
- The volume, in mL, of 0.02 MK₂Cr₂O₇ solution required to **62.** react with 0.288 g of ferrous oxalate in acidic medium is . (Molar mass of Fe = 56 g mol⁻¹)

[Main Sep. 05, 2020 (II)]

- 63. The mass of ammonia in grams produced when 2.8 kg of dinitrogen quantitatively reacts with 1 kg of dihydrogen is [Main Sep. 04, 2020 (I)]
- **64**. The mole fraction of glucose $(C_6H_{12}O_6)$ in an aqueous binary solution is 0.1. The mass percentage of water in it, to the nearest integer, is _____ [Main Sep. 03, 2020 (I)]
- **65**. 10.30 mg of O_2 is dissolved into a liter of sea water of density 1.03 g/mL. The concentration of O_2 in ppm is [Main Jan. 09, 2020 (II)]
- NaClO₃ is used, even in spacecrafts, to produce O₂. The 66. daily consumption of pure O₂ by a person is 492 L at 1 atm, 300 K. How much amount of NaClO₃, in grams, is required to produce O_2 for the daily consumption of a person at 1 atm, 300 K? $NaClO_3(s) + Fe(s) \rightarrow O_2(g) + NaCl(s) + FeO(s)$
- $R = 0.082 \text{ L} \text{ atm mol}^{-1} \text{ K}^{-1}$ [Main Jan. 08, 2020 (II)] 67. The molarity of HNO_2 in a sample which has density 1.4 g/mL and mass percentage of 63% is _____. (Molecular Weight of $HNO_2 = 63$) [Main Jan. 09, 2020 (I)]

Question Stem for Question Nos. 68 and 69

A sample (5.6 g) containing iron is completely dissolved in cold dilute HCl to prepare a 250 mL of solution. Titration of 25.0 mL of this solution requires 12.5 mL of 0.03 M KMnO₄ solution to reach the end point. Number of moles of Fe²⁺ present in 250 mL solution is $x \times 10^{-2}$ (consider complete dissolution of FeCl₂). The amount of iron present in the sample of y% by weight. (Assume : $KMnO_4$ reacts only with Fe^{2+} in the solution

Use : Molar mass of iron as 56 g mol^{-1})

- **68.** The value of x is
- The value of y is **69**.
- [Adv. 2021] 70. The ammonia prepared by treating ammonium sulphate with calcium hydroxide is completely used by NiCl₂.6H₂O to form a stable coordination compound. Assume that both the reactions are 100% complete. If 1584 g of ammonium sulphate and 952 g of NiCl₂.6H₂O are used in the preparation, the combined weight (in grams) of gypsum and the nickel-ammonia coordination compound thus produced is

(Atomic weights in g mol⁻¹: H = 1, N = 14, O = 16, S = 32, Cl = 35.5, Ca = 40, Ni = 59) [Adv. 2018]

71. Galena (an ore) is partially oxidized by passing air through it at high temperature. After some time, the passage of air is stopped, but the heating is continued in a closed furnace such that the contents undergo self-reduction. The weight (in kg) of Pb produced per kg of O₂ consumed is

(Atomic weights in g mol⁻¹: O = 16, S = 32, Pb = 207)

[Adv. 2018]

[Adv. 2021]

- 72. How many millilitres of 0.5 M H₂SO₄ are needed to dissolve 0.5 g of copper(II) carbonate? [1999 - 3 Marks]
- 73. One gram of commercial AgNO₃ is dissolved in 50 mL. of water. It is treated with 50 mL. of a KI solution. The silver iodide thus precipitated is filtered off. Excess of KI in the filterate is titrated with (M/10) KIO₃ solution in presence of 6M HCl till all I⁻ ions are converted into ICl. It requires 50 mL. of (M/10) KIO₃ solution. 20 mL. of the same stock solution of KI requires 30 mL. of (M/10)KIO₃ under similar conditions. Calculate the percentage of AgNO₃ in the sample. (Reaction : KIO₃ + 2KI + 6HCl → 3ICl + 3KCl + 3H₂O)
- 74. A 1.0 g sample of Fe_2O_3 solid of 55.2% purity is dissolved in acid and reduced by heating the solution with zinc dust. The resultant solution is cooled and made upto 100.0 mL. An aliquot of 25.0 mL of this solution requires 17.0 mL of 0.0167 M solution of an oxidant for titration. Calculate the number of electrons taken up by the oxidant in the reaction of the above titration. [1991 - 4 Marks]
- 75. Calculate the molality of 1 litre solution of 93% H₂SO₄ (weight/volume). The density of the solution is 1.84 g/mL.
 [1990 1 Marks]
- 76. A sample of hydrazine sulphate $(N_2H_6SO_4)$ was dissolved in 100 mL of water, 10 mL of this solution was reacted with excess of ferric chloride solution and warmed to complete the reaction. Ferrous ion formed was estimated and it required 20 mL of M/50 potassium permanganate solution. Estimate the amount of hydrazine sulphate in one litre of the solution. [1988 - 3 Marks]

Reaction : $4Fe^{3+} + N_2H_4 \rightarrow N_2 + 4Fe^{2+} + 4H^+$

 $MnO_4^- + 5Fe^{2+} + 8H^+ \rightarrow Mn^{2+} + 5Fe^{3+} + 4H_2O.$

77. Hydroxylamine reduces iron (III) according to the equation: $2NH_2OH + 4 Fe^{3+} \rightarrow N_2O(g) \uparrow + H_2O + 4 Fe^{2+} + 4H^+$ Iron (II) thus produced is estimated by titration with a standard permanganate solution. The reaction is :

 $MnO_4^- + 5 Fe^{2+} + 8H^+ \rightarrow Mn^{2+} + 5 Fe^{3+} + 4H_2O$

A 10 mL. sample of hydroxylamine solution was diluted to 1 litre. 50 mL. of this diluted solution was boiled with an excess of iron (III) solution. The resulting solution required 12 mL. of 0.02 M KMnO₄ solution for complete oxidation of iron (II). Calculate the weight of hydroxylamine in one litre of the original solution. (H=1, N=14, O=16, K=39, Mn = 55, Fe=56) [1982 - 4 Marks]

- **78.** A 1.00 g sample of H_2O_2 solution containing X per cent H_2O_2 by weight requires X mL of a KMnO₄ solution for complete oxidation under acidic conditions. Calculate the normality of the KMnO₄ solution. [1981 3 Marks]
- **79.** 4.215 g of a metallic carbonate was heated in a hard glass tube and the CO_2 evolved was found to measure 1336 mL at 27°C and 700 mm pressure. What is the equivalent weight of the metal? [1979]
- 80. What weight of AgCl will be precipitated when a solution containing 4.77 g of NaCl is added to a solution of 5.77 g of AgNO₃? [1978]

81. Igniting MnO_2 converts it quantitatively to Mn_3O_4 . A sample of pyrolusite is of the following composition : MnO_2 80%, SiO₂ and other inert constituents 15%, rest being water. The sample is ignited in air to constant weight. What is the percentage of Mn in the ignited sample? [1978] [O = 16, Mn = 54.9]

(9) 9 Assertion and Reason / Statement Type Questions

Each Question contains Assertion and Reason statements. In the light of the given statements in the question choose the correct answer from the options given below.

- (a) If both Assetion and Reason are correct and Reason is the correct explanation of the Assertion
- (b) If both Assertion and Reason are correct but Reaon is not the correct explanation of the Assertion.
- (c) If the Assertion is correct but the Reason is incorrect
- (d) If the Assertion is incorrect but the Reason is correct
- 82. Assertion : In the titration of Na_2CO_3 with HCl using methyl orange indicator, the volume required at the equivalence point is twice that of the acid required using phenolphthalein indicator. Reason : Two moles of HCl are required for the complete

neutralization of one mole of Na_2CO_3 . [1991 - 2 Marks]

10 Subjective Problems

83. Calculate the molarity of water if its density is 1000 kg/m³. [2003 - 2 Marks]

- 84. Hydrogen peroxide solution (20 mL) reacts quantitatively with a solution of KMnO₄ (20 mL) acidified with dilute H₂SO₄. The same volume of the KMnO₄ solution is just decolourised by 10 mL of MnSO₄ in neutral medium simultaneously forming a dark brown precipitate of hydrated MnO₂. The brown precipitate is dissolved in 10 mL of 0.2 M sodium oxalate under boiling condition in the presence of dilute H₂SO₄. Write the balanced equations involved in the reactions and calculate the molarity of H₂O₂. [2001 - 5 Marks]
- 85. An aqueous solution containing 0.10 g KIO₃ (formula weight = 214.0) was treated with an excess of KI solution. The solution was acidified with HCl. The liberated I_2 consumed 45.0 mL of thiosulphate solution to decolourise the blue starch-iodine complex. Calculate the molarity of the sodium thiosulphate solution. [1998 5 Marks]
- 86. A 3.00 g sample containing Fe_3O_4 , Fe_2O_3 and an inert impure substance, is treated with excess of KI solution in presence of dilute H_2SO_4 . The entire iron is converted into Fe^{2+} along with the liberation of iodine. The resulting solution is diluted to 100 mL. A 20 mL of the diluted solution requires 11.0 mL of 0.5 M Na₂S₂O₃ solution to reduce the iodine present. A 50 mL of the diluted solution, after complete extraction of the iodine requires 12.80 mL of 0.25 M KMnO₄ solution in dilute H_2SO_4 medium for the oxidation of Fe^{2+} . Calculate the percentages of Fe_2O_3 and Fe_3O_4 in the original sample. [1996 - 5 Marks]
- 87. 8.0575×10^{-2} kg of Glauber's salt is dissolved in water to obtain 1 dm³ of a solution of density 1077.2 kg m⁻³. Calculate the molarity, molality and mole fraction of Na₂SO₄ in the solution. [1994 3 Marks]

A8

- Upon mixing 45.0 mL. of 0.25 M lead nitrate solution with 25.0 mL of 0.10 M chromic sulphate solution, precipitation of lead sulphate takes place. How many moles of lead sulphate are formed? Also, calculate the molar concentrations of the species left behind in the final solution. Assume that lead sulphate is completely insoluble. [1993 3 Marks]
- 89. A 2.0 g sample of a mixture containing sodium carbonate, sodium bicarbonate and sodium sulphate is gently heated till the evolution of CO₂ ceases. The volume of CO₂ at 750 mm Hg pressure and at 298 K is measured to be 123.9 mL. A 1.5g of the same sample requires 150 mL. of (M/10) HCl for complete neutralisation. Calculate the % composition of the components of the mixture. [1992 5 Marks]

90. A solution of 0.2 g of a compound containing Cu^{2+} and

 $C_2O_4^{2-}$ ions on titration with 0.02 M KMnO₄ in presence of H₂SO₄ consumes 22.6 mL. of the oxidant. The resultant solution is neutralized with Na₂CO₃, acidified with dil. acetic acid and treated with excess KI. The liberated iodine requires 11.3 mL of 0.05 M Na₂S₂O₃ solution for complete reduction. Find out the molar ratio of Cu²⁺ to C₂O₄²⁻ in the compound. Write down the balanced redox reactions involved in the above titrations. [1991 - 5 Marks]

- 91. A mixture of $H_2C_2O_4$ (oxalic acid) and $NaHC_2O_4$ weighing 2.02 g was dissolved in water and solution made upto one litre. Ten millilitres of the solution required 3.0 mL of 0.1 N sodium hydroxide solution for complete neutralization. In another experiment, 10.0 mL of the same solution, in hot dilute sulphuric acid medium. require 4.0 mL of 0.1 N potassium permanganate solution for complete reaction. Calculate the amount of $H_2C_2O_4$ and $NaHC_2O_4$ in the mixture. [1990 5 Marks]
- 92. A solid mixture (5.0 g) consisting of lead nitrate and sodium nitrate was heated below 600 °C until the weight of the residue was constant. If the loss in weight is 28.0 per cent, find the amount of lead nitrate and sodium nitrate in the mixture. [1990 4 Marks]
- **93.** An equal volume of a reducing agent is titrated separately with 1M KMnO₄ in acid neutral and alkaline media. The volumes of KMnO₄ required are 20 mL. in acid, 33.4 mL in neutral and 100 mL. in alkaline media. Find out the oxidation state of manganese in each reduction product. Give the balanced equations for all the three half reactions. Find out the volume of 1M $K_2Cr_2O_7$ consumed; if the same volume of the reducing agent is titrated in acid medium.

[1989 - 5 Marks]

- 94. A sugar syrup of weight 214.2 g contains 34.2 g of sugar $(C_{12}H_{22}O_{11})$. Calculate : (i) molal concentration and (ii) mole fraction of sugar in the syrup. [1988 2 Marks]
- **95.** (*i*) What is the weight of sodium bromate and molarity of solution necessary to prepare 85.5 mL of 0.672 N solution when the half-cell reaction is

$$\operatorname{BrO}_3^- + 6\mathrm{H}^+ + 6\mathrm{e}^- \rightarrow \mathrm{Br}^- + 3\mathrm{H}_2\mathrm{O}$$

Chemistry

(*ii*) What would be the weight as well as molarity if the half-cell reaction is :

 $2 \operatorname{BrO}_{3}^{-} + 12 \operatorname{H}^{+} + 10 \operatorname{e}^{-} \rightarrow \operatorname{Br}_{2} + 6 \operatorname{H}_{2} \operatorname{O}$

[1987 - 5 Marks]

- 96. Five mL of 8N nitric acid, 4.8 mL of 5N hydrochloric acid and a certain volume of 17M sulphuric acid are mixed together and made upto 2litre. Thirty mL of this acid mixture exactly neutralise 42.9 mL of sodium carbonate solution containing one gram of Na₂CO₃.10H₂O in 100 mL of water. Calculate the amount in gram of the sulphate ions in solution. [1985 4 Marks]
- 97. 2.68×10^{-3} moles of a solution containing an ion A^{n+} require 1.61×10^{-3} moles of MnO $_4^-$ for the oxidation of A^{n+} to AO_3^- in acid medium. What is the value of *n*?

[1984 - 2 Marks]

- **98.** The density of a 3 M sodium thiosulphate solution $(Na_2S_2O_3)$ is 1.25 g per mL. Calculate (i) the percentage by weight of sodium thiosulphate, (ii) the mole fraction of sodium thiosulphate and (iii) the molalities of Na⁺ and $S_2O_3^{2-}$ ions. [1983 5 Marks]
- 99. 4.08 g of a mixture of BaO and an unknown carbonate MCO₃ was heated strongly. The residue weighed 3.64 g. This was dissolved in 100 mL of 1 N HCl. The excess acid required 16 mL of 2.5 N NaOH solution for complete neutralization. Identify the metal *M*. [1983 4 Marks]
 (At. wt. H=1, C=12, O=16, Cl=35.5, Ba=138)
- **100.** 3 g of a salt of molecular weight 30 is dissolved in 250 g of water. The molality of the solution is [1983 1 Mark]
- **101.** (i) A sample of $MnSO_4 \cdot 4H_2O$ is strongly heated in air. The residue is Mn_3O_4 .
 - (ii) The residue is dissolved in 100 mL of 0.1 N FeSO₄ containing dilute H_2SO_4 .
 - (iii) The solution reacts completely with 50 mL of KMnO_4 solution.
 - (iv) 25 mL of the KMnO₄ solution used in step (iii) requires 30 mL of 0.1 N FeSO₄ solution for complete reaction. Find the amount of MnSO₄·4H₂O present in the sample. [1980]

102. (a) One litre of a sample of hard water contains 1 mg of $CaCl_2$ and 1 mg of MgCl_2. Find the total hardness in terms of parts of $CaCO_3$ per 10⁶ parts of water by weight.

- (b) A sample of hard water contains 20 mg of Ca⁺⁺ ions per litre. How many milli-equivalent of Na₂CO₃ would be required to soften 1 litre of the sample?
- (c) 1 g of Mg is burnt in a closed vessel which contains 0.5 g of O₂.
 - (i) Which reactant is left in excess?
 - (ii) Find the weight of the excess reactants?
 - (iii) How may milliliters of $0.5 \text{ NH}_2\text{SO}_4$ will dissolve the residue in the vessel. [1980]

- 103. A hydrocarbon contains 10.5 g of carbon per gram of hydrogen. 1 litre of the vapour of the hydrocarbon at 127 °C and 1 atmosphere pressure weighs 2.8 g. Find the molecular formula. [1980]
- **104.** A mixture contains NaCl and unknown chloride MCl.
 - (i) 1 g of this is dissolved in water. Excess of acidified AgNO₃ solution is added to it. 2.567 g of white ppt. is formed.
 - (ii) 1 g of original mixture is heated to 300 °C. Some vapours come out which are absorbed in acidified AgNO₃ solution, 1.341 g of white precipitate was obtained.

Find the molecular weight of unknown chloride. [1980]

105. 5 mL of a gas containing only carbon and hydrogen were mixed with an excess of oxygen (30 mL) and the mixture exploded by means of an electric spark. After the explosion, the volume of the mixed gases remaining was 25 mL. On

adding a concentrated solution of potassium hydroxide, the volume further diminished to 15 mL of the residual gas being pure oxygen. All volumes have been reduced to N.T.P. Calculate the molecular formula of the hydrocarbon gas. [1979]

- 107. One gram of an alloy of aluminium and magnesium when
treated with excess of dil. HCl forms magnesium chloride,
aluminium chloride and hydrogen. The evolved hydrogen,
collected over mercury at 0 °C has a volume of 1.20 litres at
0.92 atm. pressure. Calculate the composition of the alloy.
[H=1, Mg=24, Al=27][1978]

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Answer Key

Topic-1 : Measurement, Mole Concept and Percentage Composition																			
1.	(d)	2.	(c)	3.	(a)	4.	(c)	5.	(b)	6.	(d)	7.	(c)	8.	(d)	9.	(d)	10.	(d)
11.	(a)	12.	(d)	13.	(b)	14.	(a)	15.	(a)	16.	(c)	17.	(c)	18.	(56)	19.	(59)	20.	(12)
21.	(25)	22.	(25)	23.	(3)	24.	(46)	25.	(2)	26.	(18)	27.	(5418)	28.	(2)	29.	(3)	30.	(8)
31.	(5)	32.	(4)	33.	(15.05)	34.	(24)	35.	(4.14g)		36.	(Carbo	n (C	-12))	37.	(6.02	$\times 10$	²⁴)
38.	(b,c)	39.	(d)																
	Tonic 2. Steichiomotor, Equivalent Concent, Neutralization and Dodey Tityation																		
	iopic-2 : Stoichiometry, Equivalent Concept, Neutralization and Redox Litration																		
1.	(c)	2.	(d)	3.	(b)	4.	(c)	5.	(c)	6.	(c)	7.	(c)	8.	(b)	9.	(c)	10.	(a)
11.	(d)	12.	(b)	13.	(a)	14.	(a)	15.	(d)	16.	(N)	17.	(b)	18.	(d)	19.	(a)	20.	(b)
21.	(b)	22.	(d)	23.	(a)	24.	(a)	25.	(b)	26.	(d)	27.	(b)	28.	(d)	29.	(a)	30.	(d)
31.	(a)	32.	(a)	33.	(d)	34.	(222)	35.	(18)	36.	(100)	37.	(224)	38.	(36)	39.	(11)	40.	(1)
41.	(44)	42.	(4)	43.	(227)	44.	(1362)	45.	(150)	46.	(200)	47.	(15)	48.	(4)	49.	(46)	50.	(2)
51.	(46)	52.	(3810)	53.	(3)	54.	(1143)	55.	(0)	56.	(13)	57.	(18)	58.	(4)	59.	(525)	60.	(13)
61.	(2)	62.	(50)	63.	(3400)	64.	(47)	65.	(10.00)	66.	(2130)	67.	(14.00)	68.	(1.875)	69.	(18.75	5) 70.	(2992)
71.	(6.47)	72.	(8.09)	73.	(85)	74.	(6.0)	75.	(10.43)	76.	(6.5)	77.	(39.6)	78.	(0.58)	79.	(12.1;	5)80.	(4.87)
81.	(59.33)	82.	(b)	83.	(55.55)				. ,				, ,						. ,