Note : Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink in the answer-book. Cutting or filling two or more circles will result in zero mark in that question.

1-1	Equal masses of methane and oxygen gases are mixed in an empty container at 25 ^{o}C. The fraction of the total pressure exerted by oxygen is :
	(A) $\frac{1}{3}$ (B) $\frac{8}{9}$ (C) $\frac{1}{9}$ (D) $\frac{16}{17}$
2	Orbitals having same energy are called :
	(A) Hybrid orbitals (B) Valence orbitals (C) Degenerate orbitals (D) d-orbitals
3	For which system does the equilibrium constant K_c has units of (concentration)$^{-1}$:
	(A) $N_2 + 3H_2 \rightleftharpoons 2NH_3$ (B) $H_2 + I_2 \rightleftharpoons 2HI$ (C) $2NO \rightleftharpoons N_2O_4$ (D) $2HF \rightleftharpoons H_2 + F_2$
4	All the photochemical reactions are usually :
	(A) First order reactions (B) Second order reactions
	(C) Zero order reactions (D) Third order reactions
5	The largest number of molecules are present in :
	(A) 3.6 g of H_2O (B) 4.8 g of C_2H_5OH (C) 2.8 g of CO (D) 5.4 g of N_2O_5
6	Which of the following hydrogen halide has the highest percentage of ionic character :
	(A) HCℓ (B) HBr (C) HF (D) HI
7	The colour of iodine in organic layer is :
	(A) Brown (B) Colourless (C) Purple (D) Green
8	The bond order of N_2 molecule is :
	(A) Zero (B) Three (C) Two (D) One
9	The cathodic reaction in the electrolysis of dil. H_2SO_4 with pt electrode is :
	(A) Oxidation (B) Reduction
	(C) Both oxidation and reduction (D) Neither oxidation or reduction
10	ΔH_v value of C_6H_{14} should be ---- than that of C_2H_6 :
	(A) Greater (B) Lesser (C) Equal to (D) Always lesser
11	The phenomenon of isotopy was introduced by :
	(A) Soddy (B) Avogadro (C) Rutherford (D) Max plank
12	Diamond is bad conductor because :
	(A) It has a tight structure
	(B) It has high density
	(C) There are no free electrons present in the crystal of diamond to conduct electricity
	(D) Is transparent to light
13	During liquefaction of gases the intermolecular spaces :
	(A) Decreases (B) Increases (C) Remains constant (D) Cannot be predicted
14	Rutherford model of atom failed because :
	(A) The atom did not have a nucleus and electron
	(B) It did not account for attraction between proton and nucleus
	(C) It did not account for the stability of atom
	(D) There is actually no space between the nucleus and electron
15	Paper chromatography is known as :
	(A) Adsorption chromatography (B) Partition chromatography
	(C) Thin layer chromatography (D) Gas chromatography
16	Which one is not a state function :
	(A) Temperature (B) Internal energy (C) Work (D) Volume
17	Molarity of pure water is :
	(A) 1 (B) 18 (C) 55.5 (D) 6

CHEMISTRY   224-1ˢᵗ Annual-(INTER PART – I)   Time Allowed : 2.40 hours

PAPER – I (Essay Type)   GROUP – I   Maximum Marks : 68

SECTION – I

LHR-1-24

2. Write short answers to any EIGHT (8) questions :   16

(i) 23 g of sodium and 238 g of uranium have equal number of atoms in them. Justify.

(ii) Why actual yield is always less than theoretical yield?

(iii) Define the term atomicity. Give example.

(iv) Describe Gooch Crucible.

(v) How the fluted filter paper is prepared?

(vi) How the crystals are dried in crystallization?

(vii) Why pilots feel uncomfortable breathing in un-pressurized cabins?

(viii) Derive Charles's law from kinetic molecular theory.

(ix) Some of postulates of kinetic molecular theory are faulty. Justify.

(x) Discuss effect of change in temperature on K_w.

(xi) Justify that chemical equilibrium is dynamic in nature.

(xii) Discuss effect of common ion on solubility.

3. Write short answers to any EIGHT (8) questions :   16

(i) Though oxygen and sulphur belong to same group but water is liquid while H_2S is a gas at room temperature. Why?

(ii) Write four uses of liquid crystals.

(iii) Define crystal lattice with an example.

(iv) Heat of sublimation of iodine is very high. Why?

(v) Define Hund's rule and Pauli's exclusion principle.

(vi) Calculate mass of electron using its e/m value.

(vii) What is origin of X-rays?

(viii) State ($n + \ell$) rule.

(ix) Define the term molarity and molality.

(x) What do you mean by water of crystallization? Give an example.

(xi) Differentiate between average and instantaneous rates of reaction.

(xii) Define zero order reaction. Give an example.

4. Write short answers to any SIX (6) questions :   12

(i) Why $\sigma 2p_x$ is higher in energy in B_2 , C_2 and N_2 and lower in energy in O_2 and F_2 in energy level diagram?

(ii) Draw shape and write bond angle in NH_3 and BF_3 molecules with respect to VSEPR theory.

(Turn Over)

4. (iii) Define electron affinity. Name two factors affecting electron affinity.

(iv) Why lone pair of electron occupy more space than bond pair of electron?

(v) Define state of system and state function.

(vi) Define enthalpy of reaction. Give one example.

(vii) Define spontaneous process. Give one example.

(viii) How impure copper can be purified.

(ix) What is standard hydrogen electrode?

SECTION – II

Note : **Attempt any THREE questions.**

5. (a) Write all the steps involved in determination of empirical formula.　　4

(b) Define evaporation. On what factors it depends? Discuss.　　1,1,2

6. (a) 250 cm^3 of hydrogen is cooled from 127 ^{o}C to – 27 ^{o}C by maintaining the pressure constant. Calculate the new volume of the gas at this low temperature.　　4

(b) What is the concept of dual nature of matter? Also derive de-Broglie's equation.　　4

7. (a) What is dipole moment? Give its various units. Find relationship between Debye and mc.　　4

(b) Calculate the pH of a buffer solution in which 0.11 molar CH_3COONa and 0.09 molar acetic acid solution are present K_a for acetic acid (CH_3COOH) is 1.85×10^{-5}.　　4

8. (a) State and explain Hess's law of constant heat summation with an example.　　4

(b) Describe the construction and working of standard hydrogen electrode.　　4

9. (a) Discuss two types of solutions of liquids in liquids.　　4

(b) Define the following with examples :　　4
　(i) Autocatalysis.　(ii) Negative catalysis.　(iii) Homogeneous catalysis.
　(iv) Enzyme catalysis.

42-224-I-(Essay Type) – 57000

Note : Four possible answers A, B, C and D to each question are given. The choice which you think is correct, fill that circle in front of that question with Marker or Pen ink in the answer-book. Cutting or filling two or more circles will result in zero mark in that question.

1-1	The gases show more deviation from ideal behaviour at :	
	(A) Low temperature and high pressure	(B) High temperature and low pressure
	(C) High temperature and high pressure	(D) Low temperature and low pressure
2	The wave number of the light emitted by a certain source is $2 \times 10^6 \, m^{-1}$. The wavelength of this light will be :	
	(A) 200 nm (B) 500 m (C) 500 nm (D) $5 \times 10^7 m$	
3	The equilibrium constant for the reaction $2O_3 \rightleftharpoons 3O_2$ is 10^{55} at 25 °C. It tells us that at room temperature :	
	(A) O_3 is unstable and decomposes rapidly	(B) O_3 is highly stable and decomposes slowly
	(C) O_3 is unstable and decomposes slowly	(D) O_3 is highly stable and decomposes rapidly
4	The main function of a catalyst in a chemical reaction is to :	
	(A) Increase Ea (B) Decrease temperature (C) Decrease Ea (D) Decrease pressure	
5	49 g of aqueous solution of H_2SO_4 contains moles of H^+ ions :	
	(A) 1.0 (B) 0.2 (C) 0.4 (D) 0.01	
6	Which of the following molecule has zero dipole moment :	
	(A) H_2S (B) SO_2 (C) CO (D) CS_2	
7	Solvent extraction is an equilibrium process and it is controlled by :	
	(A) Law of mass action	(B) Distribution law
	(C) The amount of solute	(D) The amount of solvent used
8	The geometry of PH_3 is :	
	(A) Bent (B) Trigonal planar (C) Tetrahedral (D) Trigonal pyramidal	
9	Stronger the oxidizing agent, greater is the :	
	(A) Oxidation potential (B) Reduction potential (C) Redox potential (D) emf of cell	
10	Which type of intermolecular forces are present in chloroform :	
	(A) Hydrogen bonding	(B) Dipole-dipole forces
	(C) London forces	(D) Dipole-induced forces
11	One mole of CO_2 contains :	
	(A) 6.02×10^{23} atoms of oxygen	(B) 18.1×10^{23} molecules of CO_2
	(C) 6.02×10^{23} atoms of carbon	(D) 22 gram atoms of CO_2
12	The solid iodine is the best example of :	
	(A) Ionic solids (B) Covalent solids (C) Metallic solids (D) Molecular solids	
13	The order of the rate of diffusion of gases NH_3 , SO_2 , Cl_2 and CO_2 is :	
	(A) $NH_3 > SO_2 > Cl_2 > CO_2$	(B) $NH_3 > CO_2 > SO_2 > Cl_2$
	(C) $Cl_2 > SO_2 > CO_2 > NH_3$	(D) $NH_3 > CO_2 > Cl_2 > SO_2$
14	Quantum number values for 2p orbitals are :	
	(A) n = 2 , ℓ = 1 (B) n = 1 , ℓ = 2 (C) n = 1 , ℓ = 0 (D) n = 2 , ℓ = 0	
15	Which of the following substance is used as drying agent in desiccator :	
	(A) NaCl (B) Animal Charcoal (C) NH_4Cl (D) Anhydrous $CaCl_2$	
16	At constant volume, q_v is equal to :	
	(A) ΔH (B) ΔE (C) ΔP (D) ΔV	
17	18 g glucose is dissolved in 90 g of water. The relative lowering of vapour pressure is equal to :	
	(A) 1/5 (B) 5.1 (C) 1/51 (D) 6	

16

2. Write short answers to any EIGHT (8) questions :

  (i) What are molecular ions, give two examples?

  (ii) Define stoichiometry.

  (iii) What is importance of limiting reactant?

  (iv) Why is sintered glass crucible superior than Gooch Crucible?

  (v) What is solvent extraction?

  (vi) Write quantitative statement of Charles's law.

  (vii) Differentiate between quantitative and qualitative analysis.

  (viii) What is compressibility factor, write its value for an ideal gas?

  (ix) Write two characteristics of plasma.

  (x) Differentiate between equilibrium constant " K_c " and chemical equilibrium.

  (xi) Derive expression of K_c for $NH_3(g)$ synthesis by Hyber process.

  (xii) Define pH and pOH.

16

3. Write short answers to any EIGHT (8) questions :

  (i) Ionic crystals are highly brittle. Explain with reason.

  (ii) HF is the weakest acid among all halogen acids. Why?

  (iii) Differentiate between crystalline and amorphous solids.

  (iv) Evaporation takes place at all temperatures. Explain with reason.

  (v) How neutron decays? Give reaction.

  (vi) What is atomic emission spectrum? Explain.

  (vii) Give importance of Moseley's law. (Any two)

  (viii) State (n + ℓ) rule. Give its importance.

  (ix) What do you mean by the term activation of a catalyst? Give example.

  (x) Define order of reaction by giving example.

  (xi) What do you mean by water of crystallization? Give two examples.

  (xii) Define mole fraction in solutions by giving one example.

12

4. Write short answers to any SIX (6) questions :

  (i) Bond distance is a compromised distance between two atoms. Justify the statement.

  (ii) Sketch the hybrid orbitals of : (i) PCl_3 (ii) NH_4^+

(Turn Over)

4. (iii) Define bond energy. What are factors influencing bond energy?

(iv) Why is sigma (σ) bond stronger than pi (π) bond?

(v) Define lattice energy. Give one example.

(vi) How do you determine ΔH for food and fuel in laboratory?

(vii) Define Hess's law of constant heat summation.

(viii) Na & K can displace hydrogen from acids but Pt, Pd and Cu can not. Why?

(ix) Give the reactions taking place in silver oxide battery.

SECTION – II

Note : **Attempt any THREE questions.**

5. (a) Explain evidence of atom in detail.   4

(b) Define metallic solids. Discuss metallic solids in terms of electron gas theory and molecular orbital theory.   1,3

6. (a) What pressure is exerted by a mixture of 2.00 g of H_2 and 8.00 g of N_2 at 273 K in a $10\,dm^3$ vessel?   4

(b) Explain J.J Thomson's experiment for determination e/m value of electron.   4

7. (a) Define hybridization. Explain sp hybridization by taking example of ethyne.   1,3

(b) Calculate the pH of a buffer solution in which 0.11 molar CH_3COONa and 0.09 molar acetic acid solution are present K_a for CH_3COOH is 1.85×10^{-5}.   4

8. (a) Define the following with suitable example :   2,2
   (i) Enthalpy of neutralization.   (ii) Enthalpy of formation.

(b) Define oxidation number. Also write rules for assigning oxidation number.   1,3

9. (a) How boiling point elevation is measured by Landsberger's method?   4

(b) Differentiate between homogeneous catalysis and heterogeneous catalysis with one example of each.   2,2

132-224-II-(Essay Type) – 25000