Roll No _____ (To be filled in by the candidate) **(Academic Sessions 2017 – 2019 to 2020 – 2022 )**

**CHEMISTRY** 221-(INTER PART – I) Time Allowed : 20 Minutes

Q.PAPER – I ( Objective Type ) GROUP – I Maximum Marks : 17

**PAPER CODE = 6487** LHR-41-21

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 pH of mixture of $CH_3COONa$ and $CH_3COOH$ is :<br>(A) 7 (B) $> 7$ (C) $< 7$ (D) 1 |
| 2 | Balmer series in hydrogen spectrum lies in the region :<br>(A) Ultraviolet (B) Visible (C) Infrared (D) Microwave |
| 3 | Density of an ideal gas can be calculated by the formula :<br>(A) $d = nRT$ (B) $d = \frac{PM}{RT}$ (C) $d = \frac{m}{M}RT$ (D) $d = \frac{PV}{M}$ |
| 4 | In endothermic reactions, the heat content of the :<br>(A) Products is more than that of reactants (B) Reactants is more than that of products<br>(C) Surrounding increases (D) Reactants and products are equal |
| 5 | Which of the following species has unpaired electrons in antibonding molecular orbitals :<br>(A) $O_2^{2+}$ (B) $N_2^{2-}$ (C) $B_2$ (D) $F_2$ |
| 6 | 1 gram formula of $NaC\ell$ is equal to :<br>(A) 58.5 g (B) 23 g (C) 35.5 g (D) 12 g |
| 7 | The unit of rate constant is the same as that of rate of reaction in :<br>(A) First order reaction (B) Second order reaction<br>(C) Zero order reaction (D) Third order reaction |
| 8 | When water freezes at 0 °C, its density decreases due to :<br>(A) Cubic structure of ice (B) Empty spaces present in structure of ice<br>(C) Change of bond lengths (D) Change of bond angles |
| 9 | An excess of silver nitrate in aqueous form is added to aqueous barium chloride and precipitate is removed by filtration. What are main ions in the filtrate :<br>(A) $Ag^+$ and $NO_3^-$ only (B) $Ag^+$ and $Ba^{2+}$ and $NO_3^-$<br>(C) $Ba^{2+}$ and $NO_3^-$ only (D) $Ba^{2+}$ and $NO_3^-$ and $C\ell^-$ |
| 10 | Many elements have fractional atomic masses, this is because :<br>(A) The mass of an atom is itself fractional (B) Atomic masses are average masses of isobars<br>(C) Atomic masses are average masses of isotopes<br>(D) Atomic masses are average masses of isotopes proportional to their relative abundance |
| 11 | According to VSEPR theory, the shape of $PH_3$ molecule is :<br>(A) Trigonal pyramidal (B) Tetragonal (C) Linear (D) Trigonal planer |
| 12 | Which of the following compounds do not show process of sublimation :<br>(A) Ammonium chloride (B) Iodine (C) Naphthalene (D) Carbon tetra chloride |
| 13 | A thermometer used in Landsberger's method can read upto :<br>(A) 0.1 K (B) 0.01 F (C) 0.01 K (D) 0.01 °C |
| 14 | In the monoclinic crystal system, bond axes are :<br>(A) $a = b = c$ (B) $a = b \neq c$ (C) $a \neq b = c$ (D) $a \neq b \neq c$ |
| 15 | If a salt bridge is not used between two half cells, then the voltage :<br>(A) Decreases rapidly (B) Decreases slowly (C) Does not change (D) Drops to zero |
| 16 | Orbitals having same energy are called :<br>(A) Hybrid orbitals (B) Valence orbitals (C) Degenerate orbitals (D) d-orbitals |
| 17 | If absolute temperature of a gas is doubled and the pressure is reduced to one half, the volume of the gas will :<br>(A) Remain unchanged (B) Increase four times (C) Reduce to $\frac{1}{4}$ (D) Be doubled |

No _____ (To be filled in by the candidate) **(Academic Sessions 2017 – 2019 to 2020 – 2022 )**

**HEMISTRY** 221-(INTER PART – I) Time Allowed : 2.40 hours

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

**SECTION – I** MHR-4621

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

(i) How is the law of conservation of mass obeyed during stoichiometeric calculations?

(ii) Why $N_2$ and CO have same number of electrons, protons and neutrons? Justify.

(iii) Define mole. Calculate the gram atoms ( moles) in 0.1 g of sodium.

(iv) Draw the beautiful diagram of sublimation process.

(v) Write down the uses of chromatography.

(vi) What is the physical meaning of R?

(vii) Prove Boyle's law in the light of K.M.T.

(viii) What are the two characteristics of plasma?

(ix) Write down the quantitative statement of Charles's law.

(x) Define heat of solution.

(xi) How will you justify that the lowering of vapour pressure is a colligative property?

(xii) Differentiate between ideal and non-ideal solutions.

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

(i) Ethyl alcohol is soluble in water. Why?

(ii) Explain H-bonding in deoxyribonucleic acid (DNA).

(iii) What do you know about anisotropy, explain with example?

(iv) What is allotropy, give one example?

(v) Write two nuclear reactions for production of gamma (γ) radiations and β-particle.

(vi) Write defect of Rutherford Atomic Model.

(vii) Define Heisenberg's uncertainty principle and write its mathematical equation.

(viii) Write name of different quantum numbers.

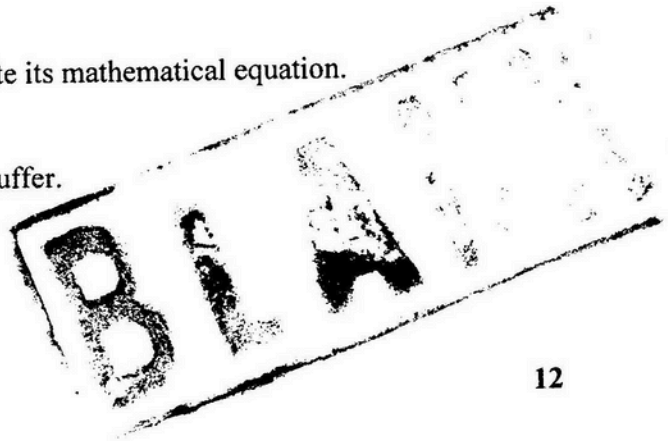
(ix) Write Henderson's equation for acidic and basic buffer.

(x) Why do we need buffer solution?

(xi) Explain specific rate constant briefly.

(xii) What is zero order reaction, give one example?





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

(i) Define bond order and give one example.

(ii) Draw diagram for formation of bonding and antibonding molecular orbitals for $H_2$ molecule.

(iii) Define sigma bond and pi-bond.

(iv) Define atomic orbital hybridization.

(v) What is first law of thermodynamics, give its mathematical equation?

(vi) Define enthalpy of combustion $\Delta H_c^o$.

(vii) How anodized aluminium is prepared in an electrolytic cell?

(viii) Draw a diagram of standard hydrogen electrode (SHE)

(ix) Define electrochemical series.

(Turn Over)

## SECTION – II

**Note : Attempt any THREE questions.** LHR-9L21

5. (a) $NH_3$ gas can be produced by heating together $NH_4C\ell$ and $Ca(OH)_2$. If a mixture containing 100g of each solid is heated then calculate the number of grams of $NH_3$ produced.
$$2NH_4C\ell + Ca(OH)_2 \rightarrow CaC\ell_2 + 2NH_3 + 2H_2O$$ 4

   (b) Explain isomorphism with examples. 4

6. (a) Give postulates of kinetic molecular theory. 4

   (b) Derive an expression to determine radius of an orbit using Bohr's model. 4

7. (a) What is $sp^2$ hybridization, how it explains structure of ethene? 4

   (b) What is Hess's law? Explain by giving two examples. 4

8. (a) Calculate the pH of a buffer solution in which 0.11 molar $CH_3COONa$ and 0.09 molar acetic acid solutions are present. $K_a$ for the $CH_3COOH$ is $1.85\times10^5$. 4

   (b) Define half life period. How order of reaction can be determined by knowing half life of a reaction? 4

9. (a) What are colligative properties of solutions? Explain elevation of boiling points. 4

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