VCD/07/10/22 S.Y.B.Sc SEM III CHEMISTRY P-I 100 MARKS 3 HOURS

Note: i) All the questions are compulsory.
ii) Figures to right indicate full marks.
iii) Use of non-programmable calculator/log table is allowed.

Q.1 A) Multiple Choice Questions.(Any 12) **(12M)**

1. If ΔG has negative value, then the reaction is____

   a) Non-sponteneous b) Spontaneous c) at equilibrium d) Random

2. Change of free energy with pressure at constant temperature is related ____

   a) volume b) entropy c) equilibrium constant d) activity coefficient

3. Sum of transport number of cations and anions of an electrolyte is _____

   a) one b) zero c) less than one d) less than zero

4. The SI unit of specific conductance is ____

   a) M $hos^{-1}cm^{-1}$ b) S cm^{-1} c) S m^{-1} d) S m

5. What is the bond order of B_2 molecule on basis of MOT?

   a) 2 b) 1 c) 2.5 d) 1.5

6. The p-orbital is in the shape of ____

   a) sphere b) dumbbell c) bell d) pear

7. What is magnetic nature of C_2 molecule?

   a) Diamagnetic b) Paramagnetic c) Ferromagnetic d) Ferrimagnetic

8. A type of enthalpy cycle which is used to calculate lattice energy is ____

   a) NaCl b) NaBr c) NaI d) MgF_2

9. The reactivity order of alkyl halides in SN^2 is ____

   a) 1°>2°>3° b) 2°>1°>3° c) 3°>1°>2° d) 3°>2°>1°

10. Chlorobenzene on heating with aqueous NaOH at 370°C under pressure gives phenol by _____ process.

    a) Born Haber b) Dow's c) Contact d) Hydration

11. Among the following which is not present in Grignard reagent.

    a) Methyl group b) Magnesium c) Halogens d) Carboxylic acid

12. Epoxide have ____ heterocyclic ring with oxygen atom in the ring.

    a) 2 membered b) 3 membered c) 4 membered d) 5 membered

13. Phenolic esters on heating with anhydrous $AlCl_3$ undergoes ____ rearrangement.

    a) Fries b) Beckman c) Curtis d) Hofmann

14. Sodium borohydride is a very selective reagent which reduce aldehyde and ketone into____

a) Acid b) Anhydride c) Alcohol d) Ester

15. Electrolytic conductance is due to which of following species?

a) electrons b) ions c) protons d) neutrons

16. The maximum work done by the system can be obtained at the expense of

a) Gibb's Free energy b) Enthalpy c) Entropy d) Helmholtz free energy

17. Which one of the following is not a strong bond?

a) Covalent b) Metallic c) Ionic d) Vander Waals Bond

18. Number of electrons involved in formation of nitrogen molecule are:

a) 3 b) 4 c) 6 d) 8

B. Match the following. (5M)

i.	Escaping Tendency	a) lattice energies of ionic compounds
ii.	Bond Haber Cycle.	b) strong
iii.	$-OCH_3$	c) reducing agent
iv.	$LiAlH_4$	d) fugacity
v.	Sigma bond	e) electron donating group

C. State whether the following statements are True or False. (3M)

1. Transport number of alkali cations are affected by hydration.

2. Ionic bond is directional bond as it spreads all over the crystal lattice.

3. SN^1 reactions are favoured by less polar solvent

Q.2 Attempt ANY FOUR of the following questions. (20M)

1. Derive Gibbs's – Helmholtz equation.

2. Discuss the factors that influence or affect transport number.

3. The equilibrium constant for gaseous reaction is 169 at 500K and it's heat of reaction is -42.676 kJ. Find equilibrium constant at 690 K. (Given: $R = 8.314\ JK^1\ mol^1$)

4. Derive Gibbs's – Duhem equation.

5. Explain all the application of Kohlrausch's Law using using conductance measurements.

6. Describe moving boundary method to determine of transport number of ion.

Q.3 Attempt ANY FOUR of the following questions. (20M)

1. What is hybridization? Give the role of hybridization by giving suitable example.

2. Explain Born Haber Cycle in the formation of ionic compounds.

3. Calculate the lattice energy of NaCl crystal from the following data by the use of Born Haber Cycle.

Heat of atomization of sodium = 108.7 kJ mol^{-1}

Heat of atomization of chlorine = 120.9 kJ mol^{-1}

Ionisation Potential of Sodium = 493.7 kJ mol^{-1}

Electron affinity of chlorine (Cl) = -365.3 kJ mol^{-1}

Heat of formation of NaCl = - 410.9 kJ mol^{-1}

4. Explain with the help of molecular orbital theory, the paramagnetic nature of oxygen.
5. Write short note on: 1)Borne Lande equation 2)Kapustinski equation
6. What are the conditions for the formation of ionic bonds.

Q.4 Attempt ANY FOUR of the following. **(20M)**

1. Explain the mechanism of SN^1 reaction with energy profile diagram.
2. What are the factors that affect SN^1 and SN^2 reaction?
3. Write note on Claisen Rearrangement of allyloxy arenes with suitable example.
4. Give the ring opening reaction of epoxide by:
   i) Hydrolysis in acidic condition
   ii) Reaction with HX
   iii) Reaction with ROH
   iv) Reaction with RMgX
   v) Reaction with HCN
5. Write down any two preparation of alcohols.
6. Give applications of phenols.

Q.5 Attempt ANY FOUR of the following. **(20M)**

1. Differentiate between Electronic Conductors and Electrolyte Conductors.
2. 0.4 N solution of salt surrounding two plates of electrodes, 2.2 cm apart and 4.4 cm^2 in area, was found to offer a conductance of 4×10^{-3} S. Calculate the equivalent conductance of the solution.
3. Explain with the help of molecular orbital diagram, bond order of N_2 molecule
4. Give applications of Born Haber's Cycle.
5. Explain the mechanism of SN^2 reaction with energy profile diagram.
6. a) Explain Elimination-Addition Mechanism
   b) Why o–nitrophenol is steam volatile but para isomer is not