

INTERNATIONAL CENTRE FOR APPLIED SCIENCES MAHE, MANIPAL B.Sc. (Applied Sciences) in Engg. End – Semester Theory Examinations – Nov./ Dec. 2020 II SEMESTER - CHEMISTRY (ICH 121) (Branch: Common to all)

Time: 3 Hours	Date: 05 December 2020	Max. Marks: 100
✓ Answer any FIVE	full questions.	
✓ Missing data, if an	v. may be suitably assumed	

✓ Draw the diagrams wherever required

1A. Define electrochemical cell, galvanic cell and electrolytic cell. Explain the following terms with respect to galvanic cell and electrolytic cell: i) Anode ii) Cathode iii) half-cell reactions.

- **1B.** Explain the half-life period of a chemical reaction. Derive the expressions for the half-life period of first and second order reactions.
- 1C. Explain the VSEPR theory for water and ammonia molecules and compare it with methane.

(8+8+4=20 marks)

2A. Explain the following types of isomerism with a suitable example

- i) Chain isomerism
- ii) Position isomerism
- iii) Functional isomerism
- iv) Metamerism

2B. Discuss energy of activation of a reaction. Explain the Arrhenius method of determination of activation energy of a reaction

2C. Derive an expression for the electrode potential and pH of glass electrode.

(8+8+4= 20 marks)

3A. Give reason:

- a) Covalent compounds exhibit low chemical reactivity and have low melting and boiling points.
- b) Ionic solids are generally brittle.
- c) HF is liquid at lab temperature but HCl is a gas.
- d) O₂ is paramagnetic
- **3B.** Explain the construction and working of calomel and gas electrode. Mention its two applications
- **3C.** Explain the different factors affecting the rate of a reaction.

(8+8+4= 20 marks)

4A. Explain the law of mass action and the Le-Chatelier's principle. Apply them to the manufacture of ammonia.

4B. Discuss the factors governing ionic bond formation. Discuss in detail the Born-Haber cycle for the formation of NaCl crystal.

4C. Discuss the following in secondary bonding with examples and diagrams:

- i) Dipole-induced dipole interaction
- ii) Induced dipole-induced dipole interaction

(8+8+4= 20 marks)

5A. Derive Gibbs-helmholtz equation. Discuss its application and significance.

5B. Distinguish between the following.

- a) Reversible process and Irreversible process.
- b) Homogeneous system and Heterogeneous system.
- c) Intensive and Extensive properties.
- d) Isothermal process and Adiabatic process

5C. For the cell, Fe/Fe²⁺ (0.01)//Ag⁺¹ (0.1)/Ag write the cell reaction and calculate the emf of the cell at 298K, if the standard electrode potentials of Fe and Ag electrode are -0.44 and 0.8 V respectively.

(8+8+4= 20 marks)

6A. Discuss on common ion effect and solubility product of an electrolyte? Discuss its any two applications briefly.

6B. Draw the MO energy level diagram for H_2 , N_2 and O_2 molecules and predict their bond order and magnetic properties.

6C. How are organic reagents classified? Give examples for each type.

(8+8+4= 20 marks)

7A. Discuss the mechanism of S_N1 and S_N2 reaction of alkyl halides.

7B. Explain sp^3 and sp^2 hybridizations with a suitable example.

7C. Calculate the hydrolysis constant for KCN if hydrolysis of 0.01 M solution of KCN is 3.7 % at certain temperature.

(8+8+4= 20 marks)

8A. Write a note on the following:

- i) Carbonium ions iii) Carbanions
- ii) Carbon free radicals iv) Carbenes.

8B. Explain the following:

i) Electron sea model of metallic bonding

ii) Resonance

8C. Draw the structure of the following molecules

- i) 2-bromo-5nitrohexane iii) 2- Butenol
- ii) 1,3-butadiene iv) 4-penten-1-yne

(8+8+4=20 marks)
