

B.TECH.
(SEM I) THEORY EXAMINATION 2022-23
ENGINEERING CHEMISTRY

Time: 3 Hours**Total Marks: 70****Note:** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief.****2 × 7 = 14**

- (a) Explain the feasibility of He_2 & He_2^+ existence.
- (b) What do you understand by stereo-regular polymers?
- (c) What do you understand by sacrificial anodic protection?
- (d) What do you understand by fire point and flash point?
- (e) How many electronic transitions will possible in CH_3COCH_3 ?
- (f) Explain, how the value of $\text{HCV} = \text{LCV}$ is possible?
- (g) Discuss the Bathochromic shift.

SECTION B**2. Attempt any three of the following:****7 × 3 = 21**

- (a) With the help of Molecular Orbital Diagram arrange the following molecule/ion N_2 , N_2^- , N_2^{2-} in order of their increasing dissociation energy and discuss their magnetic behavior.
- (b) What are elastomers? Discuss in details of vulcanisation of rubber? Differentiate between thermosetting and thermoplastic polymers.
- (c) Draw the diagram of a galvanic cell. What is corrosion? Explain the various ways for protection of metals.
- (d) State and explain phase rule to water system.
 Calculate the degree of freedom for a system containing saturated solution of sodium chloride in equilibrium with a solid sodium chloride and water vapour is:

$$\begin{array}{ccccc} \text{NaCl} & \rightleftharpoons & \text{NaCl - Water} & \rightleftharpoons & \text{Water vapour} \\ \text{(solid)} & & \text{(solution)} & & \text{(gas)} \end{array}$$
- (e) What is infrared spectroscopy? Describe the various molecular vibrations modes of AB_2 . How many normal modes of vibration do you expect from: (a) CO_2 and (b) CH_4

SECTION C

3. Attempt any *one* part of the following: $7 \times 1 = 7$
- Describe the preparation, structure, properties and applications of fullerenes.
 - What do you understand by liquid crystals? Discuss in brief the classification, various phases and applications of liquid crystals.
4. Attempt any *one* part of the following: $7 \times 1 = 7$
- What are organo-metallic compounds? Classify it. Give the preparation and applications of Grignard reagent.
 - Discuss the preparation (structure of monomer and polymer), properties & applications of the following polymers: (i) Buna –S (ii) Nylon 6,6 (iii) Terylene (iv) Neoprene
5. Attempt any *one* part of the following: $7 \times 1 = 7$
- Discuss the mechanism of electrochemical corrosion by absorption of oxygen. Differentiate between anodic and cathodic metallic coatings.
 - Write short note on Plaster of Paris. Describe the manufacturing of cement with the help of schematic diagram and give the chemical reaction involved during settling and hardening of cement.
6. Attempt any *one* part of the following: $7 \times 1 = 7$
- What do you understand by hardness of water? Discuss the process of softening of water by ion exchange process.
The hardness of 40,000 liters of a sample of water was removed by passing it through a Zeolite softener. How many litres of NaCl solution containing 3% of NaCl is required for regeneration, if hardness of 1 litre water sample is 600 mg/L.
 - Explain the basic principle of lime-soda process. The following impurities was found to contain as: $\text{MgCO}_3=8.4$ mg/L, $\text{MgCl}_2=95$ mg/L, $\text{Al}_2(\text{SO}_4)_3=22.8$ mg/L, $\text{MgSO}_4=12$ mg/L, $\text{HCO}_3^-=61$ mg/L, $\text{KCl}=10.0$ mg/L and $\text{SiO}_2=68$ mg/L. Calculate the quantity of lime (81% pure) and soda (58% pure) needed for softening of 25,000 L of water.
7. Attempt any *one* part of the following: $7 \times 1 = 7$
- Write the principle of UV-Spectroscopy. Discuss the different types of electronic transitions.. Predict the possible electronic transitions for CH_3COOH and CH_3OCH_3 .
The % transmittance of a solution with concentration 2×10^{-5} M of unknown compound is 20% at λ_{max} 340 nm in a 2 cm cell. Calculate the absorbance and molar absorptivity of the unknown solution.
 - Discuss the Ultimate analysis of coal. Calculate the weight of air needed for complete combustion of 2.0 kg of coal containing C=75%, H=12%, S=3% and O=10%.