

B TECH
(SEM-I) THEORY EXAMINATION 2018-19
ENGG CHEMISTRY

Time: 3 Hours

Total Marks: 100

Note: Attempt the questions in any order and the answers should be written in a neat and legible manner.

S E C T I O N

1. Attempt the questions briefly. 2 x 10 = 20

- a) Explain why HDPE has high density.
- b) Write a short note on racemization.
- c) Define pour point & cloud point of lubricants.
- d) What are the monomers of Buna-N and PMMA?
- e) Why is TMS used as a standard reference in NMR spectroscopy?
- f) How many phases are present in an aqueous Sucrose solution?
- g) The density of NaCl is 2.163 g/cc. calculate the edge of its cubic cell. Assuming that four molecules of NaCl are associated per unit cell.
- h) What is temporary hardness? Write the constituent responsible for temporary hardness.
- i) Give the composition of bio-gas.
- j) Explain why Helium remains monoatomic.

SECTION B

2. Attempt any three of the following: 10 x 3 = 30

- a) Derive Bragg's equation. In Bragg's reflection of X-ray, a reflection was found at 30° with lattice spacing of 1.87 Å. If this is a second order reflection. Calculate the wavelength of X-ray.
- b) (i) Describe proximate analysis of coal. A sample of coal was analyzed as follows: Exactly 2.5 g was weighed into a silica crucible. After heating for one hour at 110°C , the residue weighed 2.415 g. The crucible was then strongly heated for exactly 7 minutes at 950°C . The residue weighed 1.528 gm. The crucible was then heated until a constant weight was obtained. The last residue was found to be weight 0.245 gm. Calculate the percentage results of the above analysis
(ii) Write short note on conducting polymers.
- c) Define the term Chromospheres and Auxochrome in UV spectroscopy. An organic Compound having molecular formula $\text{C}_7\text{H}_6\text{O}$ shows absorption peaks at 3010, 2700, 1600, 1580, 1520, 1480, and 1270 cm^{-1} in its IR spectrum. Suggest its structure.
- d) Discuss the mechanism of SN^1 & SN^2 reaction.
- e) Define phase rule. Apply phase rule to water system.

SECTION C

3. **Attempt any one part of the following:** **10 x 1 = 10**
- a) What is the basic principle of Lime Soda process? A water sample, using $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$ as a coagulant at the rate of 139 ppm gave the following results on analysis.
 $\text{Ca}^{2+} = 150 \text{ ppm};$ $\text{CO}_2 = 88 \text{ ppm}$
 $\text{Mg}^{2+} = 80 \text{ ppm};$ $\text{HCO}_3^- = 488 \text{ ppm}$
Calculate the lime and soda required to soften 1, 00,000 liters of water.
- b) Write short notes on:
(i) E,Z nomenclature.
(ii) Conformation of n-butane.
4. **Attempt any one part of the following:** **10 x 1 = 10**
- a) What are organ metallic compounds? Explain various methods of preparation of organ metallic compounds and also write their applications.
- b) What is Portland cement? Give the chemical reaction involved during setting and hardening of Cement.
5. **Attempt any one part of the following:** **10 x 1 = 10**
- a) Explain reverse osmosis. 100 ml of water sample has hardness equivalent of 12.5 ml of 0.08 N MgSO_4 . What is its hardness in ppm?
- b) With the help of Molecular orbital diagram explain why NO molecule is paramagnetic
6. **Attempt any one part of the following:** **10 x 1 = 10**
- a) Write the preparation, properties and applications of:
(i) Butyl rubber
(ii) HDPE
- b) Explain finger print region in IR spectroscopy. How will you distinguish between the following pairs of compounds on the basis of infrared spectroscopy:
(i) CH_3COOH and $\text{CH}_3\text{COOC}_2\text{H}_5$
(ii) $\text{C}_2\text{H}_5\text{OH}$ and $\text{C}_2\text{H}_5\text{OC}_2\text{H}_5$
7. **Attempt any one part of the following:** **10 x 1 = 10**
- a) What is Crystal imperfection? Explain the zero dimensional imperfection in solid.
- b) Write the mechanism of electrochemical or wet corrosion. Explain sacrificial anodic and impressed current cathodic protection method for prevention of corrosion.