



**BTECH**  
**(SEM I) THEORY EXAMINATION 2023-24**  
**ENGINEERING CHEMISTRY**

TIME: 3HRS

M.MARKS: 70

Note: 1. Attempt all Sections. If require any missing data; then choose suitably.

**SECTION A**

1. Attempt all questions in brief.

| Q no. | Question  | Marks |
|-------|---|-------|
| a.    | Explain molecular self-assembly method for preparing the nanomaterials.   | 2     |
| b.    | A solution shows a transmittance of 20%, when kept in a cell of 2.5 cm thickness. Calculate its concentration if the molar absorptivity coefficient is $12000\text{dm}^3\text{mol}^{-1}\text{cm}^{-1}$ .        | 2     |
| c.    | Analyze the effect of polar solvent on $\pi \rightarrow \pi^*$ transition in acetone.   | 2     |
| d.    | Calculate the emf of the cell, if the standard emf of the cell is 1.54 V. Write cell reaction also.<br>$\text{Zn}(s)   \text{Zn}^{2+}(0.2M)    \text{Ag}^+(0.002M)   \text{Ag}(s) \text{ at } 25^\circ\text{C}$ | 2     |
| e.    | What is role of Gypsum in cement manufacturing?   | 2     |
| f.    | A sample of coal contains 60% Carbon, 33% Oxygen, 6.0% Hydrogen, 0.5% Sulphur, 0.2% Nitrogen and 0.3% Ash. Calculate its GCV.   | 2     |
| g.    | What do you understand by Polymer Blends?   | 2     |

**SECTION B**

2. Attempt any three of the following:

|    |  |   |
|----|--|---|
| a. | Draw molecular orbital diagram of $\text{O}_2$ and $\text{NO}$ . Calculate their bond order and comment on their magnetic behaviors.   | 7 |
| b. | Illustrate the shielding and Deshielding effect involved in NMR spectroscopy. In the P-NMR spectrum recorded at 293 K, an Organic compound ( $\text{C}_3\text{H}_7\text{NO}$ ) exhibited signals at $\delta$ 7.8 (1H, singlet), $\delta$ 2.8 (3H, singlet) and $\delta$ 2.6 (3H, singlet). Find the structure of compound. | 7 |
| c. | Illustrate the various steps involved during manufacturing of Portland cement with the help of a labelled diagram Give the chemical reactions involved during setting and hardening of cement.   | 7 |
| d. | Compare merits and demerits of Zeolite and Ion Exchange method.  | 7 |
| e. | Discuss the preparation of Grignard Reagent. Predict the final product obtained when $\text{C}_2\text{H}_5\text{MgBr}$ reacts with<br>(i) $\text{HCHO}$ (ii) $\text{CH}_3\text{CHO}$ (iii) $(\text{CH}_3)_2\text{CO}$ (iv) $\text{CO}_2$   | 7 |

**SECTION C**

3. Attempt any one part of the following:

|    |   |   |
|----|---|---|
| a. | Illustrate any five principles of Green Chemistry and the give green synthesis method for preparation of Paracetamol. | 7 |
| b. | Classify Liquid crystals on the basis of temperature and give their applications in various fields.                   | 7 |

4. Attempt any one part of the following:

|    |   |   |
|----|---|---|
| a. | Asymmetrically substituted compounds having even number of cumulative double bonds exhibit optical isomerism whereas compounds having odd number of cumulative double bonds exhibit geometrical isomerism. Explain giving proper reasons. | 7 |
| b. | Write short notes on (any TWO)<br>(i) UV Shift (ii) Applications of IR spectroscopy (iii)Molecular vibration  | 7 |

5. Attempt any one part of the following:



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|    |   |   |
|----|---|---|
| a. | Illustrate the working, diagrammatic representation and cell reaction of Lead Acid storage battery during charging and discharging. | 7 |
| b. | Briefly explain wet corrosion. How corrosion can be prevented by Metallic coating and using corrosion inhibitors?                   | 7 |

**6. Attempt any one part of the following:**

|    |   |   |
|----|---|---|
| a. | <p>With the help of a neat diagram, explain the working of Bomb calorimeter. A sample of coal contain C=89%, H=8% and ash=3%.</p> <p>The following data were obtained when the above coal was tested in bomb calorimeter: Weight of coal burnt= 0.85 g; Weight of water taken= 850 g; Water equivalent of bomb and calorimeter= 3500 g; Rise in temperature= 2.5°C; Fuse wire correction = 10.0 cal ; Acid correction= 50.0 cal; Cooling correction= 0.03 °C. Assuming that the latent heat of condensation of steam as 580 cal/gm, Calculate gross and net calorific values of the coal.</p> | 7 |
| b. | <p>Illustrate the principle of lime soda process.</p> <p>Analysis of raw water gives the following data: <math>Ca^{2+} = 20</math> ppm, <math>Mg^{2+} = 25</math> ppm, <math>CO_2 = 30</math> ppm, <math>HCO_3^- = 150</math> ppm, <math>K^+ = 10</math> ppm. Analysis of treated water: <math>CO_3^{2-} = 45</math> ppm, <math>OH^- = 68</math> ppm. Calculate the Lime (87% pure) and Soda (91% pure) required to soften <math>10^6</math> litre of sample water.</p>   | 7 |

**7. Attempt any one part of the following:**

|    |   |   |
|----|---|---|
| a. | Classify conducting polymers and mention their important applications   | 7 |
| b. | <p>Write the preparation (structure of monomer and polymer), properties &amp; applications of the <b>any THREE</b> polymers:</p> <p>(i) Buna -S (ii) Nylon 6,6 (iii) Polyester (iv) Kevlar (v) Bakelite</p> | 7 |