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**BTECH**  
**(SEM I) THEORY EXAMINATION 2021-22**  
**CHEMISTRY**

**Time: 3 Hours****Total Marks: 100****Note: 1.** Attempt all Sections. If require any missing data; then choose suitably.**SECTION A****1. Attempt all questions in brief.****2 x 10 = 20**

| Qno. | Question                                                                                           | Marks | CO |
|------|----------------------------------------------------------------------------------------------------|-------|----|
| a.   | Which species out of $H_2$ , $H_2^{2+}$ and $H_2^{2-}$ are paramagnetic and why?                   | 2     | 1  |
| b.   | Why Lithium exists as diatomic while beryllium remains as monoatomic?                              | 2     | 1  |
| c.   | How will you distinguish between benzene and anthracene by UV spectroscopy?                        | 2     | 2  |
| d.   | How many vibrational modes are there in a linear and non-linear molecule having n number of atoms? | 2     | 2  |
| e.   | Why Iron Nail present on the door undergoes corrosion?                                             | 2     | 3  |
| f.   | What is salt bridge? Mention its function in an electrochemical cell.                              | 2     | 3  |
| g.   | What is the difference between Gross calorific value and Net calorific value of a fuel?            | 2     | 4  |
| h.   | Temporary hardness is removed by boiling. Write chemical reactions in support of your answer.      | 2     | 4  |
| i.   | What is Bio-degradable polymers? Discuss their importance.                                         | 2     | 5  |
| j.   | Define functionality. What is the minimum functionality required for a compound to act as monomer? | 2     | 5  |

**SECTION B****2. Attempt any three of the following:**

| Qno. | Question                                                                                                                                                                                                                                                                                | Marks | CO |
|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----|
| a.   | Draw the Molecular Orbital diagram of NO. Calculate the bond order and predict the magnetic behaviors of NO, $NO^+$ , $NO^-$ .                                                                                                                                                          | 10    | 1  |
| b.   | Illustrate Finger print region in IR spectroscopy. Two Isomers I and II of the molecular formula $C_3H_6O$ give I.R. absorption band near $3550\text{ cm}^{-1}$ and $1717\text{ cm}^{-1}$ respectively. Assign structural formula to A and B consistent with their IR absorption bands. | 10    | 2  |
| c.   | Define Phase, Component and Degree of freedom with examples. Also outline the salient features of the phase diagram of water system highlighting the name of system (areas, curves and points), phase in equilibrium and degree of freedom in each case.                                | 10    | 3  |
| d.   | What are Resins? How hard water can be purified by Ion exchange resins? Compare its merits and demerits over lime –soda process.                                                                                                                                                        | 10    | 4  |
| e.   | Give preparation, properties and applications of following polymer: (i) Buna-S (ii) Dacron (iii) Nylon 6 (iv) Neoprene                                                                                                                                                                  | 10    | 5  |

**SECTION C****3. Attempt any one part of the following:**

| Qno. | Question                                                                                                                           | Marks | CO |
|------|------------------------------------------------------------------------------------------------------------------------------------|-------|----|
| a.   | What are the Anisotropic crystals? How they are classified on the basis of temperature? Also mention their important applications. | 10    | 1  |
| b.   | Discuss preparation, properties, structure and applications of an allotrope of carbon having truncated icosahedron geometry.       | 10    | 1  |



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

| Qno. | Question                                                                                                                                                                                                                                          | Marks | CO |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----|
| a.   | Discuss the quantum theory of Raman Spectroscopy. What technological advances have enabled the routine use of Raman Spectroscopy? How the Stokes, anti-Stokes and Rayleigh lines appear in the Raman Spectroscopy?                                | 10    | 2  |
| b.   | Discuss electronic transitions involved in UV- visible spectroscopy. Illustrate, the effect of polar solvent on n - $\pi^*$ transition in acetone. Also describe Absorption and Intensity shift in the UV spectroscopy with the help of examples. | 10    | 2  |

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

| Qno. | Question                                                                                                                                                                        | Marks | CO |
|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----|
| a.   | What is battery? Differentiate between primary and secondary batteries. Explain the construction and working of secondary battery by taking an account of Lead Storage battery. | 10    | 3  |
| b.   | Outline the mechanism involved in Electrochemical theory of corrosion. How corrosion is prevented by anodic and cathodic inhibitors?                                            | 10    | 3  |

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

| Qno. | Question                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Marks | CO |
|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|----|
| a.   | With the help of neat sketch, explain continuous cold Lime soda process for softening of hard water. Also write the chemical reactions involved. Calculate the quantity of lime (74% pure) and soda (90% pure) for softening 50,000 liters of water containing the following salts:<br>Mg(HCO <sub>3</sub> ) <sub>2</sub> =50mg/L, MgCl <sub>2</sub> =6ppm, Ca(HCO <sub>3</sub> ) <sub>2</sub> =81 mg/L, CO <sub>2</sub> =44 ppm, Na <sub>2</sub> SO <sub>4</sub> =10°Fr, HCl=73mg/L, Al <sub>2</sub> (SO <sub>4</sub> ) <sub>3</sub> =57 mg/L. | 10    | 4  |
| b.   | With the help of a neat diagram, explain the construction and working of bomb calorimeter.<br>A sample of coal contain C=80%, H=15% and ash=5%. The following data were obtained when the above coal was tested in bomb calorimeter:<br>Weight of coal burnt=0.98 g<br>Weight of water taken=1000 g<br>Water equivalent of bomb and calorimeter= 2500 g<br>Rise in temperature=2.5°C<br>Fuse wire correction =8.0 cal<br>Acid correction= 50.0 cal<br>Cooling correction=0.02 °C<br>Calculate gross and net calorific values of the coal.       | 10    | 4  |

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

| Qno. | Question                                                                                             | Marks | CO |
|------|------------------------------------------------------------------------------------------------------|-------|----|
| a.   | Write short notes on:<br>(i) Polymer Blends (ii) Preparation and applications of Grignard reagent    | 10    | 5  |
| b.   | What are conducting polymers? Classify conducting polymers and mention their important applications. | 10    | 5  |