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**B TECH**  
**(SEM-I) THEORY EXAMINATION 2020-21**  
**ENGINEERING 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**

Q no.	Question	Marks	CO
a.	Explain impurity defects.	2	1
b.	Why Teflon is highly chemically resistant?	2	5
c.	What is selection rule?	2	2
d.	On the basis of IR spectra, distinguish between intermolecular and intramolecular hydrogen bonding.	2	2
e.	Calculate Phase, Component and Degree of freedom in the given system; $\text{C}_{(s)} + \frac{1}{2} \text{O}_2 \rightarrow \text{CO}_{(g)}$ $\text{C}_{(s)} + \text{O}_2 \rightarrow \text{CO}_{2(g)}$	2	3
f.	Why calgon is better than other internal process for water treatment?	2	4
g.	Give the preparations of Grignard reagent.	2	5
h.	Why O <sub>2</sub> is paramagnetic and N <sub>2</sub> is diamagnetic?	2	1
i.	How can sulfur be estimated by ultimate method?	2	5
j.	How much rust (Fe <sub>2</sub> O <sub>3</sub> .3H <sub>2</sub> O) can be produced by 3g of iron?	2	3

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

Q no.	Question	Marks	CO
a.	With the help of Molecular orbital theory how Metallic bonding in metals can be explained?	10	1
b.	Write the criteria for a molecule to show Raman, IR, Rotational and UV Spectra. Give the possible electronic transitions (UV spectra) in-CH <sub>3</sub> CH <sub>2</sub> CH <sub>3</sub> , CH <sub>3</sub> CH=CH <sub>2</sub> , CH <sub>3</sub> CH=O and CH <sub>3</sub> .CH=CH-CH=CH-CH <sub>3</sub> . How many fundamental Vibrational degrees of freedom are expected. for the following molecules: CO <sub>2</sub> , H <sub>2</sub> O and C <sub>2</sub> H <sub>2</sub> ?	10	2
c.	The percentage composition of coal sample is: C = 70 %, H <sub>2</sub> = 10 %, O <sub>2</sub> 1%,S= 5%,ash = 0.5 %and N = 0.3 %. i. Calculate the quantity of air needed for complete combustion of 1kg of coal, if 60% excess of air is supplied. ii. Calculate the gross and net calorific value of the coal using dulong's formula.	10	4
d.	Give significance of Nernst equation. Consider a cell reaction: Zn / Zn <sup>2+</sup> [0.1M]    Cu <sup>2+</sup> [0.2M] / Cu Standard reduction potential of Zn <sup>2+</sup> and Cu <sup>2+</sup> are -0.76V and 0.34V respectively. Write half-cell reactions, complete cell reaction and calculate EMF of the cell.	10	3
e.	Distinguish between addition and condensation polymerization. Give monomers and one use each of PMMA, Polyethylene, Bakelite, PVC, nylon6,6.,Buna S.	10	5



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## SECTION C

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

Q no.	Question	Marks	CO
a.	i. Explain types of Non stoichiometric defects with examples. ii. Calculate bond order, magnetic behavior and order of stability of NO, NO <sup>-</sup> , NO <sup>+</sup>	10	1
b.	Write a note on liquid crystal describing classifications and applications of liquid crystals.	10	1

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

Q no.	Question	Marks	CO
a.	The e.m.f. of the cell $\text{Cd}   \text{CdCl}_2, 2.5 \text{ H}_2\text{O (Saturated)}    \text{AgCl}_{(s)}   \text{Ag}$ involving following reaction $\text{Cd(s)} + 2\text{AgCl}_{(s)} \rightleftharpoons \text{CdCl}_2 \cdot 2.5\text{H}_2\text{O (Saturated)} + 2\text{Ag}_{(s)}$ is 0.6753V and 0.6915V at 25°C and 0°C. Calculate $\Delta H$ , $\Delta G$ and $\Delta S$ at 25°C.	10	3
b.	Draw the Phase diagram of water and explain triple point and metastable state.	10	3

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

Q no.	Question	Marks	CO
a.	Write Notes on chromophores and Auxochrome. Explain Transitions in UV spectra.	10	2
b.	Explain the Microwave (Rotational) spectra of diatomic molecule and write their applications.	10	2

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

Q no.	Question	Marks	CO
a.	Draw diagram of Bomb calorimeter. Explain proximate analysis of coal.	10	4
b.	Explain Ion exchange process of water softening. Zeolite softener was 90% exhausted, when 10,000 hard water was passed through it. The softener required 200 L of NaCl solution of strengths 50 gm/L. Calculate the hardness of water.	10	4

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

Q no.	Question	Marks	CO
a.	Explain with equations preparations of acid, ketone, alcohol, alkanes and Organometallic compound from Grignard reagent.	10	5
b.	What are composite materials? Give the classifications of composite materials?	10	5