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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; $C_{(s)} + \frac{1}{2} O_2 \rightarrow CO(g)$ $C_{(s)} + O_2 \rightarrow CO_2(g)$	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 ₂ is paramagnetic and N ₂ is diamagnetic?	2	1
i.	How can sulfur be estimated by ultimate method?	2	5
j.	How much rust (Fe ₂ O ₃ .3H ₂ 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 ₃ CH ₂ CH ₃ , CH ₃ CH=CH ₂ , CH ₃ CH=O and CH ₃ .CH=CH-CH=CH-CH ₃ . How many fundamental Vibrational degrees of freedom are expected. for the following molecules: CO ₂ , H ₂ O and C ₂ H?	10	2
c.	The percentage composition of coal sample is: C = 70 %, H ₂ = 10 %, O ₂ 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 ²⁺ [0.1M] Cu ²⁺ [0.2M] / Cu Standard reduction potential of Zn ²⁺ and Cu ²⁺ 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 ⁻ , NO ⁺	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 $\text{Cd} \text{CdCl}_2, 2.5 \text{ H}_2\text{O} (\text{Saturated}) \text{AgCl}_{(s)} \text{Ag}$ involving following reaction $\text{Cd}_{(s)} + 2\text{AgCl}_{(s)} \rightleftharpoons \text{CdCl}_2 \cdot 2.5\text{H}_2\text{O}(\text{Saturated}) + 2\text{Ag}_{(s)}$ is 0.6753V and 0.6915V at 25 ⁰ C and 0 ⁰ C. Calculate ΔH , ΔG and ΔS at 25 ⁰ 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