Roll No:

BTECH
(SEM II) THEORY EXAMINATION 2021-22
CHEMISTRY

Time: 3 Hours   *Total Marks: 100*

Note: Attempt all Sections. If you require any missing data, then choose suitably.

SECTION A

1. **Attempt *all* questions in brief.**   **2x10 = 20**

Qno	Questions	CO
(a)	Evaluate on the basis of MOT that Li_2 is stable and Be_2 is unstable.	1
(b)	Explain the conducting nature of Graphite.	1
(c)	Outline the molecular finger – prints region in IR spectra and comment on it.	2
(d)	Why 1,3,5-Hexatriene absorbs at higher λ_{max} value as compared to Ethylene?	2
(e)	What is salt bridge? Mention its function in an electrochemical cell.	3
(f)	Corrosion is reverse of metallurgy. Comment.	3
(g)	Calculate H.C.V. and L.C.V. of coal sample having following composition by mass C = 80 %, O = 3 %, H = 7 %, N = 2.1 %, S = 3.5%, Ash = 4.4%.	4
(h)	Why is hardness expressed in terms of $CaCO_3$ equivalents? What are the units of hardness and give inter-relation between them?	4
(i)	What is the basic requirement for a molecule to behave as monomer?	5
(j)	Classify polymers blends on basis of preparation.	5

SECTION B

2. **Attempt any *three* of the following:**   **10x3 = 30**

Qno	Questions	CO
(a)	What do you understand by Mesomorphic State? Classify them on the basis of temperature and mention their three important applications.	1
(b)	State the selection rule for Raman spectroscopy. What technological advances have enabled the routine use of Raman Spectroscopy. Also describe how the Stokes and anti Stokes lines appear in the Raman Spectroscopy?	2
(c)	Define phase, component and degree of freedom as applied to phase rule. Explain the application of phase rule to water system.	3
(d)	Outline the demineralization method of water softening with well labelled diagram. Compare the merits and demerits of ion exchange method with zeolite method.	4
(e)	What are conducting polymers? Give their classification and mention their important applications.	5

SECTION C

3. **Attempt any *one* part of the following:**   **10x1 = 10**

Qno	Questions	CO
(a)	Compare and draw the MO diagram of N_2 and CN molecule. Calculate their bond order and predict their magnetic behavior.	1
(b)	Discuss the preparation, properties and applications of an allotrope of carbon having bucky ball shape.	1

4. **Attempt any *one* part of the following:**   **10x1 = 10**

Qno	Questions	CO
(a)	What are absorption spectra? Discuss about different types of electronic transitions in UV spectroscopy with examples. Also comment on the effect of polar solvent on $n \rightarrow \pi^*$ transition.	2

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(b)	Write short notes on (**any two**) (i) Applications of IR spectroscopy (ii) Molecular Vibrations (iii) UV Shift	2

5. **Attempt any *one* part of the following:** 10x1 = 10

Qno	Questions	CO
(a)	What is the difference between primary and secondary batteries? With the help of labeled diagram, illustrate the construction and working of lead-acid storage cell. Also summarize the electrode reactions involved in the working of lead-acid storage cell.	3
(b)	Derive Nernst equation and give its applications. Determine the concentration of Cd^{2+} ions in the following electrochemical cell. Zn / Zn^{2+} (0.1 M)// Cd^{2+} (x M)/Cd **Given**: $E° Zn^{2+}/Zn$= -0.76V $E° Cd^{2+}/Cd$= -0.40V E_{cell}=0.3305V at 298 K	3

6. **Attempt any *one* part of the following:** 10x1 = 10

Qno	Questions	CO
(a)	Outline the principle and process involved in continuous Hot Lime-Soda method for water softening. Calculate the amount of lime and soda required for 50,000 L of water containing the following salts: $Ca(HCO_3)_2$ = 8.1 mg/L, $Mg(HCO_3)_2$ = 7.5 mg/L, $MgCl_2$ = 2.0 mg/L , $MgSO_4$ = 12.0 mg/L, NaCl = 4.7 mg/L and $CaSO_4$ = 13.6 mg/L.	4
(b)	With the help of a neat diagram, illustrate the principle, construction and working of bomb calorimeter. A sample of coal contain C=92%, H=5% and ash=3%. The following data were obtained when the above coal was tested in bomb calorimeter: Weight of coal burnt= 0.95 g Weight of water taken= 700 g Water equivalent of bomb & calorimeter= 2000 g Rise in temperature= 2.48˚C Fuse wire correction= 10 Cal Acid correction= 60 Cal Cooling Correction= 0.02˚C Evaluate gross and net calorific values of the coal, (if the latent heat of vaporization is 587 Cal/g).	4

7. **Attempt any *one* part of the following:** 10x1 = 10

Qno	Questions	CO
(a)	Illustrate the preparation, properties and applications of Grignard Reagent.	5
(b)	Discuss various methods of preparation, properties and applications of the following polymers- i. Nylon- 6,10 ii. BUNA-S iii. Cis-Polyisoprene cross linked with Sulphur	5