Roll No: | | | | | | | | | | | | | |

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 $12000 dm^3 mol^{-1} cm^{-1}$.	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. $$Zn(s)\left\vert Zn^{2+}(0.2M)\right\Vert Ag^{+}(0.002M)\left\vert Ag(s)\right. at\ 25^0 C$$	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 O_2 and 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 (C_3H_7NO) exhibited signals at δ 7.8 (1H, singlet), δ 2.8 (3H, singlet) and δ 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 C_2H_5MgBr reacts with (i) HCHO (ii) CH_3CHO (iii) $(CH_3)_2CO$ (iv) 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) (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.	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%. 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.	7
b.	Illustrate the principle of lime soda process. Analysis of raw water gives the following data: Ca^{2+} = 20 ppm, Mg^{2+} = 25 ppm, CO_2 = 30 ppm, HCO_3^- = 150 ppm, K^+ = 10 ppm. Analysis of treated water: CO_3^{2-} = 45ppm, OH^- = 68 ppm. Calculate the Lime (87% pure) and Soda (91% pure) required to soften 10^6 litre of sample water.	7

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

a.	Classify conducting polymers and mention their important applications	7
b.	Write the preparation (structure of monomer and polymer), properties & applications of the **any THREE** polymers: (i) Buna –S (ii) Nylon 6,6 (iii) Polyester (iv) Kevlar (v) Bakelite	7