

TCY-101

1396

Odd Semester Examination, 2017-18

B.TECH. (SEMESTER-I)

ENGINEERING CHEMISTRY

Time: 03:00 Hours

Max. Marks: 70

Note: Attempt all questions. The marks assigned to each question are indicated at question itself.

1. Attempt **any four** questions:

[5x4=20]

- On the basis of Molecular Orbital Theory, give molecular configuration, bond order and magnetic behavior of NO molecule.
- Derive and discuss Bragg's equation for diffraction of X-rays by crystal.
- Give importance of hydrogen bonding. Explain why H_2O is liquid and H_2S is a gas at room temperature ?
- By using appropriate example discuss the mechanism of SN^1 reaction.
- Discuss the structure and applications of Fullerene.
- Compare liquid crystalline phase with solid and liquid phase. Explain Nematic liquid crystal and write examples.

2. Attempt **any four** questions:

[5x4=20]

- Derive integrated rate equation for second order reaction when the concentration of both the reactants is same. Also derive equation for its half life.
- A first order reaction is 20% completed in 10 minutes. Calculate: (i) specific rate constant of the reaction, and (ii) the time taken for the reaction go to 75% completion.
- What is hardness of water? Calculate the amount of lime (84% pure) required for softening 5000 liter of hard water containing 144 ppm of MgSO_4 .
- Give a brief account of liquid junction potential.
- What is meant by corrosion? Explain the electrochemical theory of corrosion.

- (f) The molar conductances of sodium acetate, hydrochloric acid and sodium chloride at infinite dilution are 91.0×10^{-4} , 426.16×10^{-4} and $126.45 \times 10^{-4} \text{ S m}^2 \text{ mol}^{-1}$ respectively. Calculate the molar conductance at infinite dilution for acetic acid.

3. Attempt **any two** questions: [10x2=20]

- (a) (i) What are the limitations of raw rubber? Explain the process of vulcanization.
 (ii) Give reaction involved in preparation of synthetic rubber SBR and Polyurethane. Discuss their applications.
- (b) Define and classify refractories giving at least two examples of each class. What are the major characteristics of good refractory?
- (c) Write notes on:
 (i) Biodegradable polymer
 (ii) Setting and hardening of cement
 (iii) Conducting polymer
 (iv) Toughened glass.

4. Attempt **any two** questions: [10x2=20]

- (a) (i) Explain conversion of biomass into Biogas. Write composition of Biogas and advantages of Biogas.
 (ii) Explain flash and fire point of lubricant. Discuss its significance.
- (b) (i) Define gross and net calorific values of fuel. Explain working of bomb calorimeter for determining the heating values of solid fuels.
 (ii) A fuel sample contains 92% C, 5% H and 2% ash gave following analysis on combustion by Bomb Calorimeter: Weight of coal burnt = 0.95g, Weight of water taken = 750g, Water equivalent of calorimeter = 2000g, Rise in temperature = 2.8°C , Cooling correction = 0.20°C , Fuse wire correction = 10.0 cal, Acid correction = 40.0 cal. Calculate GCV and NCV of the fuel.
- (c) (i) What are lubricants? How are they classified?
 (ii) Explain extreme high pressure lubrication mechanism.

5. Attempt any two questions:

[10x2=20]

- (a) (i) How ethanol and diethyl ether will be distinguished with the help of ^1H NMR spectroscopy. Give the splitting pattern as well.
- (ii) What is importance of position of the signal in NMR Spectra. Explain causes of chemical shift.
- (b) (i) Discuss the application of complex metric titration for estimation of hardness of water.
- (ii) 25mL of a solution of iron salt containing 1.307g per 100ml of salt requires 12.5 ml N/15 $\text{K}_2\text{Cr}_2\text{O}_7$ solution with dilute H_2SO_4 for complete reaction using external indicator $\text{K}_3[\text{Fe}(\text{CN})_6]$. Calculate the percentage of ferrous ion in iron salt.
- (c) (i) Write note on Auxochrome and Chromophore. Discuss applications of UV spectroscopy.
- (ii) Write short note on TGA.

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