

[Total No. of Questions - 9] [Total No. of Printed Pages - 4]
(2125)

15008

B. Tech 1st Semester Examination

Engineering Chemistry (CBS)

CH-101

Time : 3 Hours

Max. Marks : 60

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Question No. 9 (Section E) is compulsory. The candidate is required to attempt five questions selecting one question from each section A, B, C & D. All questions carry equal marks.

SECTION - A

1. (a) Write a note on caustic embrittlement. Discuss the limitations and advantages of zeolite process for water softening. (6)
- (b) Discuss the principles and processes used in domestic water purifiers. (6)
2. (a) A zinc rod is placed in a 0.1 M solution of zinc sulphate at 25°C. Calculate the potential of the electrode at this temperature assuming 96% dissociation of ZnSO_4 and $E^\circ (\text{Zn}^{2+}/\text{Zn}) = 0.76\text{V}$. (3)
- (b) What is a reference electrode? Discuss the construction and working principle of a glass electrode. How does it measure the pH of a solution—Explain. (8)
- (c) Explain why a porous plate or a salt bridge is not required in a lead-acid storage cell? (1)

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SECTION - B

3. (a) Explain how does the following factors influence the rate of corrosion—
 - (i) Ratio of anodic and cathodic areas
 - (ii) pH
 - (iii) Nature of the oxide film formed on the surface. (6)
- (b) Describe the mechanism of electrochemical corrosion involving (i) hydrogen evolution and (ii) oxygen absorption. Why corrosion becomes faster in acidic medium? (6)
4. (a) Briefly discuss the basic principle of X-ray diffraction techniques. (3)
- (b) What are the electronic transitions taking place in UV-Vis spectroscopy? Why broad absorption bands are found in UV-Vis spectrum instead of sharp peaks? Explain the effect of solvent and conjugation in structure on the electronic transitions in UV-Vis range. (7)
- (c) Write few applications of IR spectroscopy (2)

SECTION - C

5. (a) What are the different types of coal and their carbon content? Differentiate between proximate and ultimate analysis of coal.

A sample of coal was analyzed as follows:

1.000g of an air-dried coal sample was weighed in silica crucible. After heating for 1 hour at 105-110°C, the dry coal residue weighed 0.985g. The crucible was covered with a vented lid and then heated strongly for exactly 7 minutes at 950±20°C. The residues weighed 0.800g. The crucible was then heated strongly in air, until a constant weight was obtained. The last residue was found to weigh 0.100g. Calculate the proximate analysis. (7)

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(b) Explain the followings:

- (i) Cracking and reforming of petroleum fuels.
- (ii) Cetane number. (5)

6. (a) Differentiate between hydrodynamic and boundary lubrication mechanisms. (3)

(b) Explain the following:

- (i) Flash and fire point.
- (ii) Cloud and pour points.
- (iii) Viscosity and viscosity index.
- (iv) Neutralization number and Iodine number.
- (v) Aniline number. (9)

SECTION - D

7. (a) Write the preparation and applications of—

- (i) epoxy resin
- (ii) PMMA
- (iii) polyurethane (9)

(b) Differentiate between thermoplastic and thermosetting polymers with examples. (3)

8. (a) What are nano materials? Discuss few important applications of nano materials. (4)

(b) Write notes on:

- (i) vulcanization of rubber.
- (ii) biodegradable polymers.
- (iii) nano-wires and nano-cones.
- (iv) urea formaldehyde resin. (8)

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9. (a) What is saponification number of a lubricant?

(b) What is COD of a water sample?

(c) Bolt and nut made of same metal is preferred in practice-why?

(d) What are boiler scales?

(e) Explain why aniline shows maximum absorption at 230 nm in neutral medium and 203 nm in acidic medium respectively.

(f) Distinguish between galvanizing and tinning.

(g) Explain the term "auxochrome".

(h) What is octane number?

(i) What is fundamental vibration in IR spectroscopy?

(j) Write the name and structure of monomer for PVC.

(k) What is temporary hardness of water?

(l) Write an important application of glass electrode.
(1×12=12)