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

15015

B. Tech 1st Semester Examination

Engineering Chemistry (NS)

NS-103

Time : 3 Hours **Max. Marks : 100**

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 : All sections are compulsory.

Attempt five questions in all selecting one question from each section A, B, C & D of the question paper and all the subparts of Section E.

SECTION - A

1. (a) What is electrochemical series? Using electrochemical series find out whether zinc and silver would react with dilute H_2SO_4 or not.

   E° Zn/Zn^{2+} = -0.76 V, E° Ag/Ag^{+}=0.80 V. (5)

   (b) Determine the concentration of Cd^{2+} ions in the following electrochemical cell.

   $Zn/Zn^{2+}(0.1M)$ // Cd^{2+} (M)/ Cd

   Given E° Zn^{2+} /Zn = -0.76V

   E° Cd^{2+}/Cd = -0.40V (5)

   (c) What is Nernst equation? What is its importance in computing the EMF of the cell? (5)

   (d) Explain the construction of Calomel electrode? What are advantages and disadvantages of calomel electrode? (5)

[P.T.O.]

2. (a) Draw and explain phase diagram for

   (i) Water system. (ii) Lead silver system. (7×2=14)

   (b) What is phase rule? Give the limitations and advantages of phase rule. (5)

   (c) For one component system, triple point is invariant. Explain. (1)

SECTION - B

3. (a) Why does a steel pipe in larger copper tank corrode causing rapid destruction? (2)

   (b) Galvanisation of iron articles is preferred over tinning. Give reasons. (2)

   (c) What is stress corrosion? Write chemical reactions taking place during season cracking and caustic embrittlement. (10)

   (d) Differentiate between anodic and cathodic coatings. (4)

   (e) Why does iron corrode faster than aluminium even though it is below A1 in the electrochemical series? (2)

4. (a) Why hard water consumes lot of soap? (2)

   (b) What are the different factors contributing to boiler corrosion? How can the boiler corrosion be minimized? (5)

   (c) What is the principle of EDTA method? Describe the estimation of hardness of by EDTA method. (10)

   (d) Write a short note on COD. (3)

SECTION - C

5. (a) Absorption maxima of aniline shifts from 280 mμ to 200 mμ in acidic solution. Why? (2)

   (b) What is the shift of resonance from TMS of a group of nuclei with δ = 3.50 and operating frequency of 350 MHz? (2)

   (c) On the basis of IR spectroscopy how can you distinguish among 1-hexyne, 1-hexene and hexane? (2)

(d) A monochromatic radiation is incident on a solution of 0.01 M concentration of an absorbing substance. The compound transmits 20% of the radiation when the path length is equal to 1.5 cm. What is molar extinction coefficient of the substance? (5)

(e) What is chemical shift? Differentiate between shielding and desheilding. (5)

(f) Distinguish between fluorescence and phosphorescence with suitable examples. (4)

6. (a) What are chemical fuels? Give complete classification of chemical fuels with examples. (5)

(b) What is water gas? Give its composition. How is it prepared on large scale? What are uses? (7)

(c) What is the significance of ultimate analysis of coal? How is this analysis is carried out in the laboratory? (5)

(d) What is reforming of petrol? How does reforming increase octane number? (3)

SECTION - D

7. (a) What is anionic polymerization? What are its conditions? Discuss its mechanism. (8)

(b) What is tacticity of polymers? Explain its types. (2)

(c) Differentiate between addition and condensation polymerisation. (2)

(d) Explain synthesis and applications of

i. Bakelite ii. Plexiglass (3×2=6)

(e) Crystalline polymers show more chemical resistance than amorphous polymers of same molecular weight. Explain. (2)

8. (a) Composites are used as structural material in place of conventional materials. Justify the statement. (2)

(b) Calculate the fraction of load carried by the fibers in two composites of glass fibers and epoxy matrix one of them containing 20% fibers by volume and the one 60%. Elastic moduli for the glass fibers and the epoxy resin are 72 GN/m^2 and 3.6 GN/m^2, respectively. (5)

(c) Discuss in brief the role played by matrix, fiber and interface in the fiber reinforced composites. (5)

(d) Under what conditions fiber reinforced composites can fail? Discuss their failure modes. (5)

(e) What are the advantages and applications of composites? (3)

SECTION - E

9. (a) A copper equipment should not possess a small steel bolt. Why?

(b) What is the significance of carbon in coal and how is it determined?

(c) Differentiate between temporary and permanent hardness of water.

(d) Why do electrochemical cells stop working after sometime?

(e) Predict the number of components for decomposition of $CaCO_3$:

$CaCO_3$ (s) $\leftrightarrow$ CaO (s) + CO_2(g)

(f) Explain the fact that unlike propene and propyne, ethylene and ethyne have no carbon to carbon multiple stretching bands in IR spectrum.

(g) Why TMS is used as internal standard in NMR spectroscopy?

(h) What is bathochromic and hypsochromic shift? Explain with suitable example.

(i) Why do rubber become stiff on stretching?

(j) Why natural fiber reinforced composites are being preferred over glass fiber reinforced composites?

(2×10=20)