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CHE12/22

First / Second Semester B.E. Degree Examination, Dec. 07 / Jan. 08
Engineering Chemistry

Time: 3 hrs.

Max. Marks:100

Note : Answer any FIVE full questions.

- 1 a. What are liquid crystals? Give the salient features of nematic and columnar liquid crystals. (06 Marks)
- b. Explain with examples the liquid crystalline behaviour of PAA and MBBA homologous series. (08 Marks)
- c. Write a note on Biofertilizers. (06 Marks)
- 2 a. Define i) Gross calorific value and ii) Net calorific value of a fuel. How are they related? (04 Marks)
- b. Calculate the gross and net calorific value of a coal sample from the following data obtained from a bomb calorimeter experiment:
i) Weight of coal = 0.65 kg ii) Weight of water taken in calorimeter = 1200 kg
iii) Water equivalent of calorimeter = 400 kg iv) Latent heat of steam = $587 \times 4.2 \text{ kJ Kg}^{-1}$
v) Hydrogen in the coal sample = 2% vi) Rise in temperature = 1.8°C vii) Specific heat of water = $4.187 \text{ kJ kg}^{-1}\text{ }^{\circ}\text{C}$. (08 Marks)
- c. What is knocking in IC engines? Explain the mechanism of knocking. How can it be prevented? (08 Marks)
- 3 a. Define i) Single electrode potential and ii) Standard electrode potential.
An electrochemical galvanic cell is obtained by coupling silver [$E^{\circ}_{\text{Ag}^+/\text{Ag}} = 0.80 \text{ volts}$] with standard hydrogen electrode [$E^{\circ}_{\text{SHE}} = 0$] at 298 K. How would you determine the potential of silver electrode? Represent the electrochemical cell and write the cell reactions. (06 Marks)
- b. Consider a electrochemical cell as given, $\text{Zn}/\text{Zn}^{2+} (0.005\text{M})//\text{Ag}^+ (0.1\text{M})/\text{Ag}$.
The cell reaction is spontaneous at 298 K. The standard reduction potentials of zinc and silver are -0.76 and 0.80 volts respectively. Write the redox electrode reactions with their respective electrode potentials, net cell reaction; and calculate the EMF of the cell. (07 Marks)
- c. What are reference electrodes? Explain the construction and working of a calomel electrode. (07 Marks)
- 4 a. Discuss construction and working of Zn – air battery. (06 Marks)
- b. Explain the construction and working of Nickel-Cadmium cell. Mention the composition and the electrode reactions during the discharge of the cell. (08 Marks)
- c. What are fuel cells? Discuss construction and working of $\text{H}_2 - \text{O}_2$ fuel cell. (06 Marks)
- 5 a. What is corrosion? Explain the electrochemical theory of rusting of iron in moist atmosphere. (08 Marks)
- b. Write a note on i) Pitting corrosion ii) Cathodic protection. (08 Marks)
- c. Define i) Decomposition potential ii) Over voltage. (04 Marks)
- 6 a. What is electroless plating? Write two advantages of electroless plating. Describe the process of electroless plating of nickel. (08 Marks)
- b. Write briefly the process of electroplating of chromium. (06 Marks)
- c. Write a note on i) Organic additives used in plating ii) Throwing power of plating bath. (06 Marks)
- 7 a. Give the sources and ill effects of
i) Oxides of sulphur ii) Photochemical oxidants. (08 Marks)
- b. Write a note on i) Ozone depletion ii) Global warming. (08 Marks)
- c. 20 cm^3 of an industrial effluent sample required 8.5 cm^3 of 0.05 N potassium-dichromate solution. Calculate the COD of the effluent sample. (04 Marks)
- 8 a. Write the free radical mechanism of addition polymerization by taking ethylene as example. (08 Marks)
- b. Give the manufacture and uses i) Phenol formaldehyde ii) Buna – S. (08 Marks)
- c. What are conducting polymers? Give the synthesis of polyaniline. (04 Marks)