CBCS SCHEME

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17CHE12/22

First/Second Semester B.E. Degree Examination, Jan./Feb. 2023
Engineering Chemistry

Time: 3 hrs. Max. Marks: 100

Note: ***Answer any FIVE full questions, choosing ONE full question from each module.***

Module-1

1 a. Define single electrode potential. Derive the Nernst equation for single electrode potential. **(07 Marks)**

b. What are Ion selective electrodes? Explain the determination of P^H of solution by using glass electrode. **(06 Marks)**

c. Define battery. Explain the following battery characteristics :
i) Capacity
ii) Cycle life
iii) Energy efficiency. **(07 Marks)**

OR

2 a. What are reference electrodes? Explain the construction and working of calomel electrode. **(07 Marks)**

b. What are concentration cells? The cell potential of Ag concentration cell, $Ag(s)|AgNO_3(0.02)||AgNO_3(XM)|Ag$ is 0.169V at 25°C calculate the value of X. **(06 Marks)**

c. Write any two differences between battery and fuel cell. Explain construction and working methanol – oxygen fuel cell. **(07 Marks)**

Module-2

3 a. What is Corrosion? Explain the electrochemical theory of corrosion with an example. **(07 Marks)**

b. Explain how the following factors influence on rate of corrosion :
i) Ratio of Anode and cathode
ii) Nature of corrosion product
iii)Temperature. **(06 Marks)**

c. Define electroless plating. Describe the electroless plating of Cu on PCB. **(07 Marks)**

OR

4 a. Define metal finishing. Mention the objectives of metal finishing. **(06 Marks)**

b. Explain the electroless plating of chromium and mention its applications. **(06 Marks)**

c. Describe the following corrosion controlling techniques :
i) Galvanizing ii) Anodizing. **(08 Marks)**

Module-3

5 a. Define Cracking. Explain the Fluidized bed Catalytic Cracking (FCC) with a neat diagram. **(07 Marks)**

b. Define gross colorific value. Calculate GCV and LCV of 0.65g of coal sample containing, 3% H_2 which was subjected to combustion in a bomb calorimeter. Mass of water taken in the calorimeter was 1500g and water equivalent of colorimeter was 250g and the rise in temperature was 2.5°C. Given specific heat of water is 4.187 KT/kg/°C and latent heat of steam is 2454 kJ/kg. **(07 Marks)**

c. Define Photovoltaic Cell. Explain the construction and working of photovoltaic cell. **(06 Marks)**

OR

6 a. What is Knocking? Explain the mechanism of knocking in IC engine. **(06 Marks)**

b. Explain the production of synthetic petrol by Fischer – Tropsch process. **(07 Marks)**

c. Explain the production of solar grade silicon (S_i) by union carbide process with relevant reactions. **(07 Marks)**

Module-4

7 a. Describe the free radial mechanism of addition polymerization of Poly Vinyl Chloride. **(06 Marks)**

b. What is glass transition temperature (T_g)? Explain any three factors influence on T_g and mention its any two significance. **(08 Marks)**

c. A polymer of polypropylene is found to have the following composition :

i) $R\text{+}CH_2-\underset{\underset{CH_3}{|}}{CH}\text{+}_{400} R$ of 20%

ii) $R\text{+}CH_2-\underset{\underset{CH_3}{|}}{CH}\text{+}_{400} R$ of 30%

iii) $R\text{+}CH_2-\underset{\underset{CH_3}{|}}{CH}\text{+}_{400} R$ of 50%

Calculate the number average ($\overline{M}_n$) and weight average ($\overline{M}_w$) molecular masses of the polymer. (Given : atomic mass of C = 12, H = 1, neglect the mass of R). **(06 Marks)**

OR

8 a. What is polymerization? Explain the addition and condensation polymerization with an example. **(05 Marks)**

b. Write the synthesis and applications of the following polymers :
i) Silicone rubber
ii) Polyurethane. **(08 Marks)**

c. What are polymer composites? Explain the synthesis, properties and applications of Kevlar fiber. **(07 Marks)**

Module-5

9 a. Discuss the purification of water by :
i) Electro dialysis
ii) Reverse osmosis. **(07 Marks)**

b. Define COD and calculate the COD of the effluent sample when 25ml of effluent requires 8.9ml of 0.001M $K_2Cr_2O_7$ for complete oxidation. **(07 Marks)**

c. Explain any three size dependent properties of nanomaterials. **(06 Marks)**

OR

10 a. What are boiler scale and sludge? List out their disadvantages and mention preventive methods. **(05 Marks)**

b. What are nanomaterials?. Explain the gas condensation method of preparation of nanomaterails. **(08 Marks)**

c. What is domestic sewage? Describe the sewage treatment with neat diagram. **(07 Marks)**

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