CBCS SCHEME

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18CHE12/22

First/Second Semester B.E. Degree Examination, July/August 2022
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 Nernst equation for single electrode potential. **(07 Marks)**

b. What are batteries? Explain the construction and working of Nickel – Metal hydride battery. Mention its applications. **(07 Marks)**

c. A galvanic cell consists of a rod of copper immersed in 10.0M solution of $CuSO_4$ and a rod of iron immersed in 0.1M solution of $FeSO_4$. Write the cell representation, cell reaction and calculate the emf of the cell. Given, $E^0_{Fe^{2+}/Fe} = -0.44V$ and $E^0_{Cu^{2+}/Cu} = 0.34V$. **(06 Marks)**

OR

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

b. Explain primary, secondary and reserve batteries with an example. **(07 Marks)**

c. Define electrolyte concentration cell. Give an example. The emf of the cell $Ag(s)|Ag^+(0.01M)||Ag^+(xM)|Ag(s)$ is 0.0591V at 298K. Find the value of x. **(06 Marks)**

Module-2

3 a. Define metallic corrosion. Discuss the electrochemical theory of corrosion taking iron as an example. **(07 Marks)**

b. What is galvanizing? Explain the galvanizing of iron. **(07 Marks)**

c. What is electroplating? Explain the electroplating of hard chromium with reactions. **(06 Marks)**

OR

4 a. What is cathodic protection? Explain the impressed current and sacrificial anode methods of corrosion control. **(07 Marks)**

b. Define electroless plating. Discuss the electroless plating of copper with relevant reactions. **(07 Marks)**

c. What is metal finishing? Mention any FIVE technological importance of metal finishing. **(06 Marks)**

Module-3

5 a. Explain the experimental determination of calorific value of a solid fuel using Bomb calorimeter. **(07 Marks)**

b. What is biodiesel? How is it produced? Mention its advantages. **(07 Marks)**

c. What is knocking in IC engines? Explain the mechanism of knocking in petrol engine. **(06 Marks)**

OR

6 a. What are PV cells? Explain the construction and working of PV cell with neat diagram. **(07 Marks)**

b. Describe the construction and working of MeOH – O_2 fuel cell. Mention its applications. **(07 Marks)**

c. On burring 0.78g of a fuel in a bomb calorimeter, the temperature of 2600g of water was increased by 2.8K water equivalent of calorimeter is 400g. If the fuel contains 5% hydrogen, calculate its GCV and NCV. Given, specific heat of water = 4.187kJkg^{-1} K^{-1} and Latent heat of steam = 2454 kJ/kg. **(06 Marks)**

Module-4

7 a. Mention the sources, effects and discuss the control of oxides of sulphur pollution. **(07 Marks)**

b. What is boiler feed water? Explain the scale and sludge formation in boilers. Mention their ill effects. **(07 Marks)**

c. Define BOD and COD. In a COD test, 28.2cm^3 and 12.5cm^3 of 0.05N FAS solution is consumed for blank titration and sample titration respectively. The volume of waste water used is 25cm^3. Calculate the COD of the sample. **(06 Marks)**

OR

8 a. Mention the sources of solid wastes. Explain the scientific land filling method and composting method of solid waste disposal. **(07 Marks)**

b. What are the sources, ill effects and control of lead pollution? **(07 Marks)**

c. What is desalination of sea water? Describe the desalination of water by reverse osmosis process. **(06 Marks)**

Module-5

9 a. Write the principle and explain the instrumentation and any one application of conductometry. **(07 Marks)**

b. What are nano – materials? Explain the synthesis of nano-materials by chemical vapour deposition. **(07 Marks)**

c. Explain the theory and instrumentation of potentiometry. **(06 Marks)**

OR

10 a. Write a note on fullerenes sand carbon nanotubes. **(07 Marks)**

b. Discuss the synthesis of nanomaterials by sol-gel process. **(07 Marks)**

c. Discuss the theory and application of colorimetry in the estimation of concentration of copper in the given solution. **(06 Marks)**

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