CBCS SCHEME

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18CHE12/22

First/Second Semester B.E. Degree Examination, July/August 2021
Engineering Chemistry

Time: 3 hrs. Max. Marks:100

Note: ***Answer any FIVE full questions.***

1 a. Define free energy and derive Nernst equation for single electrode potential of an electrode. **(06 Marks)**

b. Calculate the emf a Fe-Ag cell in which Fe is in contact with 0.1M $FeSO_4$ solution and Ag is in contact with 0.1M Ag NO_3 solution. The standard reduction potentials of Fe and Ag are – 0.44V and +0.80V respectively. **(07 Marks)**

c. Explain the construction and working of Lithium – ion battery. Mention its applications. **(07 Marks)**

2 a. Explain the construction and working of Ni-metal hydride battery. Mention its applications. **(07 Marks)**

b. What are ion–selective electrodes? Describe the construction and working of glass electrode. **(07 Marks)**

c. The emf a cell Ag|Ag NO_3(0.001M)||$AgNO_3$(XM)|Ag is 0.0591V at 25°C. Find the value of X. **(06 Marks)**

3 a. Explain electrochemical theory of corrosion taking iron as an example. **(07 Marks)**

b. Explain the process of :
i) Galvanising
ii) Anodizing. **(07 Marks)**

c. Define the term :
i) Polarization
ii) Decomposition potential
iii) Overvoltage. **(06 Marks)**

4 a. Explain the following factors affecting rate of corrosion
i) Nature of corrosion product
ii) Ratio of anodic to cathodic area. **(07 Marks)**

b. What is meant by metal finishing? Mention (any 5) technological importance of metal finishing. **(07 Marks)**

c. Describe electroless plating of copper with plating reaction and mention its application. **(06 Marks)**

5 a. Describe the Bomb calorimetric method for determination of calorific value of fuel. **(07 Marks)**

b. What do you mean by knocking in IC engine? Explain mechanism of knocking. **(07 Marks)**

c. What are fuel cells? Mention advantages and limitations of fuel cell. How the fuel cell differs from battery (conventional cell). **(06 Marks)**

6 a. What are Photovoltaic cell? Describe construction, working and application of typical PV cell. **(07 Marks)**

b. Explain the preparation of solar grade silicon by union Carbide process. **(07 Marks)**

c. Calculate the higher and lower calorific value of a coal sample from the following data obtained in bomb calorimetric experiment.

i) Weight of coal = 0.65 g
ii) Weight of water in calorimeter = 1200 g
iii) Water equivalent of calorimeter W = 400 g
iv) Latent heat of steam = 587 × 4.2 kJ/kg
v) Hydrogen in coal sample = 2%
vi) Rise in temperature = 1.8°C
vii) Sp-heat of water = 4.187kJ/kg/°C. **(06 Marks)**

7 a. What are the sources, effects and control method of oxides of sulphur. **(07 Marks)**

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

c. In COD test 25ml and 14ml of 0.05N FAS solution are required for blank and sample titration respectively. The volume of test sample used was 25ml. Calculate the COD of sample solution. **(06 Marks)**

8 a. What do you mean by desalination of water? Explain the reverse osmosis process for desalination of water. **(07 Marks)**

b. Explain the determination of sulphate content in water by gravimetric method. **(07 Marks)**

c. What are the sources and ill effect of secondary pollutant ozone? Explain ozone depletion. **(06 Marks)**

9 a. Explain theory, Instrumentation and Application of flame photometry. **(07 Marks)**

b. Explain the theory and instrumentation of potentiometer. **(07 Marks)**

c. Write a note on fullerene. Mention its application. **(06 Marks)**

10 a. Explain the theory, instrumentation and application of conductometry in the titration of mixture of strong acid and weak acid with a strong base. **(07 Marks)**

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

c. Describe the properties and application of :

i) Carbon nature
ii) Graphenes. **(06 Marks)**

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