Reg. No. : ⬜⬜⬜⬜⬜⬜⬜⬜⬜⬜⬜⬜

Question Paper Code : 97107

B.E./B.Tech. DEGREE EXAMINATION, DECEMBER 2015/JANUARY 2016.

First Semester

Civil Engineering

HS 1103 — ENGINEERING CHEMISTRY — I

(Common to all branches)

(Regulation 2008)

Time : Three hours   Maximum : 100 marks

Answer ALL questions.

PART A — (10 × 2 = 20 marks)

1.   What is phosphate conditioning?

2.   Define temporary and permanent hardness.

3.   Differentiate between physisorption and chemisorption.

4.   What is adsorption isotherm?

5.   What are reversible and irreversible cells?

6.   What is an electrochemical series?

7.   Distinguish primary and secondary batteries

8.   What are solar cells?

9.   Derive the Beer-Lamberts law.

10. Draw the block diagram of atomic absorption spectrometer.

PART B — (5 × 16 = 80 marks)

11. (a) (i)   With a necessary diagram, describe the reverse osmosis method for
                 the desalination of brackish water.   (8)

          (ii) Describe the principle and procedure involved in the zeolite process
                 for water treatment.   (8)

Or

(b) (i) Write a brief note on the following :

(1) Ozonization

(2) Calgon conditioning. (8)

(ii) 50 mL of a sample water consumed 15 mL of 0.01 M EDTA before boiling and 5 mL of the same EDTA after boiling. Calculate the degree of total hardness permanent hardness and temporary hardness. (8)

12. (a) (i) Derive the expression for Langmuir's adsorption isotherm and discuss how the substrate concentration influences the rate of adsorption. (8)

(ii) What are the factors that influence the adsorption of solutes from solution? Explain how they influence. (8)

Or

(b) (i) What is ion exchange adsorption? Explain how this concept is useful in the separation of compounds by chromatographic technique. (8)

(ii) Explain the role of adsorption in catalysis. (8)

13. (a) (i) A cell is formed by dipping Zn rod in 0.01 M Zn^{2+} solution and Ni rod in 0.5 M Ni^{2+} solution. The standard electrode potentials of Zn and Ni are −0.76 V and −0.25 V respectively. Write the cell representation, cell reaction and calculate the emf of the cell. (8)

(ii) Explain the construction and working of quinhydrone electrode. Discuss its merits and limitations. (8)

Or

(b) (i) What are potentiometric titrations? Show how the end points are obtained in redox and precipitation reactions. (8)

(ii) Discuss the construction and functioning of a calomel electrode. (8)

14. (a) (i) Enumerate the steps involved in the nuclear fission of uranium. (8)

(ii) Discuss the charge-discharge mechanism of nickel-cadmium battery. (8)

Or

(b) (i) With a neat sketch of nuclear reactor, explain its parts and functions. (8)

(ii) Define fuel cell and discuss the operation of hydrogen-oxygen fuel cell. (8)

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15. (a) (i) Draw the block diagram of IR spectrometer and describe its parts. (8)

(ii) When a monochromatic light is passed through a cell of 1 cm length, the intensity of the radiation is reduced to 10%. if the same radiation is passed through a cell of length 8 cm what is the concentration of the solution? Calculate the length of the cell in order to have 25% absorbance. (8)

Or

(b) (i) How would you estimate the concentration of sodium in the given solution using flame photometry? (8)

(ii) How will you estimate the concentration of iron in the given solution by colorimetry? (8)

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