Roll No. ....

Total Pages : 4

BT-1/D-12

8011

CHEMISTRY

Paper–CH-101E

Time Allowed : 3 Hours]   [Maximum Marks : 100

Note :   Attempt **five** questions in all, selecting at least **one** question from each Unit. All questions carry equal marks.

UNIT–I

1. (a)   Discuss the second law of thermodynamics in terms of entropy. Show that entropy is a state function.   5

   (b)   Derive the Gibb's-Helmholtz equation and describe its significance.   10

   (c)   Five moles of an ideal gas expand isothermally and reversibly at 27°C from an initial volume of 5 dm³ to 50 dm³ against a pressure that is gradually reduced. Calculate ΔG and ΔS for the above process.   5

2. (a)   State and explain the various terms frequently used in the description of phase diagram.   6

   (b)   With the half of a neat, cleaned, labelled sketch, discuss the various phase equilibria, area and points involved in water system.   10

   (c)   Calculate the degrees of freedom (F) in the following :

   (i)   Ag and Pb at eutectic points

   (ii) Ice and water at equilibrium.   4

8011/K/1234/14,800

P. T. O.

UNIT–II

3. (a)   Name the various types of hardness present in water.   3

   (b)   How will you estimate Mg hardness by complexometric titration method in a given hard water sample ?   6

   (c)   What are the scales and sludges ? How are they formed in steam boiler ? Discuss the disadvantages and the methods of prevention of scales and sludges.   6

   (d)   A water sample responds to both phenolphthalein (HPh) and methyl orange (MeO) indicators. 100 ml of this water sample consumes 15.7 ml of N/20 HCl solution upto HPh end point. The resulting solution in the presence of MeO consumes another 7.3 ml of the above acid. Calculate the various types of alkalanities present in the aboe alkaline water sample in ppm as $CaCO_3$ equivalents.   5

4. (a)   Describe the electrodialysis process for desalination of brackish water. What are the main adantages and limitations of the above process ?   10

   (b)   Write short notes on the following (Any **two**) :

   (i)   Disinfection

   (ii) Coagulation

   (iii) Sedimentation.   5

   (c)   Discuss the working of an ion-exchanger used for the softening of hard water. How will you reclaim an exhausted ion-exchanger ? Illustrate your answer with the chemical reactions involved in these.   5

8011/K/1234/14,800   2

UNIT–III

5. (a) State and explain the dry and wet corrosion of the metals. 5

(b) How will you represent symbolically and construct diagramatically a Galvanic cell consisting of Zn and Cu electrodes ? 5

(c) Discuss the various factors affecting the corrosion. 5

(d) Write a short note on cathodic protection. 5

6. (a) Discuss the mechanism of hydrodynamic lubrication. 5

(b) How are the lubricants classified on the basis of their physical states ? Give a brief account of various types of lubricants. 7

(c) Write short notes on the following properties of the lubricants :

(i) Flash and fire point

(ii) Viscosity index. 2×4

UNIT–IV

7. (a) How will you classify the polymers on the basis of (i) their structures and (ii) the molecule forces ? 7

(b) Explain the mechanism of free radical addition polymerisation. 5

(c) Discuss the preparation, properties and technical applications of any one thermosetting polymer. 8

8011/K/1234/14,800   3   P. T. O.

8. (a) Describe the working of a common flame photometer. Mention two important applications of the flame photometry. 10

(b) What are conductometric titrations ? Discuss their important advantages. 5

(c) Write a short note on titrimetric analysis or on thermal analysis. 5