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BT-1/J05 8035

CHEMISTRY

Paper : CH-101 E

Time : Three Hours] [Maximum Marks : 100

Note :— Attempt **FIVE** questions in all, selecting at least **ONE** from each unit. All questions carry equal marks.

UNIT—1

1. (a) Define the various terms involved in phase rule. Explain the thermodynamic criterion of phase rule equilibrium. 8

   (b) Name the scientist who introduced the term eutectic. 1

   (c) State and explain the various equilibria involved in water system with a neat, sketched diagram. 8

   (d) Mention any two limitations of phase rule. 3

2. (a) State and explain (at least in two forms) the second law of thermodynamics. 5

   (b) One mol. of an ideal gas at 300 K expands reversibly from 3×10^{-2} m^3 to 5×10^{-2} m^3

   Calculate the entropy change for the gas (R = 1·987 cal) 5

   (c) Predict the magnitude of ΔS in the following :

   (i) $H_2(g) + Cl_2(g) + aq \rightarrow 2HCl\ (aq)$

   (ii) $H_2O\ (l) \xrightarrow{\Delta} H_2O\ (g)$

   (iii) $N_2(g) + 3H_2(g) \rightarrow 2NH_3\ (g)$

   Justify your answer with suitable explanation. 6

(d) The vapour pressures of water at 95°C and 100°C are 634 mm and 760 mm of Hg respectively. Calculate the latent heat of vaporization of water per gram (R = 1·987 cal).

UNIT– 2

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3 (a) What are complexometric titrations ? Name the indicator used in the determination of hardness of water. 4

(b) Why are the results of alkalinity and the hardness mostly expressed in terms of $CaCO_3$ equivalents ? 2

(c) Why the combination of hydroxide and bicarbonate alkalinities is not possible occurring together ? 2

(d) A water sample is alkaline both to phenol phthalein and methyl orange. 50 ml of the water sample requires 20 ml of N/50 H_2SO_4 upto phenolphthalein end point and another 5 ml for complete neutralization. Describe the types and amounts of the alkalinities present as $CaCO_3$ equivalents. 6

(e) 50 ml of a given water sample consumed 15 ml of 0·01 M EDTA solution before boiling and 5 ml of the same EDTA solution after boiling. Calculate the various types of hardness in ppm as $CaCO_3$ equivalents. 6

4. (a) What is meant by blow down operation and what is its use ? 3

(b) Distinguish between softening and demineralization of water. 3

(c) Differentiate among pure water, hard water, heavy water and boiler feed water. 4

(d) Draw a neat, labelled sketch of electrodialyzer. Explain its working. 8

(c) Write the structural formulae of EDTA and the indicator used in EDTA titrations. 2

UNIT – 3

5. (a) Name any two solid lubricants. 2

(b) Explain the electrochemical theory of corrosion. 5

(c) Discuss the various factors affecting corrosion. 5

(d) Iron corrodes faster than aluminium, even though iron is placed below aluminium in the electrochemical series. Why ? 3

(e) Explain extreme pressure lubrication. 5

6. (a) Why does graphite act as an excellent lubricant on the surface of moon ? 4

(b) What are blended oils ? Give examples of additives for improving different properties of a lubricant. 6

(c) Write the composition of Wij's reagent. 1

(d) 0·14 g of an oil sample was saponified with 50 ml of 0·5 N KOH alc. solution. The solution was then titrated against 0·05 N HCl. The volume of the acid used was found to 22·5 ml and 13·0 ml with the sample and without sample. Calculate the saponification value of the oil. 4

(e) What do you mean by consistency and drop point of a grease sample. Give their significance. 5

UNIT – 4

7. (a) Differentiate between a polymer and macromolecule. 3

(b) Though the functionality of ethene is two and the polymer obtained from it is expected to be a linear one. However, under the impact of temperature (180°C – 200°C) and

pressure (1500 atm), in presence of traces of oxygen, a branched chain polythene is obtained. Why ? 3

(c) Write the preparation, properties and industrial applications of any one thermoset. 7

(d) Write a short note on silicones. Aggarwal Jagadhri

8. (a) Explain the various types of polymerisation.

OR

Discuss the importance of any one spectroscopic method towards the elucidation of structure of compound. 10

(b) Write a short note on flame photometry. 10