Roll No. ..... **Total No. of Pages : 3**

PC 12970-N

K-8/2111
PHYSICAL CHEMISTRY—1103T
Semester—I

Time Allowed : Three Hours] [Maximum Marks : 55

Note :– The candidates are required to attempt *two* questions each from Sections A and B. Section C will be compulsory.

SECTION—A

I. State and explain partial molal properties. Discuss their significance. How partial molal volumes for the components of a binary mixture can be determined ? Explain. 8

II. (a) State and explain Third Law of thermodynamics. How this law is utilized to estimate absolute entropy of a substance ?

(b) Describe the role of free energy in metabolism. 5,3

III. (a) Using statistical considerations, obtain an expression for Maxwell Boltzmann distribution law.

(b) Derive expression for energy of a particle possessing rotational motion. 4,4

IV. (a) Derive expression for translational partition function.

(b) Obtain relation between Gibbs free energy and partition function. 4,4

SECTION—B

V. (a) Describe in detail Debye-Huckel theory of ion-ion interactions. Also discuss its utility and limitations.

(b) Comment on "Ion-triplets in electrolyte solutions". 6,2½

VI. Write notes on the following :

(a) Ion-solvent interactions

(b) Debye-Huckel-Onsager theory of electrolytes and its modification. 4,4½

VII. (a) Give a brief account on Adsorption theory of double layers.

(b) What is meant by Electrocatalysis ? Discuss its role in reactions involving adsorbed species. 4½,4

VIII. Write notes on the following :

(a) Electrochemical energy convertors

(b) Metallic coating for corrosion protection

(c) Stress corrosion. 3½,3,2

SECTION—C

IX. Answer the following :

(a) Define ionic strength.

(b) Introduce the concept of statistical mechanics.

(c) Define standard state of pure crystalline solid and pure liquid.

(d) Explain the term characteristic vibrational temperature. Also discuss its significance.

(e) Why entropy of mixing of gaseous mixture is always a positive quantity ?

(f) Explain activity coefficient and mean activity coefficients.

(g) State and explain micro states with suitable example.

(h) What is meant by passivation of metals ?

(i) Define excess functions. Also discuss their significance.

(j) Give in brief two applications of fuel cells.

(k) State and explain Kohlrasch law. 11×2=22