বিদ্যাসাগর বিশ্ববিদ্যালয়
VIDYASAGAR UNIVERSITY

Question Paper

B.Sc. Honours Examinations 2020
(Under CBCS Pattern)
Semester - V
Subject: CHEMISTRY
Paper: DSE1T & DSE1P
(Advanced Physical Cheistry)

Full Marks : 60
Time : 3 Hours

*Candiates are required to give their answer in their own
words as far as practicable.
The figures in the margin indicate full marks.*

Group - A

THEORY (Marks : 40)

Answer any *two* from the following questions :   2×20

1. (a) (i) Calculate % of void space in f. c. c.   3

     (ii) Draw 110 and 111 planes in a cubic unit cell.   2

     (iii) Name all types of crystal systems with geometrical paramters.   3

     (iv) What is Debye characteristic temperature ?   2

(b) (i) Explain Nernst heat theorem. 3

(ii) Write short note on "Conducting polymer". 2

(iii) Give example of addition and condensation co-polymerisation. 2

(iv) Write short notes on "Cooling by adiabatic demagnetisation". 3

2. (a) (i) Explain microcanonical, canonical and grand canonical ensemble. 3

(ii) Find the ratio of population of two states such that $E_2 - E_1 = kT$ and degeneracy of the 1st and 2nd energy levels are 1 and 3 respectively. 2

(iii) Show that entropy is a logarithmic function of thermodynamic probability. 3

(iv) Distinguish between bosons and fermions. 2

(b) (i) Derive Bragg's equation for crystal analysis.. 4

(ii) Ag is known to crystallise in f.c.c. form and the distance between nearest neighbour atoms is 2.87A°. Caculate the density of Ag. (Atomic wt. of Ag. 108) 3

(iii) What is Partition function ? Explain its significance. 3

3. (a) (i) Derive Einstein equation for heat capacity of solids. Hernce show the Dulong-Petit law is a special case of Einstein equation. 4+2

(ii) A System containing N particles has internal energy 'U' and entropy 'S'. Show that $S = NK_B \ln Q + U/T$, N = Total no. of molecules in the system. 4

(b) (i) What is nylon 66 ? 2

(ii) Calculate residual entropy of 1 mole CO. 2

(iii) State Lewis & Randall statement of Third law of thermodynamics. 2

(iv) Calculate number of ways of arranging 5 different particles among 3 energy levels where one energy level has 1 particle, two have 2 each. 2

(v) What is Debye's T^3 law ? 2

4. (a) Derive the expression of thermodynamic probability for distinguishable particles and hence derive the Boltzmann distribution law. 6+6

(b) Write a note on Barometric distribution. 8

Group - B

PRACTICAL (Marks : 20)

Answer any *one* from the following questions : 1×20

1. Give a Schematic plot of P^H Vs Volume of alkali in the P^H metric titration of oxalic acid Vs *NaOH*. Give a derivative plot of the same. How do you determine strength of oxalic acid and the P^{k2} from the plot ?

2. Write down the cell set-up in the potentiometric titration of $AgNO_3$ Vs *KCl*. Give a Schematic plot of *EMF* Vs volume of *KCl*. Give a derivative plot of the same. How do you determine K_{sp} of *AgCl* from the plot.

3. Write down Maxwell speed distribution eqn^n of gas for (i) one (ii) two and (iii) three dimension. Give the schematic plot of probability distribution Vs speed in each dimension. Describe the nature of plot with (i) increasing temparature (ii) ioncreasing mass of gas.

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