2023

Chemistry

B.Sc. Fifth Semester End Examination - 2023

PAPER - DSE-1T

Full Marks : 40   *Time : 2 hours*

The figures in the right-hand margin indicate marks.
Candidates are required to give their answers in their own
words as far as practicable.
Illustrate the answers wherever necessary.

Group - A

A. **Answer any five questions :**   5×2=10

1. (a) Crystalline solids are anisotrpoic while amorphous solids are isotropic. Explain.

    (b) Write down the names of different types of conducting polymers.

    (c) The specific heat of metal M is 0.25 cal/gK. Its equivalent weight is 12. What is its correct atomic weight?

(Turn Over)

(2)

(d) What is kinetic chain length?

(e) Write the structure of caprolactum.

(f) Differentiate between boson and fermions?

(g) Why ae radio waves considered to be unsuitable for determining crystal structure?

(h) Determine the Miller indices of the planes that interest the cyrstal axes at a, 2b, ∝c and a, b, −c.

Group - B

Answer any four from the following :   5×4=20

2. (a) Derive the relationship between entropy and termodynamic probablity.

   (b) Consider a system A consisting of subsystems A_1 and A_2, for which $W_1=1.0\times10^{20}$ and $W_2=2.0\times10^{20}$. What is the number of configurations available to the combined system? Also, compute the entropies S_1, S_2 and S. What is the significance of this result?   3+2=5

3. (a) Prove that the interplanner spacing $((d_{hkl})$ in a kubic system is given by

$$d_{hkl} = \frac{1}{\left(h^2 + k^2 + l^2\right)^{1/2}}$$

Where a is the edge length of the cube.

(3)

(b) A certain solid crystalizes in the body ccntred cubic lattice. First order X-ray ($\lambda=0.154$ nm) reflection maximum from a set of (200) planes was observed at 16°6'. Calculate the edge length of the unit cell.

                                            (3+2)=5

4. (a) Write down the failure of Einstein equation of specific heat of solid.

   (b) Dulong Petit law is a special case of Einstein equation?

                                            $2\frac{1}{2}+2\frac{1}{2}=5$

5. (a) Difference between polymer and macromolecule.

   (b) Wave length of X-ray used must nor exceed twice of interplaner distance of the crystal. Justify.   2+3=5

6. (a) How many face, edge and corner are there in hexagonal crystal?

   (b) Lowering of internal energy is favourable for the formation of crystal – Justify   (3+2)=5

7. (a) Show that $\beta=\frac{1}{2}kT$

   (b) State sterling's approximation and mention the condition of its validity.   3+2

(4)

Group - C

8.   (a)   Is it possible to obrain Bragg reflection from (100) plane of a simple cubic crystals with edge length $1.5°$ A by using X-rays with wave length $3.5°A$?

    (b)   Show that the body centred cubic lattice is less economically packed compared to the face centred cubic lattice.

    (c)   The distance between two successive crystal planes of a cubic crystal lattice cannot be $\frac{a}{\sqrt{7}}$. Where 'a' is the edge of the cube.   3+4+3=10

9.   (a)   Differentiate between Bose-Einstein statistics and Fermi-Dirac statictics?

    (b)   What is μ space and ensemble.

    (c)   Consider the system of six distinguishable particles, one of the macrostates has the following distribution of particles.

Energy	0ε	1ε	2ε	3ε	4ε
No of Particles	0	0	2	2	2

Calculate its thermodynamic probablity.   4+2+4