B.Sc 5th Semester (Honours) Examination 2020 (CBCS)
Subject: Chemistry
Paper: DSE – 1
Advanced Physical Chemistry

Time: 2 Hours Full marks: 40

Candidates are requested to give their answers in their own words as far as practicable.

Answer any eight questions out of ten questions, each carrying 05 marks 5×8 = 40

1. Derive Bragg's equation. List the axis of symmetries that are present in a cube.

2. Derive the expression of interplanar distance for an orthorhombic system. Calculate the coordination number of an atom in 3-D close packed structure.

3. Calculate the percentage of void space in a fcc unit cell. Find out the Miller indices of the plane that makes intercepts ½, 2 and 3/2 multiples of unit distances on the three axes.

4. Find out the number of ways that six distinguishable particles can be placed in three different energy levels with three particles in the first level, two in the second and one in the third, without any regard for the energy required, also find out the entropy of the system. State the principle of 'equal a priori probabilities'.

5. Give the statement of Nernst Heat theorem and explain it. What is residual entropy?

6. Write down the mathematical expression relating to Maxwell-Boltzman distribution by clearly mentioning all the terms. Give a short reference of partition function. Derive the expression of internal energy in terms of partition function.

7. What is the unit of molar polarization? What are the components of molar polarization? Write down the effect of temperature, dipole moment and dielectric constant over molar polarization.

8. Derive the rate law for step-growth polymerization. Give the idea and two examples of conducting polymer.

9. Starting from the expression of 'average energy of an oscillator' as per Planck's formulation, arrive at the Einstein's equation of heat capacity of solids. Which type of bonds do exist in polymers?

10. Give the idea of 'canonical ensemble'. Find the percentage error in calculation of ln(10!) using Stirling's approximation. What is the lowest limit of thermodynamic probability?