Total Marks: 30

1. Calculate the separation of (a) the {123} planes and (b) the {246} planes of an orthorhombic unit cell with $a = 0.82$ nm, $b = 0.94$ nm, and $c = 0.75$ nm. Calculate Miller indices of a crystal plane which is cut through the crystal axes 2a, –3b, –c. **6**

2. Discuss the origin of charge on colloidal particles. What is meant by electrical double layers? What is meant by Zeta potential? **5**

3. What will be the significant figure of 0.003040? **1**

4. Calculate the packing fraction in fcc and bcc crystal system. **3**

5. Deduce an expression for translation partion function for a particle of mass m moving in a 3D box of sides a, b and c assuming that potential is zero within the box. What do mean by thermodynamic probability ? **4 + 1 =5**

6. Discuss about the osmotic pressure method for determination of the molar mass of a polymer. State why this method gives number average molar mass only. **4 + 1=5**

7. Deduce an expression for entropy of monoatomic gas in terms of partition function. **5**