

M.Sc. Chemistry-4th Semester  
(2720)

Paper: Course-XXV

## Chemistry of Materials

Time Allowed: 2 hrs.

Max. Marks: 75

Note: Attempt any four questions. All questions are of equal marks.  
-Log tables may be asked for.

1. a) Discuss the band theory of conduction in metals, semiconductors and insulators. (15)
- b) What are colour centres? From where they originate? ( $3\frac{3}{4}$ )
2. a) Derive an expression for the energy required to create a Frenkel defect. ( $12\frac{1}{2}$ )
- b) Calculate the lattice energy of NaCl crystal by using Born-Lande equation from the following data :-  
 $e = 4.8 \times 10^{-10}$  esu,  $A=1.7476$ ,  $r_{Na^+}=0.95 \text{ \AA}$ ,  
 $r_{Cl^-} = 1.81 \text{ \AA}$ ,  $n=8$  (6 $\frac{1}{4}$ )
3. Elaborate the difference between the following:
  - a) Regular and irregular polymers. (5)
  - b) Chain and step polymerization. (5)
  - c) Block and graft copolymers. ( $3\frac{3}{4}$ )
  - d) Thermoplastic and thermosetting polymers. (5)
4. a) How will you find the molecular mass of a polymer by using ultracentrifuge method? ( $12\frac{1}{2}$ )

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(2)

- b) Equal masses of polymer monomers with molar masses 10000 and 15000 mol<sup>-1</sup> were mixed. Calculate number-average and mass-average molecular masses. (6 $\frac{1}{4}$ )
5. a) Discuss the thermodynamics of glass formation. (6 $\frac{1}{4}$ )
- b) Outline the important applications of glass-ceramics. (6 $\frac{1}{4}$ )
- c) Discuss the kinetics of crystallization and glass formation. (6 $\frac{1}{4}$ )
6. Write notes on the following:
- a) Refractories (6 $\frac{1}{4}$ )
- b) Silicate glasses (6 $\frac{1}{4}$ )
- c) metallic glasses. (6 $\frac{1}{4}$ )
7. a) Describe ceramic method for the preparation of smart materials. Also enlist its limitations. (12 $\frac{1}{2}$ )
- b) Throw light on BCS theory of superconductivity. (6 $\frac{1}{4}$ )
8. a) What are nano-materials? How their properties differ from their bulk counterparts? Highlight the role of nano materials in targeted drug delivery. (15)
- b) Explain the difference between soft and hard magnetic materials giving suitable examples. (3 $\frac{3}{4}$ )

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