



B.E.(Full Time) DEGREE ARREAR EXAMINATIONS – APR/MAY 2014  
 MATERIALS SCIENCE AND ENGINEERING  
 THIRD SEMESTER (REGULATION 2008)  
 ML 9202 – THERMODYNAMICS AND KINETICS OF MATERIALS

Time : 3 Hours

Max. Marks : 100

Answer ALL Questions

**PART – A ( 10 X 2 = 20 MARKS)**

1. Distinguish 'homogenous' and 'heterogenous' system with examples.
2. Mention any one method used to represent the equilibrium state of a system.
3. Define the term complexions.
4. What do you understand by the term chemical potential of a component?
5. State Le Chatelier's principle.
6. What do you mean by partial molar value of a property?
7. Define the term 'Activity co-efficient'.
8. What do you understand by rate of reaction?
9. What is 'up-hill diffusion'?
10. What do you understand by 'polarisation'?

**PART – B ( 5 X 16 = 80 MARKS)**

11. Discuss the polarization effects on corrosion process and the significance of Butler-Volmer equation.
12. a) i) Prove that  $C_p - C_v = (\partial V / \partial T)_P [ P + (\partial U / \partial V)_T ]$  and explain the role of internal cohesive forces acting between constituent particles of the substance on the heat capacity. (10)  
 ii) Show that  $PV^\gamma = \text{Constant}$  for a reversible adiabatic process. (Take  $\gamma = C_p / C_v$ ) (6)

(OR)

b) Prove that the absolute thermodynamic scale of temperature is identical with ideal gas temperature scale.

13. a) Derive Maxwell's equation and explain how it is useful in determining the internal energy and entropy of a closed system of fixed composition

(OR)

b) Explain Einstein's method of calculating heat capacity.

14. a) Discuss briefly Raoult's Law and Henry's Law as they apply to the behaviour of solutions.

(OR)

b) Derive Gibbs-Duhem equation and explain how it is useful in the determination of activity of a binary solution.

15. a) Describe the thermodynamics of point defects in solids.

(OR)

b) Explain the mechanisms involved in solid state diffusion.