

**II B.Tech II Semester Supplementary Examinations,
November/December 2005
THERMODYNAMICS AND KINETICS
(Metallurgy & Material Technology)**

Time: 3 hours**Max Marks: 80**

**Answer any FIVE Questions
All Questions carry equal marks**

1. (a) Prove the following for a closed system.
For constant volume process $Q = mC_V(T_2 - T_1)$
For constant pressure process $Q = mC_P(T_2 - T_1)$
(b) Differentiate between extensive properties and intensive properties with examples. [12+4]
2. (a) Why the internal energy change in an adiabatic process is negative. Explain.
(b) Explain the significance of Joule-Thomson coefficient.
(c) Explain sign conventions of heat and work in thermodynamics. [5+5+6]
3. (a) State and explain second law of thermodynamics.
(b) Define and explain entropy. What are its units.
(c) Explain the principle of increase of entropy. [6+5+5]
4. (a) What is the entropy criterion for spontaneous change in an isolated system? Give an example of a spontaneous process in an isolated system.
(b) Give an equation that relates the entropy change in the surroundings to the enthalpy change in the system.
(c) When heat is added to the surroundings, the entropy of the surroundings increases. How does ΔS_{surr} depend on the temperature of surroundings? Explain. [5+5+6]
5. (a) What are the conditions for spontaneous and feasible reactions, in terms of free energies? Explain.
(b) Define and discuss the importance of Gibb's and Helmholtz function. [8+8]
6. (a) State and explain third law of thermodynamics. What is its importance.
(b) Derive an expression to show variation of equilibrium constant with temperature. [6+10]
7. (a) i. Does the Clapeyron equation involve any approximation, or is it exact?
ii. What approximation are involved in the Clausius equation.
(b) What is Clapeyron equation? What assumptions are made in obtaining the Clausius-Clapeyron equation from Clapeyron equation? [8+8]
8. (a) Derive an expression for the rate constant of a first order reaction.

- (b) Discuss the importance of equilibrium constant and its effect on equilibrium conversion. [8+8]

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