Code No: OR221852 **OR**

II B.Tech II Semester Supplementary Examinations, April/May 2005
THERMODYNAMICS AND KINETICS
(Metallurgy & Material Technology)

Time: 3 hours **Max Marks: 70**

Answer any FIVE Questions
All Questions carry equal marks

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1. (a) Explain kinetic theory of gases and derive kinetic gas equation.
   (b) Explain the differences between ideal gas and real gas.

2. (a) For an adiabatic process prove pv^r= constant.
   (b) Explain the usefulness of Kirchoff's equation in thermodynamics.
   (c) Calculate the percentage error in the determination of heat of reaction of pure solid Na_2o with Hcl gas at 1 atmosphere pressure to form solid and $NaCl$ water at 25^0. The standard heats of formation in $Kcal.Mol^{-1}$are.
   $NaCl(s)$: -98.6 ± 0.2
   $Na_2O(s)$: -100.7 ± 1.2
   $HCl(g)$: -22.0 ± 0.1
   $H_2O(l)$: -68.32 ± 0.01

3. (a) Show that $\left(d\frac{(\Delta H)}{dp}\right)_s = \Delta v$
   (b) Name the intensive and extensive parameters in the entropy representation. Explain them
   (c) The entropy of a hot baked potato decreases as it cools. Is this a violation of the increase of entropy principle? Explain.

4. (a) 'Entropy is a non conserved property'. Explain satisfactorily with suitable examples.
   (b) Explain the follows:
      i. Thermodynamic probability
      ii. Isentropic process
      iii. Entropy generation.

5. (a) Define Helmholtz energy function and explain its significance.
   (b) Derive the relationship between the standard free energy change and the equilibrium constant of a reaction.

6. (a) The temperature dependence of the equillibrium constant is given by the reaction. $\ln k = \frac{-\Delta H^0}{R}\left(\frac{1}{T}\right) + \frac{\Delta S^0}{R}$
   Where ΔH^0, and $\Delta \overset{o}{S}$ are assumed to be independent of temperature.
   Derive the equation from basics.
   (b) Explain how this expression can be used to determine experimental values of ΔH^0 and ΔS^0 from the values of k at several different temperatures.

(c) Write the equillibrium constant for the following reactions and explain.

i. A + B =C+D

ii. xA + yB+.....=m.c +n.D.....

7. (a) Derive the equation dG = Vdp-sdt and explain its significance.

   (b) Using the above equation, derive Clausius-Clapeyron equation.

8. (a) Explain the steps involved in the determination of order of a reaction.

   (b) Explain the theory of absolute reaction rates.

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