CHEMISTRY Paper-VII

(Physical Chemistry-B)

Time Allowed : 3 Hours **Maximum Marks : 45**

Note : Attempt **five** questions in all with **one** question each from Sections A to D and Section E is compulsory.

SECTION–A

1. (*a*) Distinguish between state function and path function with examples. 3

(*b*) Prove that for reversible adiabatic expansion of an icieal gas $w = C_v (T_2 - T_1)$. 3

(*c*) Calculate the change in internal energy when a gas absorbs 150 J of heat and expands against external pressure of 1.10 atm from a volume of 1.0 litre to 4.0 litres. 3

2. (*a*) Derive expression for molar heat capacities C_v and C_p in terms of internal energy change and enthalpy change. Show that $C_p - C_v = R$ for one mole of an ideal gas. 3

(*b*) Prove thermodynamically that Joule-Thomson coefficient for an ideal gas is zero. 3

(*c*) Calculate the work done in an isothermal revetsible expansion of an ideal gas. 3

SECTION–B

3. (*a*) Calculate the heat of formation of HCl gas at 348 K from the following data :

Heat of formation of HCl gas at 298 K. = – 92.3 kJ

Molar heat capacities of $H_2(g)$, $Cl_2(g)$ and HCl(g) are 28.53 J, 32.55 J and 28.49 J respectively. 4

(*b*) Define 'Bond Energy'. How is bond energy of a bond calculated for a polyatomic molecule ? How is it used to calculate the enthalpy change of a reaction ? 5

4. (*a*) Define enthalpy of neutralisation. How does it help in calculating the enthalpy of ionization of a weak acid ? 5

(*b*) Calculate the standard enthalpy of combustion of methane, given that the standard enthalpies of formation of $CO_2(g)$, $H_2O(\ell)$ and $CH_4(g)$ are –393.5, – 285.8 and – 74.9 kJ $mole^{-1}$ respectively. 4

SECTION–C

5. (*a*) How will you differentiate between true solution, colloidal solution and suspension ? 3

(*b*) What is an 'ionic micelle' ? Explain how it is formed with the help of an example. 3

(*c*) Explain the process of ultrafiltration used for purifying a colloidal sol. 3

6. (*a*) Define 'Hardy-Schulze' rule. Give four ways by which coagulation of a colloidal sol can be brought about. 3

(*b*) Explain protective action of Lyophillic colloids and define 'Gold number'. 3

(*c*) Discuss the basic principle of working of Cottrell precipitator and its use in smoke precipitator in cement plants. 3

SECTION–D

7. (*a*) Derive expression for total vapour pressure in terms of mole fractions of the components in the vapour phase. 3

(*b*) Calculate the entropy change on mixing 25 grams of benzene with 10 grams of toluene. 3