(i) Printed Pages: 4 Roll No. .....

(ii) Questions : 9 Sub. Code : 0153

Exam. Code : 0002

B.A./B.Sc. (General) 2nd Semester

1059

CHEMISTRY

Paper—VII Physical Chemistry—B

(Same for B.Sc. Microbial & Food Tech.)

Time Allowed : Three Hours] **[Maximum Marks : 22**

Note :— (1) Attempt **five** questions in all, with **one** question from each Units I, II, III and IV and Question No. **9** is compulsory.

(2) Use of simple calculator is allowed.

UNIT—I

1. (a) How maximum amount of work during isothermal expansion of a gas can be obtained ? Derive an expression for the maximum work obtainable from the isothermal expansion of n moles of an ideal gas.

(b) Two moles of hydrogen at S.T.P. are compressed adiabatically to a volume of 10 litres. Calculate the final temperature and pressure of the gas. Given that r for hydrogen is 1.41. 2,2

2. (a) Derive expression for w, q, ΔE and ΔH for adiabatic reversible expansion of an ideal gas.

(b) State first law of thermodynamics in two different ways. Derive the mathematical expression for it. Explain the fact that internal energy is a state function but work and heat are path functions. 2,2

UNIT—II

3. (a) Derive the relationship :

$$\frac{\Delta E_2 - \Delta E_1}{T_2 - T_1} = \Delta C_V .$$

Also name this equation.

(b) The molar heat of formation of $NH_4NO_3(s)$ is –367.54 kJ and those of N_2O (g) and H_2O are +81.46 kJ and –285.78 kJ, respectively at 25°C and 1 atmospheric pressure. Calculate ΔH and ΔE for the reaction :

$$NH_4NO_3(s) \rightarrow N_2O(g) + 2H_2O.$$ 2,2

4. (a) Calculate the enthalpy change for the transformation of diamond to graphite given that the enthalpy of combustion of diamond and graphite are –395.4 and –393.5 kJ, respectively.

(b) Define 'Bond energy' for a diatomic molecule and for a polyatomic molecule. How bond energies can be useful in calculating the enthalpy change of a reaction ? 2,2

UNIT—III

5. (a) Explain the terms 'Dialysis' and 'Electro-dialysis'. Briefly describe one important application of dialysis.

   (b) What are lyophilic and lyophobic colloids ? Describe the important points of difference between them. 2,2

6. (a) What are gels ? How are they prepared ? Describe the following properties of gels :

   (i) Syneresis

   (ii) Imbibition

   (iii) Thixotropy.

   (b) Write a note on Tyndall effect. 2,2

UNIT—IV

7. (a) Derive thermodynamically the relation $\Delta T_f = K_f \times m$ (m = molality of the solution).

   (b) A 4 percent solution of sucrose $C_{12}H_{22}O_{11}$ is isotonic with 3 percent solution of an unknown organic substance. Calculate the molecular mass of the unknown substance. 2,2

8. (a) What do you mean by molal elevation constant of a solvent ? How is it related to the latent heat of vaporization of the solvent ? What are its units ?

   (b) Why do we get abnormal molecular masses from colligative properties ? What is Van't Hoff factor ? 2,2

(Compulsory Question)

9. (a) What is the relationship between heat and mechanical work ? Define Joule's mechanical equivalent of heat. What is its value ?

(b) What do you understand by inversion temperature ?

(c) Why is the enthalpy of neutralization of a strong acid with a strong base constant ? Explain.

(d) What is the cause of Brownian movement ?

(e) Describe Berkeley and Hartley's method for measuring osmotic pressure.

(f) Briefly explain how lowering of vapour pressure is used in the calculation of molecular masses of solutes ?

6×1