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

(ii)   **Questions       : 9**      **Sub. Code :**  | 0 | 1 | 5 | 3 |

**Exam. Code:**  | 0 | 0 | 0 | 2 |

# B.A./B.Sc. (General) 2nd Semester
# 1048
# CHEMISTRY
# Paper : VII
# Physical Chemistry-B

**Time : 3 Hours]**                                    **[Max. Marks : 80**

*Note :-*   Attempt five questions in all with one question each from Units I, II, III and IV and Question IX is compulsory.

## UNIT-I

I.    (a)   What is Joule-Thomson effect ? Prove that it is an isoenthalpic process. Define Joule-Thomson coefficient and inversion temperature. What is the significance of Inversion temperature in adiabatic expansion of a real gas ?

(b)   Derive the expression for molar heat capacities $C$ and $C_p$ in terms of internal energy change and enthalpy change.                                                2,2

II.    (a)   Calculate the work done when 16 L of nitrogen at 4 atmospheres expand adiabatically to 30 L ( $\gamma$ for $N_2$ =1.4).

(b)   Derive expression for w, q, $\Delta E$ and $\Delta H$ for isothermal reversible expansion of an ideal gas.                                                2,2

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## UNIT-II

II. (a) Using Kirchoff's equation for the variation of $\Delta H$ of a reaction with temperature at constant pressure, calculate $\Delta H$ at 227° C of the reaction :

$$2A(g) + B(g) \longrightarrow C(g) + 3D(g)$$

where $\Delta H(27°C) = -20$ KJ mol$^{-1}$,

Molar heat capacity (J K$^{-1}$ mol$^{-1}$)

$C_p(A) = 5:2$; $C_p(B)=9.2$; $C_p(C) = 15.0$; $C_p(D) = 12.0$

Assume that the heat capacity of each substance does not change in the temperature range 27° to 227°C.

(b) State and explain Hess's law of constant heat summation. What is the significance of this law ?                    2,2

IV. (a) Define enthalpy of neutralization. How can the heat of dissociation of acetic acid be determined ?

(b) Calculate the bond energy of $C = C$ from the following reaction :

$$H_2C = CH_2(g) + H_2(g) \longrightarrow CH_3 - CH_3(g) ; \quad \Delta H = -125.25 \text{ kJ}$$

The bond energies of C-C, C-H and H-H are 347.3, 414.2 and 435.1 kJ, respectively.                    2,2

## UNIT-III

V. (a) What are multimolecular, macromolecular and associated colloids ? Give one example of each type. .

(b) Write a short note on Hofmeister series.                    2,2

VI. (a) Explain thc terms 'dialysis' and 'electrodialysis' . Briefly explain onc application of dialysis.

(b) What is peptization ? Explain taking an example. 2,2

## UNIT-IV

VII. (a) 0.44 g of a substance dissolved in 22.2 g of benzene lowered the freezing point of benzene by 0.567°C. Calculate the molecular mass of the substance. $K_f$ for benzene is 5.12°C $mol^{-1}$.

(b) Define molal elevation constant. Derive an expression relating the boiling point of a solution with the molality of the dissolved solute. 2,2

VIII. (a) What is Van't Hoff factor ? How is it used to calculate the degree of dissociation and degree of association of a solute ?

(b) A solution containing 13.5 g urea per 500 ml of solution in water has the same osmotic pressure as the solution of sucrose in water. Calculate the mass of sucrose present in 500 ml of this solution. 2,2

## (Compulsory Questions)

IX. (a) Distinguish between reversible and irreversible thermodynamic processes with examples.

(b) How bond energies can be useful in calculating the enthalpy change of a reaction ?

(c) Define the terms 'gold number' and 'congo rubin number'.

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(d) What are emulsions ? Write various types of emulsiong with examples.

(e) What is meant by reverse osmosis ? Give one application of reverse osmosis.

(f) How do you explain that relative lowering of vapour pressure is a colligative property ?                6x1=6