THE AMERICAN COLLEGE, MADURAI

(An Autonomous Institution Affiliated to Madurai Kamaraj University)
Re-accredited (2ⁿᵈ Cycle) by NAAC with Grade "A", CGPA – 3.46 on a 4-point scale

Backlog Arrear Examination, March 2021

CHE/CHS 2515   **PHYSICAL CHEMISTRY-II**   Time: 3 Hours
                                                                      Max Marks: 75

Answer any FIVE questions   5 x 15=75

1. A) Explain heat capacity, C_p and C_v. Show that one mole of an ideal gas $C_p - C_v = R$. (8)
    B) Derive an expression for the Joule Thomson coefficient (μ_{JT}) and μ_{JT} of an ideal gas. (7)

2. A) Define heat of reaction. Which factors influence heat of reaction? (8)
    B) State Hess's law and explain its applications. (7)

3. A) What is Carnot cycle? Calculate the efficiency of a Carnot engine working between two temperature T_1 and T_2. (10)
    B) Derive Maxwell's relationship. (5)

4. A) Derive Gibbs-Helmholtz equation. (7)
    B) The free energy change accompanying a given process is -85.77 kJ at 25°C and -83.68 kJ at 35°C. Calculate the change in enthalpy for the process at 30°C. (3)
    C) Define fugacity and activity. (5)

5. A) Apply Le-Chatlier's principle to the following equilibrium and workout the conditions which would favour the formation of ammonia (5)
    $$N_{2\,(g)} + H_{2\,(g)} \rightleftharpoons 2NH_3\,(g) \qquad \Delta H = -99\ kJ$$

    B) Show that Third Law of thermodynamics is valid for phosphine. (5)
    C) Derive the relationship between Kp, Kc and Kx. (5)

6. A) Explain the types of critical solution temperature (CST) and elaborate on a system having only one type of CST. (10)
    B) State Henry's law. List the factors influencing the solubility of a gas. (5)

7. A) Prove that relative lowering of vapour pressure is independent of the nature of the solute. (10)
    B) Discuss the applications of the Nernst Distribution law. (5)