

2023
B.A./B.Sc.
Fourth Semester
GENERIC ELECTIVE – 4
CHEMISTRY
Course Code: CHG 4.11
(Physical Chemistry for Biosciences)

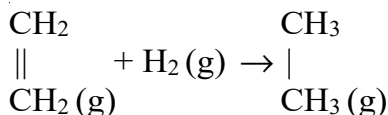
Total Mark: 70
Time: 3 hours

Pass Mark: 28

Answer five questions, taking one from each unit.

UNIT-I

1. (a) Distinguish the terms. 3×3=9
(i) Enthalpy of formation and standard enthalpy of formation
(ii) Thermochemical reactions and photochemical reactions
(iii) Integral and differential enthalpies
(b) Explain how the enthalpy of a reaction varies with temperature? 5
2. (a) Write short notes on the following: 3×2=6
(i) Third law of thermodynamics
(ii) Bond dissociation energy
(iii) Resonance energy
(b) Explain the origin of enthalpy in a chemical reaction. 3
(c) Calculate the enthalpy of the following thermochemical reaction with the given data: 5



Bond energy of various bonds are as follows:

C-H = 416.20 KJ

C-C = 347.30 KJ

C=C = 615.00 KJ

UNIT-II

3. (a) Explain the influences of changes in pressure, temperature, and concentration in the dynamic nature of a chemical equilibrium. 4
(b) Give the thermodynamics derivation of law of mass action and the equilibrium constant. 4
(c) What is Le Chatelier's principle? 2
(d) Derive the relationship between K_p and K_c . 4
4. (a) Write short notes on the following: 2×4=8
(i) Half life period
(ii) Van't Hoff method for determining the order of reaction
(iii) Photochemical reaction/Zero order reaction
(iv) Pseudo order reaction
(b) Trimolecular reaction is very rare. Why? 2
(c) Explain the concept of activation energy in chemical kinetics and its importance in terms of Arrhenius equation. 4

UNIT-III

5. (a) Determine the ionization of a weak base and correlate the degree of ionization of base with dilution. 5
(b) Write short notes on the following: 2×2=4
(i) Ionic product of water (ii) pH of a solution
(c) Establish the relation between degree of hydrolysis 'h' and pH for a salt solution of strong acid and weak base. 5
6. (a) Discuss the ionization of a weak acid and establish the relation between the degree of ionization of acid with dilution. 5
(b) Write a note on dissociation constant of monoprotic acid and diprotic acid with relevant equation. 4
(c) Establish the relation between degree of hydrolysis 'h' and 'pH' for a salt of weak acid and strong base. 5

UNIT-IV

7. (a) Explain the following terms with relevant examples: 2×3=6
(i) Component (ii) Degree of freedom
(iii) Eutectic point

- (b) Describe the nature of phase diagram of ethanol water system in terms of Gibbs phase rule. 5
- (c) Distinguish the terms phase equilibrium and metastable equilibrium. 3
8. (a) Explain the typical phase diagram of a two component system in terms of various equilibria involved in it. 6
- (b) What are the special properties of an “ideal liquid mixture”? 3
- (c) Explain the nature of metastable equilibria involved in sulphur system. 3
- (d) “Number of phases governs the nature of phase diagram in a heterogenous equilibria.” Explain. 2

UNIT-V

9. (a) Write short notes on the following: 2×3=6
- (i) Electrical transport (ii) Specific conductivity
- (iii) Migration of ions
- (b) The resistance of 0.01 N NaCl solution at 298 K is 200 ohm. The cell constant of the conductivity cell is unity. Calculate the equivalent conductance. 3
- (c) How does equivalent conductance vary with dilution? 3
- (d) What is the relationship between transport number and the mobility of ions in a solution? 2
10. (a) Explain the phenomena of fluorescence and phosphorescence in terms of Jablonski diagram. 4
- (b) What is the Stark-Einstein law of photochemical equivalence? Explain in detail. 5
- (c) Calculate the energy of one photon of light with wavelength 2450 Å. Will it be able to dissociate a bond in diatomic molecule which absorbed this photon and has a bond energy equal to 95 kcal/mol? 3
- (d) Distinguish the terms singlet and triplet excited states. 2