

Roll No.

Exam Code : M-24

Subject Code—61387

B. Sc. EXAMINATION

(Batch 2019 Onwards)

(Main/Re-appear)

(Second Semester)

CHEMISTRY

CCL-204

Physical Chemistry—I

(Chemical Energetics and Equilibrium)

Time : 3 Hours

Maximum Marks : 80

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory. All questions carry equal marks.

1. (a) What are isochoric and adiabatic process ?

- (b) What is Standard State ? Give the value of molar enthalpy of an element in its standard state.
- (c) Explain the law of chemical equilibrium.
- (d) Explain the terms activity and fugacity.
- (e) What are strong electrolyte and weak electrolyte ? Give examples of each.
- (f) What is dissociation constant of an acid ?
- (g) Define Buffer Capacity.
- (h) What is degree of hydrolysis of a salt ?

$$8 \times 2 = 16$$

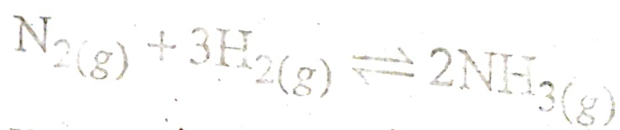
Unit I

- 2. (a) Derive the expression $TV^{\gamma-1} = \text{constant}$. 6
- (b) What is Entropy ? Give its units. Prove that entropy is a state function. 4
- (c) Derive Gibbs Helmholtz equation. 6
- 3. (a) Derive an expression for the effect of temperature on enthalpy of a reaction. 6

- (b) What is Absolute Entropy ? Determine the absolute entropy of solids. 6
- (c) Define first law of thermodynamics. Derive its mathematical expression. 4

Unit II

4. (a) Define equilibrium constant. Explain different types of equilibrium constant with their units. 6
- (b) Derive the integrated form of Vant Hoff equation. 4
- (c) Differentiate between ΔG and ΔG° . 2
- (d) Derive the expression showing variation of chemical potential with temperature. 4
5. (a) Derive the relationship between K_p , K_c and K_x . 6
- (b) What is Le-Chatelier's Principle ? Explain its any three applications. 6
- (c) For the reaction :



the value of K_p is 3.6×10^{-2} at 500 K. Calculate the value of K_c at the same temperature.

Unit III

6. (a) State and derive the expression for Ostwald's Dilution Law. 4
- (b) Define acid and base according to Bronsted-Lowry concept. What is conjugate acid-base pair ? Explain with examples. 4
- (c) Discuss different factors affecting the degree of dissociation. 4
- (d) What is pH and pKa ? Calculate the pH of a sample whose hydronium ion concentration is 3.8×10^{-3} M. 4
7. (a) What is ionic product of water ? Determine its value. 4
- (b) Discuss the Lewis concept of acid and base with its limitations. 4
- (c) Write a note on common ion effect. 4
- (d) The degree of ionisation of a 0.1M bromoacetic acid solution is 0.132. Calculate the pH of the solution and PkA of bromoacetic acid. 4

Unit IV

8. (a) Derive an expression for hydrolysis constant and degree of hydrolysis for weak acid and weak base. 8
- (b) What is Buffer Solution ? Give its types with examples. 4
- (c) Calculate the solubility of $\text{Mg}(\text{OH})_2$, if the solubility product is 9×10^{-12} . 4
9. (a) What is Solubility Product ? Discuss its applications. 8
- (b) Derive Handerson-Hasselbatch equation for pH of an acidic buffer. 4
- (c) Explain why the salts of weak acids and strong bases produce alkaline solution on hydrolysis. 4