B.Sc. 4th Semester New Scheme (Fresh and Re-Appear) Examination, May–2023

BIO-TECHNOLOGY

Paper– BT-405

Physical Chemistry

Time allowed : 3 hours] *[Maximum marks : 40*

Note: *Attempt **five** questions in all. **Question No.1 is compulsory.** Select **one** question from each section.*

1. (a) Define entropy. Write its unit also.

(b) What is the need of second law of thermodynamics?

(c) What is the physical significance of work function?

(d) What is the entropy change in a reversible process?

(e) What are reversible electrodes? Give example.

(f) What is a glass electrode?

(g) Define the term activity coefficient?

(h) Define pH. 8×1=8

Section–A

2. (a) Calculate the entropy change for the fusion of 1 mole of a solid which melts at 300K. The latent heat of fusion is 2.51 KJ/mol. 3

(b) Derive an expression for entropy change when n1 moles of an ideal gas 1 are mixed with n2 moles of an ideal gas 2. 3

(c) State and explain second law of thermodynamics. 2

3. (a) Desribe Carnot cycle and efficiency of reversible heat engine. 4

(b) Derive an expression for entropy change of an ideal gas when temperature changes from T_1 to T_2 and pressure from P_1 to P_2. 4

Section–B

4. (a) Explain: 4

(i) Third law of thermodynamics

(ii) Residual entropy

(b) Derive Gibbs-Helmholtz equation. 4

5. (a) Explain Nernst heat theorem. 4

(b) Prove that: 2

$dA = -PdV - SdT$

(c) Calculate the free energy change accompanying the compression of 1 mole of an ideal gas at 57°C from 5 atm to 50 atm. 2

Section–C

6. (a) Describe the working of: 6

(i) Calomel electrode

(ii) Weston standard cell

(b) Explain the function of a salt bridge in an electrochemical cell. 2

7. (a) Define : 4

(i) EMF

(ii) Electrode potential

(iii) Electrochemical series

(iv) Reversible cell

(b) How ΔG and ΔH of a cell can be calculated? 2

(c) Describe standard hydrogen electrode. 2

Section–D

8. (a) What is Quinhydrone electrode? How can you calculate the pH of a solution using it? 4

(b) What is liquid junction potential? Derive an expression for it. 4

9. (a) Derive an expression for EMF of a concentration cell without transference. 4

(b) What are sparingly soluble salts? How solubility of a sparingly soluble salt can be determined using EMF measurements? 4