

Exam. Code : 107404

Subject Code : 2241

**B.Sc. Bio-Technology Semester—IV****PHYSICAL CHEMISTRY—B****Paper—BT-1**

Time Allowed—3 Hours] [Maximum Marks—40

**Note :** This question paper consists of **three** Sections. Section A contains **8** very short answer type questions (Q. Nos. 1 to 8), each carrying **1** mark. Section B contains **8** short answer type questions (Q. Nos. 9 to 16), each carrying **4** marks. Section C contains **4** essay type questions (Q. Nos. 17 to 20), each carrying **6** marks. Attempt **all** the questions from Section A, any **5** questions from Section B and any **2** questions from Section C.

**SECTION—A****Each question carries 1 mark.**

1. Define standard electrode potential.
2. What is liquid junction potential ?
3. Define threshold and activation energy.
4. For a first order reaction  $A \rightarrow \text{Products}$ ,  $t_{1/2}$  is 100 s. Calculate the rate constant for the reaction.
5. What is the effect of pressure on reaction rate of a unimolecular surface reaction ? Show it diagrammatically.
6. What is cell constant ? How it is determined ?

7. Define buffer index and buffer capacity.
8. What is indicator constant ? Discuss its significance.

### SECTION—B

**Each question carries 4 marks.**

9. Discuss how activity and activity coefficients are determined from EMF measurements.
10. A zinc rod is placed in 0.1 M solution of  $\text{ZnSO}_4$  at 298.15 K. Assuming that the salt is dissociated to the extent of 95 percent at this dilution, calculate the potential of electrode at this temperature.  
 $E^0_{(\text{Zn}^{2+}, \text{Zn})} = -0.76 \text{ V}$ .
11. What is enzyme catalysis ? Enlist different factors which affect the enzyme catalysis and discuss the effect of temperature on enzyme catalysis in detail.
12. Write a short note on heterogeneous catalysis.
13. Derive integrated rate expression for first the first order reaction  $\text{A} \rightarrow \text{P}$  and show that concentration of a reactant in such reaction decreases exponentially with time.
14. Discuss Debye-Huckel theory of activity coefficients.
15. What do you mean by ionic product of water ? How it is determined ?
16. Define hydrolysis constant. Derive the necessary equation for hydrolysis of the salt of weak acid and strong base.

**SECTION—C****Each question carries 6 marks.**

17. (a) Derive Nernst equation for EMF of a cell.  
(b) What are Electrolyte-concentration cells ? Give one example each of concentration cell with and without transference.
18. (a) Discuss the Transition State theory of bimolecular process and derive Eyring equation.  
(b) Name four methods used for determining the order of reaction. Discuss differential rate expression for determination of order of a reaction.
19. (a) Calculate the pH of  $1 \times 10^{-7}$  M solution of HCl at  $25^\circ\text{C}$ . Take  $k_W = 10^{-14} \text{ mol}^2 \text{ dm}^{-6}$ .  
(b) What is transference number ? How is it determined using moving boundary method ?
20. (a) The molar conductance of sodium acetate, hydrochloric acid and sodium chloride at infinite dilution are  $91.0 \times 10^{-4}$ ,  $426.16 \times 10^{-4}$  and  $126.45 \times 10^{-4} \text{ S m}^2 \text{ mol}^{-1}$ , respectively, at  $25^\circ\text{C}$ . Calculate the molar conductance for acetic acid at infinite dilution.  
(b) Write a short note on surface reactions with special reference to unimolecular surface reactions.