Exam. Code : 107404
Subject Code : 1858

B.Sc. (Biotechnology) 4th Semester
BT-I : PHYSICAL CHEMISTRY—B

Time Allowed—3 Hours]　　　　　[Maximum Marks—40

Note :– The question paper consists of three Sections. Section A contains 8 very short answer type questions (Q.No. 1 to 8) each carrying 1 mark. The maximum length of answer should be 1/3 of a page.

Section-B contains 8 short answer type questions (Q.No. 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 two questions from Section-C.

SECTION—A

1. Define the term activity and activity coefficient.

2. What is a salt bridge ? Give its importance.

3. Define half life period of a reaction.

4. Give any two examples of zero order reaction.

5. Give any two differences between promoters and inhibitors.

6. What is Heterogeneous Catalysis ?

7. Define buffer solution. What is buffer action ?

3126(2519)/EBH-1135　　　　　1　　　　　(Contd.)

8. Calculate the pH of a sample of soft drink whose hydronium ion concentration is 3.8×10^{-3} M. $8 \times 1 = 8$

SECTION—B

9. Derive Nernst equation for measuring EMF of the cell. Give at least two important applications of Nernst Equation.

    4

10. (a) What is Quinhydrone electrode ? Show how it behaves as reversible H^+ ion electrode ?   2

    (b) Calculate the equilibrium constant at 25°C for the reaction :

$$Zn(S) + Cu^{2+}(1M) \rightleftharpoons Cu(S) + Zn^{2+}(1\ M)$$

    E° for the cell is 1.10 V.   2

11. The first order rate constant for the decomposition of N_2O_5 at 0°C is 5.2×10^{-6} min^{-1}. If the energy of the activation is 6200 J mol^{-1}. Calculate the rate constant at 25°C.   4

12. (a) Show that the equation $K = A \cdot e^{-Ea/RT}$ can be expressed in the form of an equation of a straight line. What are the slope and intercept ?   2

    (b) Give units of zero order and first order reaction.

    2

13. Write a short note on acid base catalysis.   4

14. Write a short note on surface reactions with special reference to unimolecular surface reactions.   4

3126(2519)/EBH-1135   2   (Contd.)

15. Discuss the limitations of Arrhenius theory. How does Debye Huckel theory explain the anomalous behaviour of strong electrolyte ? 4

16. (a) Derive relationship between specific conductance and equivalent conductance. 2

    (b) From conductivity measurements the solubility of SrF_2 in water is calculated to be 1.2×10^{-2} gL^{-1} at 20°C. What is the K_{sp} of salt at this temperature ? (Molecular mass of $SrF_2 = 125.6$) 2

SECTION—C

Note :— Attempt any **two** questions.

17. Describe a potentiometric titration involving :—

    (i) an acid and a base 2

    (ii) Redox titrations 2

    (iii) Precipitation titrations. 2

18. Enumerate different methods used for determination of order of a reaction. Discuss at least four methods in detail.

    6

19. (a) Define Catalysis. 2

    (b) Explain the Michaelis Menten Equation for enzyme catalysis. 4

20. Define buffer capacity. Discuss buffer action of acidic buffer. Show that $pH = pKa + \log \dfrac{[Salt]}{[Acid]}$. Under what conditions $pH = pKa$? 6