

[This question paper contains 2 printed pages.]

Your Roll No.....

Sr. No. of Question Paper : 3012

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Unique Paper Code : 2173522005

Name of the Paper : Acids & Bases and Aqueous Chemistry of Metal Ions

Name of the Course : **B.Sc. (Prog.)**

Semester : IV / VI

Duration : 2 Hours

Maximum Marks : 60

Instructions for Candidates

1. Write your Roll No. on the top immediately on receipt of this question paper.
2. Attempt **FOUR** questions in all . Each questions carry equal marks.

1. (a) What is a buffer? How does a sodium acetate/acetic acid buffer act to maintain the pH of a solution.

(b) Derive the Handerson-Hasselbalch equation. Explain the terms involved.

- (c) What are Pourbaix diagrams? How are they helpful in determining the stability of a particular oxidation state of an element with respect to pH? (5,5,5)

2. (a) What are the different redox reactions that occur in biological processes? Discuss giving any two examples in detail.

(b) How is Nernst equation used to find out the emf of a cell? Explain giving the equation.

- (c) What does the position of an element in the electrochemical series signify? Explain with respect to the reducing power of different species?

(5,5,5)

3. (a) What are Hard and Soft acids and bases? Give suitable examples.

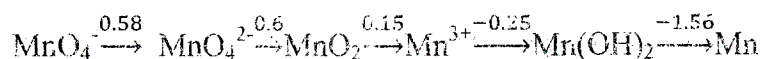
(b) What is solvent levelling effect? Explain the concept of relative strength of acids and bases giving a suitable example.

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- (c) How does Arrhenius theory define acids and bases? Compare it with the Bronsted and Lowry theory of acids and bases giving examples.

(5,5,5)

4. (a) Given below is the Latimer diagrams of Mn, reduction potential, $E^\circ(\text{V})$ in basic medium.

Basic Medium

Answer the following questions with the help of above diagram:

- (i) Write the balanced half reaction for the reduction of MnO_4^- to MnO_2 in basic medium.
 - (ii) Find the standard reduction potential for the reduction of MnO_4^- to Mn^{3+}
 - (b) Define emf of a cell. What are half-cell reactions? Give one example in each case.
 - (c) Redox reactions can be used for quantitative estimation of a species. Explain giving an example. (5,5,5)
5. (a) How does a Frost diagram relate the oxidation state of an element with the electrode potential? Explain.
- (b) Mn has an unusual oxidation state of +3 in some complexes. Explain.
- (c) How do metalloenzymes work with the help of the element present in them? Explain with reference to an example of a metalloenzyme. (5,5,5)
6. Write short notes on the following (Any three):
- (i) Crown ethers and Cryptates
 - (ii) Lewis acids and Lewis bases
 - (iii) Role of chloride ion in metal ion qualitative analysis
 - (iv) Buffer capacity (5,5,5)