


Biophysical Methods and Bioinorganic Chemistry

By the end of this course, students will be able to:

1. Apply the principles of biophysical methods and bioinorganic chemistry to understand the concept of buffer solutions and their applications in biological systems.
2. Analyze the ionic product of water and the pH scale to calculate the pH for strong acid, strong base, weak acid, and weak base solutions.
3. Determine the hydrolysis constant, degree of hydrolysis, and pH for different salts through calculations.
4. Explain the concept of buffer solutions, including pH of buffer solutions, Henderson Hasselbalch equation, buffer capacity, and their significance in biological systems.
5. Understand the regulations of bicarbonate buffer and the use of pH meter in experimental settings.
6. Evaluate different chromatography techniques such as paper chromatography, thin layer chromatography, silica and gel filtration, affinity, ion exchange chromatography, and HPLC.
7. Describe the principles of gel electrophoresis, sedimentation, and density gradient techniques in biophysical studies.
8. Interpret absorption and emission spectroscopy, Lambert-Beer Law, and various spectroscopic techniques including UV, visible, infrared, colorimetry, and fluorimetry.
9. Discuss the basics of bioinorganic chemistry, including the classification of elements based on their biological actions, and the roles of metal ions such as Na^+ , K^+ , Ca^{2+} , Mg^{2+} , $\text{Fe}^{3+}/\text{Fe}^{2+}$, $\text{Cu}^{2+}/\text{Cu}^+$, Zn^{2+} in biological systems.
10. Analyze the structure and physiological roles of oxygen-carrying proteins like haemoglobin and myoglobin, electron transport proteins like iron-sulfur proteins and cytochromes, redox enzymes containing Fe, Cu, and Zn, and hydrolytic enzymes such as carboxypeptidase A and carbonic anhydrase in biological processes.

Overall, students will develop a comprehensive understanding of the theoretical principles and practical applications of biophysical methods and bioinorganic chemistry, with a specific focus on buffer solutions, chromatography, spectroscopy, and the role of metal ions in biological systems.

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