

Course objectives

This course aims at introducing the student to the basic concepts in biochemistry. The topics begin by a detailed introduction to water, acids, bases and buffers. This is followed by the various techniques used to purify and isolate macromolecules. A consideration of the building blocks and structural organization of proteins is discussed next. The next topic deals with enzymes, their classification, function and kinetics. Then, the biochemical, especially the enzymatic aspects of nucleic acids including nucleic acid sequencing are discussed. The course culminates in a consideration of an overview of carbohydrates, lipids and integrated cellular metabolism.

Text Books:

- Biochemistry, by M. Campbell and S. Farrell, fifth edition, 2006, Thomson learning, Inc, USA
- Biochemistry, by C. Mathews and K. VanHolde, 1990, the Benjamin/Cummings Publishing Company, nc. New York.
- Biochemistry, by D. Voet and J. Voet, second edition, 1990, John Wiley and Sons, Inc. New York.
- Biochemistry, by L. Stryer, third edition, 1995, W. H. Freeman and Company. New York.
- Lehninger Principles of Biochemistry, by D. Nelson and M. Cox, third edition, 2001, worth Publishers. New York.

Course outline

Topics:

1. Introduction.
2. Water, acids and bases.
3. Buffers: preparation, types and calculations.
 - The Henderson- Hasselbalch equation.
 - Monoprotic, diprotic and triprotic acids.
4. Purification and isolation of macromolecules.
 - Selection of source and solubilization .
 - Stabilization and assay.
 - Chromatographic methods.
 - a. Ion exchange chromatography
 - b. Paper chromatography.
 - c. Gel filtration chromatography.
 - d. Affinity chromatography.
 - e. Other chromatographic techniques.
 - Electrophoresis.
 - a. Paper electrophoresis.
 - b. Gel electrophoresis.
 - c. SDS-PAGE.
 - d. Isoelectric focusing.
 - e. Capillary electrophoresis.

-Ultracentrifugation.

- a. Sedimentation .
- b. Preparative ultra centrifugation.

5. Proteins: building blocks and structural organization.

- Amino acids
- Primary structure determination.
- Chemical evolution.
- Three-dimensional structure.
 - a. Secondary structure.
 - b. Fibrous proteins.
 - c. Globular proteins.
 - d. Proteins stability.
 - e. Quaternary structure.

6. Enzymes: classification, function and kinetics.

- Introduction to enzymes.
- Specificity and regulation.
- Rates of enzymatic reactions
- Kinetics and inhibition.
- Enzymatic catalysis.

7. Biochemical aspects of nucleic acids.

- Structure and expression of the genetic material.
- Replication- DNA Biosynthesis
- Transcription – RNA Biosynthesis
- Translation- protein Biosynthesis
- Nucleic acid sequencing.
- Regulation of gene expression.

8. An overview of carbohydrates and lipids.

- Monosaccharides.
- Polysaccharides.
- Glycoproteins.
- Lipid classification.
- Properties of lipid aggregates.
- Biological membranes
- Membrane assembly and protein targeting.

9. An overview of integrated cellular metabolism.

- Metabolic pathways.
- Major pathways and strategies of energy metabolism.

Grading System: Lab. 25%
Midterm 25%
Final exam 50%

Univ. of Jordan
Dept. of Biol.Sci.
Prof.Dr. I. Ibrahimi

Biochemistry 321
Laboratory
Syllabus

Lab. No. Expt. No. title and page

1. Check in and introduction p1-34
2. 3.4 Titration of a weak acid with a strong base . p.50
3. 3.5-6 The determination of pKa for a number of unknown solutions . p.51-52
4. 3.8 Titration curves of amino acids(Gly,His,Gly) . p53
5. 7.1 Absorbance curves of two dyes. P.130
6. 7.2 Demonstration of Beer,s law. P.130
7. 8.1 Quantitative estimation of amino acids using the ninhydrin assay. P.158
8. 8.2 The Biuret assay. P 159
9. 8.3 Protein assay using Folin-Lowery method . p. 159
10. 8.5 Isolation of casein from milk . p. 160
11. 9.4 The estimation of carbohydrates by the anthrone method . p.179
12. 10.1-3 The determination of acid value, saponification value and iodine number of fat/ oil
13. 10.4 The estimation of cholesterol . p.197
14. 11.5 The isolation of DNA from sheep spleen. P.216
15. 12.1 The progress curve of.....alkaline phosphatase p. 236-237

25 points:

- 10 points for unknown lab results and reports
- 5 points for mid-term unknown
- 10 points for final unknown

Lab manual: an introduction to practical biochemistry, third edition (1987). By D. T. Plummer