



UNIVERSITY OF NICOSIA

ΠΑΝΕΠΙΣΤΗΜΙΟ ΛΕΥΚΩΣΙΑΣ

University of Nicosia, Cyprus

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| Course Code BIOL-322 | Course Title Biochemistry II | ECTS Credits 8 |
| Department Life and Health Sciences | Semester Spring | Prerequisites BIOL-321 Biochemistry I |
| Type of Course Required | Field Biology | Language of Instruction English |
| Level of Course 1 st Level | Year of Study 3rd | Lecturer Dr. Evdokia Kastanos-Kassini |
| Mode of Delivery Face to Face | Work Placement N/A | Co-requisites None |

Objectives of the Course:

This course is the second of a two parts course, aimed to cover comprehensively the fundamental concepts related the central energy metabolism as well as the basic chemical properties that underlie metabolic processes. The main objectives of this part of the course are to:

- Provide students with a comprehensive understanding of oxidative phosphorylation and the energy requirements for cell growth and maintenance.
- Make students aware of the metabolic pathways involving the four major metabolic compounds (carbohydrates, lipids, amino acids and nucleotides).
- Discuss the mechanisms by which these pathways are integrated and regulated and emphasize the relationship of bioenergetics to the physiological state.
- Relate the disruption of metabolic functions to disease states using specific examples.
- Enable students to develop laboratory skills and critical thinking to study biochemical molecules.

Learning Outcomes:

After completion of the course students are expected to be able to:

1. Explain how most cells obtain energy by the oxidation of glucose either aerobically or anaerobically and how plants and other photosynthetic organisms convert light energy to chemical energy
2. Describe the components and the chemistry underlying oxidative phosphorylation, the bioenergetic considerations and estimate energy yield requirements.
3. Apply the subcellular localization of metabolic pathways to coordinate metabolic regulation.
4. Differentiate the anabolic and catabolic pathways and diagram their important enzymatic steps.

5. Discuss how loss of normal integrated metabolism can result in disease and identify sites of metabolic regulation and intervention in disease states.
6. Record, examine and analyze experimental data and demonstrate skills in protein purification, characterization, and in measuring enzyme activity.

Course Contents:

Lectures:

1. Signal Transduction Pathways
2. Glycolysis and Gluconeogenesis
3. The Citric Acid Cycle
4. Oxidative Phosphorylation
5. The Light Reactions of Photosynthesis
6. The Calvin Cycle and the Pentose Phosphate Pathway
7. Glycogen Metabolism
8. Fatty Acid Metabolism
9. Protein Turnover and Amino Acid Catabolism
10. Biosynthesis of Amino Acids
11. Biosynthesis of Nucleotides
12. Biosynthesis of Membrane Lipids and Steroids

Laboratory Sessions:

1. Dilutions, Concentrations, Acids, Bases and Buffers
2. Spectrophotometry: Beer's Law, Standard Curves and Protein Concentration
3. Enzyme Purification: Homogenization, centrifugation, ammonium sulfate precipitation, assay for lactate dehydrogenase (LDH) enzyme activity
4. Ion Exchange Chromatography for LDH purification
5. Enzyme Kinetics of LDH: Michaelis-Menten graph, K_m and V_{max} calculations
6. Native Gel Separation of LDH isozymes
7. SDS-PAGE of LDH
8. Western Blot of LDH

Learning Activities and Teaching Methods:

Lectures; Laboratory Sessions; Discussions/Review of literature papers, Cooperative learning.

Assessment Methods:

Assignments, Mid-term Exams, Lab Reports, Final Exam

Required Textbooks/Reading:

| Authors | Title | Publisher | Year | ISBN |
|---|----------------------------------|-----------------------|------|--|
| J.M. Berg, J.L. Tymoczko, and L. Stryer | Biochemistry, 6/e | W.H. Freeman and Co. | 2008 | ISBN-10: 1-4292-3502-0 ISBN-13: 978-1-4292-3502-0 |
| S.O. Farrell, L.E. Taylor | Experiments in Biochemistry, 2/e | Thomson Brooks/Co l/e | 2006 | ISBN-13: 978-0-495-01317-4 |

Recommended Textbooks/Reading:

| Authors | Title | Publisher | Year | ISBN |
|-------------------------------------|--|------------------|-------------|--|
| D.J. Voet, J.G. Voet and C.W. Pratt | Principles of Biochemistry, | Wiley, 3/e | 2008 | ISBN-13: 978-0470-23396-2 |
| T.M. Devlin | Biochemistry with Clinical Correlations, 6/e | Wiley | 2006 | ISBN-10: 0-471-67808-2 ISBN-13: 978-0-471-67808-3 |