

THE COLLEGE OF THE BAHAMAS



COURSE PROPOSAL FORM

COURSE ABBREVIATION & NUMBER

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SCHOOL: NATURAL SCIENCES AND ENVIRONMENTAL STUDIES

DEPARTMENT: CHEMISTRY

COURSE TITLE: PRINCIPLES OF BIOCHEMISTRY

COURSE DESCRIPTION FOR CATALOGUE (50 WORDS MAXIMUM):

This course explores the essential macromolecules and metabolic pathways encountered in BIOL 200 – Animal Biology and BIOL 201 – Plant Biology. Emphasis is placed on relating chemical structure to biological activity of molecules and on the role of various factors in energy generation and regulation.

PURPOSE OF COURSE:

University Transfer	(X)	External Examination	()
College Diploma or Certificate	()	Recreational/General Interest	
College Degree	(X)	(non-credit)	(X)
Upgrading	()	Professional Development	()

PRE-REQUISITE(S): CHEM 230, BIOL 200, BIOL 201 or permission of Instructor or Chairperson

CO-REQUISITE(S): NONE

HOURS PER WEEK: Lecture 4 Laboratory _____ Seminar/Tutorial _____

LAB FEE: NONE

SEMESTER HOUR CREDITS: 4

SEQUENTIAL COURSE(S): NONE

OTHER COB COURSES HAVING CONTENT OVERLAP: CHEM 136, BIOL 200, BIOL 201, BIOL 310

COURSE DEVELOPED (X)/REVISED () BY:

(1) BRIDGET HOGG	Date: JUNE 2003
(2) ALAN MC BRIDE	Date: JUNE 2003
.....(3) NEROMANIE NEZAMUDEEN	Date: JUNE 2003

APPROVALS: Chair of School: _____ Date: _____

Head of Department: _____ Date: _____

Dean: _____ Date: _____

Academic Board: _____ Date: _____

NOTE:

1. A detailed course description must be attached. This must include course objectives, list of topics covered, prescribed textbooks, reading list, method of assessment, and external examinations which are prepared for in this course.
2. The course description must be suitable for distribution to students.
3. Only lecturers/instructors approved by The College will be allowed to teach this course.

**THE COLLEGE OF THE BAHAMAS
SCHOOL OF NATURAL SCIENCES AND ENVIRONMENTAL STUDIES
DEPARTMENT OF CHEMISTRY**

CHEM 336 – Principles of Biochemistry

4 semester hour credits

COURSE DESCRIPTION

This course explores the essential macromolecules and metabolic pathways encountered in BIOL 200 – Animal Biology and BIOL 201 – Plant Biology. Emphasis is placed on relating chemical structure to biological activity of molecules and on the role of various factors in energy generation and regulation.

SPECIFIC OBJECTIVES

On completion of this course, students will be able to

1. describe the production of biochemical macromolecules;
2. explain the primary functions of the macromolecules;
3. trace the pathway of the macromolecules through catabolic and anabolic pathways;
4. analyse energy production through the various metabolic pathways;
5. evaluate the role of enzymes and hormones in moderating biochemical activities; and
6. predict the effect of some toxic substances on body function at the cellular level.

COURSE CONTENT

1. Water – the medium of life
 - a) Structure and physical properties
 - b) Water as a solvent
 - c) Ionisation, pH, pK_w
 - d) Biological buffer systems
 - e) Unique role of water in the maintenance of life

2. Enzymology
 - a) Enzymes as biological catalysts
 - b) Kinetics of enzyme-catalysed reactions
 - i) The Michaelis-Menten equation
 - ii) The Lineweaver-Burk equation
 - iii) Effect of pH on enzyme activity
 - iv) Effect of temperature on enzyme activity
 - c) Mechanism of enzyme action
 - i) Enzyme active sites
 - ii) Acid-base catalysis
 - iii) Metal ion catalysis
 - iv) Covalent catalysis
 - d) Reversible and irreversible inhibition
 - e) Co-enzymes
 - f) Allosteric enzymes
 - i) Positive and negative effectors
 - ii) The MWC (Monod, Wyman & Changeux) model
 - iii) The sequential model
 - g) Cellular regulation of enzymes
 - h) Site-directed mutagenesis and catalytic antibodies

3. Bioenergetics and metabolism
 - a) Basic thermodynamics and standard free energy changes
 - i) Role of ATP and NADPH as energy carriers: Relationship to chemical structure
 - ii) Anabolism and catabolism
 - iii) Overview of the metabolic pathways and their linkages
 - iv) Redox biochemistry

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CHEM 336 – Principles of Biochemistry

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- b) Glycolysis – a central pathway of glucose metabolism
 - i) First and second stages of the glycolytic sequence
 - ii) Regulation and feeder pathways into the pathway
 - iii) Alcoholic fermentation
- c) The citric acid cycle, the glyoxalate cycle and the pentose phosphate pathway
 - i) The citric acid cycle
 - i) The citric acid cycle in regulation and biosynthesis
 - ii) The glyoxalate cycle
 - iii) The pentose phosphate pathway
- d) Oxidative phosphorylation
 - i) Electron transport chain
 - ii) Chemiosmotic coupling
 - iii) Mitochondrial shuttles
- e) Fatty acid oxidation
- f) Oxidative degradation of amino acids and the urea cycle
- g) Gluconeogenesis
- h) Biosynthesis of amino acids and nucleotides
- i) Photosynthesis
 - i) Light and dark phases
 - ii) Calvin cycle
 - iii) Comparison with gluconeogenesis
- j) Regulation of cell metabolism
 - i) Enzymatic
 - ii) Hormonal
 - iii) Metabolic disorders
 - iv) Environmental factors

ASSESSMENT

Class tests and assignments	30%
Project/semester paper	30%
<u>Final examination</u>	<u>40%</u>
Total	100%

REQUIRED TEXT

Boyer, R. (1999). *Concepts in biochemistry*. New York: Brooks/Cole Publishing Company. ISBN: 0-534-17208-3

SUPPLEMENTARY READINGS

Campbell, M. K., & Farrell, S. O. (2003). *Biochemistry* (4th ed.). Canada: Thompson Brooks/Cole Publishing. ISBN: 0-534-17102-8

Garrett, R. H., & Grisham, C. M. (1997). *Principles of biochemistry with a human focus*. Canada: Thompson Brooks/Cole Publishing. ISBN: 0-03-097369-4

Sheehan, M. (1994). *Biochemistry and molecular biology*. Canada: Nelson Canada. ISBN: 0-17-448207-8

Internet Resources

www.dartmouth.edu/biochem/ (Biochemistry)

www.horizonpress.com/gateway/ (Molecular Biology)

Journals

**Education in Chemistry: The Royal Society of Chemistry ISSN 0013-1350

**Journal of Chemical Education ISSN 0021-9584

**Journal of Research in Science Teaching: John Wiley and Sons Inc. ISSN 0022-4308

**Scientific American: Scientific American Inc. ISSN 0036-8733

**In The College of The Bahamas Library