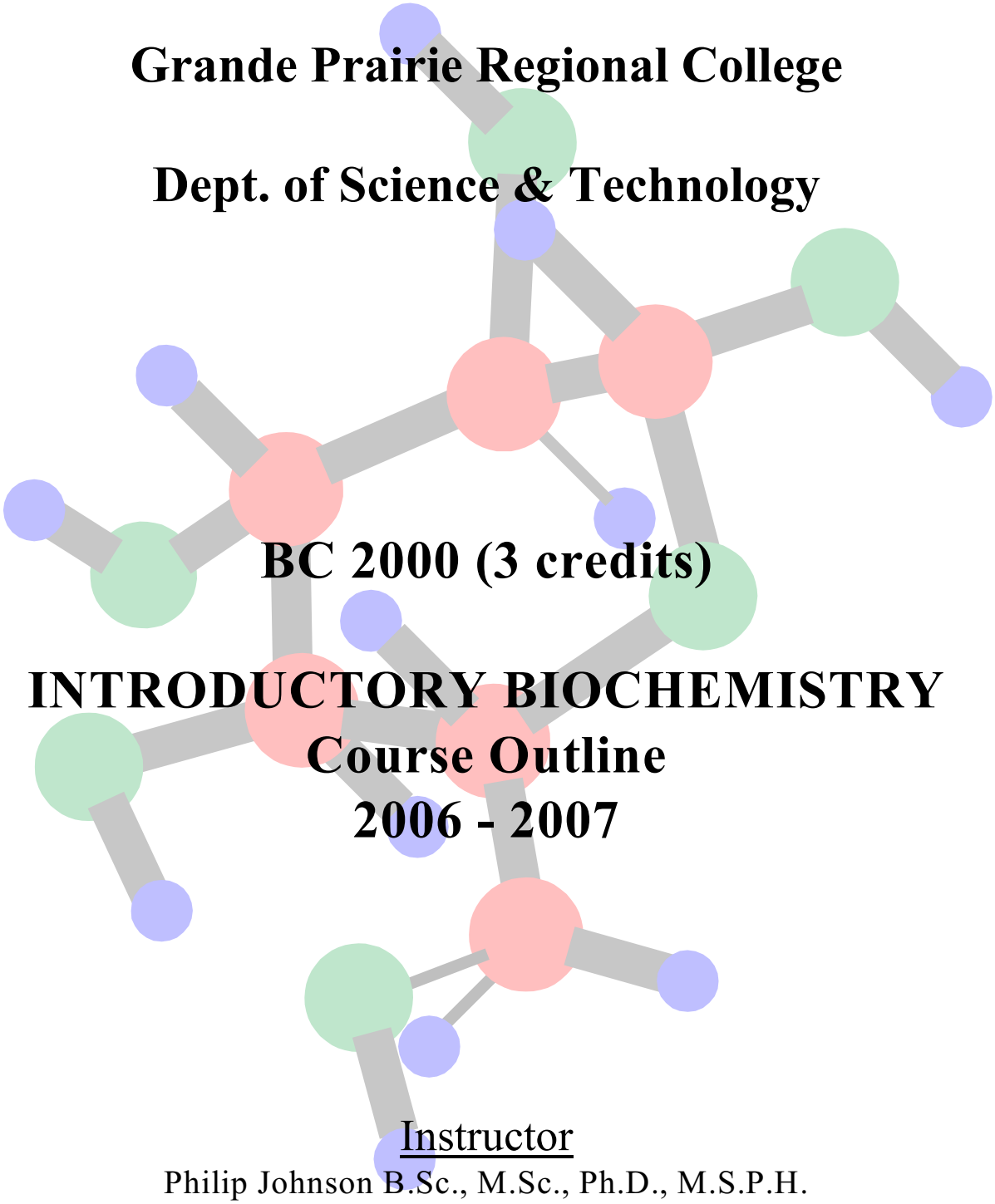
Grande Prairie Regional College

Dept. of Science & Technology



BC 2000 (3 credits)

INTRODUCTORY BIOCHEMISTRY

Course Outline

2006 - 2007

Instructor

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Course Description: An introduction to the fundamental principles of biochemistry. Protein structure and function; lipids and the structure of biological membranes; nucleotides and the structure of nucleic acids; bioenergetics and the metabolism of carbohydrates, lipids and nitrogen; the integration and regulation of cellular metabolism
This course is designed both for students who require a single term course in the fundamental principles of biochemistry, **AND** for students who intend to take further courses in biochemistry.

Hours: 3-0-0

Pre-requisites: Chemistry 1010
Chemistry 1610 or Chemistry 2610

Transferability: University of Alberta (BIOCH 200)

Text-book: "Essential Biochemistry" (2004)
Charlotte W. Pratt and Kathleen Cornely
John Wiley & Sons Inc. Publishers

Lectures: Tuesday & Thursday 1300-1420 J229

Evaluation:

Mid-term Exam I	25%
Mid-term Exam II	25%
Final Exam	50%

Grading: Final Grades will be awarded using the following approximate marks::

A+	>90%
A	87-90%
A-	83-86%
B+	79-82%
B	74-78%
B-	70-73%
C+	69-74%
C	65-68%
C-	61-64%
D+	55-60%
D	50-55%
F	<50%

Assignments: To aid preparation for exams, questions and problem sets may be assigned to students throughout the course. These must be completed and handed in at the time specified. Late assignments will not be accepted.

BC 2000 - Lecture Schedule

Topic	Reading
Introduction (1 hour)	
Biomolecules/biopolymers	Ch. 1: 6-11
Nucleotides and Nucleic acids (3 hours)	
Purine & pyrimidine bases	Ch. 3: 54-55
Nucleosides & nucleotides	Ch. 3: 55-57
High-energy molecules & phosphdiester bonds	Ch. 3: 56; Ch. 9: 291-294
Co-enzymes and role as electron carriers	Ch. 9: 284-285
Structure of DNA and RNA	Ch. 3: 57-60
The Central Dogma (genes to proteins)	Ch. 3: 62-65
Regulation of gene expression	Ch. 19: 583-588
Protein Structure and Function (6 hours)	
Amino acids	Ch. 4: 93-97
Peptide bonds and primary structure	Ch. 4: 97-98
Secondary structures	Ch. 4: 103-108
Tertiary structure (myoglobin)	Ch. 4: 108-118
Oxygen binding to myoglobin	Ch. 4: 116-118
Quarternary structure (haemoglobin)	Ch. 4: 118-119
Cooperativity and allostery	Ch. 4: 121-126
Amino acid substitutions:	
Foetal haemoglobin	Ch. 4: 126
Sickle-cell anaemia	Ch. 4: 125
Enzymes (3 hours)	
What is an enzyme?	Ch. 6: 167-169
Classifying enzymes	Ch. 6: 170-171
How do enzymes work?	Ch. 6: 171-173
Catalytic mechanisms	Ch. 6: 173-175; 181-184
Co-enzymes and dietary vitamins	Ch. 9: 288
Competitive inhibition	Ch. 7: 214-215
Allosteric enzymes	Ch. 7: 219; 222-224
Other *in vivo* regulatory mechanisms	Ch. 7: 224
Lipids and Biological Membranes (4 hours)	
Fatty acids and triacylglycerols	Ch. 8: 234-235

Membrane lipids	Ch. 8: 236-238
Lipid bilayers and membrane fluidity	Ch. 8: 238-242
Membrane proteins	Ch. 8: 242-245
Fluid Mosaic Model	Ch. 8: 245-246
Membrane transporters	Ch. 8: 252-256
Active transport	Ch. 8: 256-258
Introduction to hormones	Ch. 16: 503
Hormone-signaling mechanisms	Ch. 16: 503-504; 509-512

MID-TERM EXAM I

Introduction to Metabolism (2 hours)

Energy and metabolism	Ch. 1: 11-14
Food and Fuel	Ch. 9: 277-283
Oxidation and reduction	Ch. 9: 284-287
Free energy changes in metabolic reactions	Ch. 9: 289-290
Energy currency, ATP, coupled reactions	Ch. 9: 291-297

Glucose Metabolism (4 hours)

Glucose and glycogenolysis	Ch. 10: 305-307
Glycolysis	Ch. 10: 308-320
Fates of Pyruvate	Ch. 10: 320-324
Glycogen breakdown and the Cori Cycle	Ch. 16: 502
Gluconeogenesis and Glycogen synthesis	Ch. 10: 324-330

Citric Acid Cycle and Oxidative Phosphorylation (4 hours)

Introduction	Ch. 11: 342-344
Conversion of pyruvate to acetyl-CoA	Ch. 11: 344-347
Reactions of the Citric Acid Cycle	Ch. 11: 348-357
Regulation of the Citric Acid Cycle	Ch. 11: 357-358
Amphibolic nature of Citric Acid Cycle	Ch. 11: 360-364
Oxidative phosphorylation	Ch. 12: 371-393
Energy yield from complete oxidation of glucose	

MID-TERM EXAM II

Metabolism of Fats, Fatty Acids and Cholesterol (7 hours)

Fats as energy stores

Catabolism of lipids

Lipases and hormone-sensitive lipases	Ch. 14: 427-428
Oxidation of fatty acids	Ch. 14: 428-433
Conversion of fats to carbohydrates	Ch. 11: 363
Ketone bodies	Ch. 14: 444-446
Use of fats during exercise	
Anabolism of Fatty Acids	
Fatty acid synthesis	Ch. 14: 437-442
Regulation of Fatty acid synthesis	Ch. 14: 443-444

Integration of Carbohydrate and Lipid Metabolism (2 hours)

Organ specialization	
Cori cycle and the Glucose/Alanine Cycle	Ch. 16: 501-502
Actions of Insulin	Ch. 16: 504-509
Actions of Glucagon and Adrenaline	Ch. 16: 509-510
Diabetes	Ch. 16: 517-519

Synthesis and Transport of Cholesterol (3 hours)

Cholesterol synthesis	Ch. 14: 450-455
Lipoproteins and atherosclerosis	Ch. 14: 425-426; 441; 455-456

Nitrogen Metabolism (2 hours)

Nitrogen fixation and assimilation	Ch. 15: 463-466
Transamination reactions	Ch. 15: 466-467
Synthesis of non-essential amino acids	Ch. 15: 467-471
Catabolism of amino acids	Ch. 15: 483-486
The Urea Cycle and nitrogen disposal	Ch. 15: 487-493

FINAL EXAM