DEPARTMENT OF SCIENCE

COURSE OUTLINE – Fall 2012-13

BC 2000 – INTRODUCTORY BIOCHEMISTRY

INSTRUCTOR:	Philip Johnson	**PHONE:**	780-539-2863
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OFFICE HOURS:	Mondays, Tuesdays & Thursdays	1000-1120 hours
	Wednesdays	1300-1420 hours
	Fridays	1130-1220 hours

PREREQUISITE(S)/COREQUISITE: CH 1010 and CH 1610 or CH 2610

REQUIRED TEXT/RESOURCE MATERIALS:

"Essential Biochemistry" (2nd Edition, 2011)
Charlotte W. Pratt and Kathleen Cornely
John Wiley & Sons Inc. Publishers

SUPPLEMENTS:

Practice quizzes will be made available on Moodle to aid preparation for exams. These can be completed at any time by students.
A link to the textbook website is also available on Moodle. This site provides access to a number of useful resources.

CALENDAR 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.

CREDIT/CONTACT HOURS: 3 credits (3-0-0)

DELIVERY MODE(S): Classes Tuesdays & Thursdays 1300-1420 (J203)

TRANSFERABILITY:

University of Alberta (Biochemistry 200)
University of Calgary (Biochemistry 341)

EVALUATIONS:

Mid-term Exam I	30%
Mid-term Exam II	30%
Final Exam	40%

GRADING CRITERIA:

GRANDE PRAIRIE REGIONAL COLLEGE			
GRADING CONVERSION CHART			
Alpha Grade	**4-point**	**Percentage**	**Designation**
A^{+}	**4.0**	**90 – 100**	**EXCELLENT**
A	**4.0**	**85 – 89**	
A^{-}	**3.7**	**80 – 84**	**FIRST CLASS STANDING**
B^{+}	**3.3**	**77 – 79**	
B	**3.0**	**73 – 76**	**GOOD**
B^{-}	**2.7**	**70 – 72**	
C^{+}	**2.3**	**67 – 69**	**SATISFACTORY**
C	**2.0**	**63 – 66**	
C^{-}	**1.7**	**60 – 62**	
D^{+}	**1.3**	**55 – 59**	**MINIMAL PASS**
D	**1.0**	**50 – 54**	
F	**0.0**	**0 – 49**	**FAIL**
WF	**0.0**	**0**	**FAIL, withdrawal after the deadline**

**** Grade of D or D+ may not be acceptable for transfer to other post-secondary institutions. Students are cautioned that it is their responsibility to contact the receiving institutions to ensure transferability**

STUDENT RESPONSIBILITIES: All cell phones should be switched off while students are in class. Should a cell phone ring during class, the first instance will result in a warning to all students; further instances will results in the owner of the cell phone being asked to leave that day's class.

Students will be allowed to use standard non-programmable calculators in exams. **All other electronic devices are prohibited** and should not be brought into exams. Students found to be using a prohibited electronic device during an exam will be required to leave immediately and will receive a mark of zero for that exam.

Students should read pages pages 47-50 of the 2012-2013 G.P.R.C. Calendar, especially in regards to policies on plagiarism, cheating and the resulting penalties. These are serious issues and will be dealt with severely.

**Note: all Academic and Administrative policies are available on the same page.

BC 2000 Fall 2012-13 – Topic Outline

Topic	Textbook Readings (pages) 1st Edition	2nd Edition
Biological Molecules		
Types of biomolecules	6-7	4-6
Biopolymers	8-10	6-10
Nucleosides and nucleotides	54-55	52-54
Basic structure of DNA and RNA	56-60	56-59
Functions of Nucleic acids (Central Dogma)	62-65	61-65
Protein Structure and Function		
Overview	90-93	87-89
Amino acids	93-97	89-92
Peptide bonds and primary structure	97-98	92-93
Secondary structures	103-108	95-99
Tertiary structure and stabilization	110-114	99-104
Quarternary structure	118-119	108-109
Oxygen binding to myoglobin and haemoglobin	116-126	121-131
Enzymes		
What is an enzyme?	167-169	154-157
Classifying enzymes	170-171	157-158
How do enzymes work?	171-173	158-160
Catalytic mechanisms	173-175	160-164
Substrate binding	181-184	167-170
Co-enzymes and dietary vitamins	288	54-56, 308-311
Competitive inhibition	214-215	197-199
Allosteric enzymes	219, 222-224	205-207
Other *in vivo* regulatory mechanisms	224	207
Co-enzymes and roles as electron carriers	284-286	304-306
Lipids and Biological Membranes		
Fatty acids, triacylglycerols and membrane lipids	234-238	216-222
Lipid bilayers and membrane fluidity	238-242	222-226
Membrane proteins	242-243	226
Fluid Mosaic Model	245-246	229-230

Passive and active membrane transport	251	239
Porins, ion channels and gated channels	252-256	240-245
The Na^+-K^+ ATPase and Na^+-glucose transporters	256-258	245-248
Introduction to hormones and receptors	503	258
Hormone-signaling mechanisms	503-504, 509-512	262-266
Introduction to Metabolism		
Energy and metabolism	11-14	10-14
Food and Fuel	277-278	297-299
Storage of fuels	279-280	299-300
Mobilization of fuels	280-282	300-302
Organ specialization	Class notes	Class notes
Metabolic pathway and common intermediates	283-283	302-303
Oxidation and reduction	284-286	304-306
Overview of metabolism	286-287	306-307
Free energy changes in metabolic reactions	289-290	311-313
Energy currency, ATP, coupled reactions	291-297	313-317, fig 3-4a
Glucose Metabolism		
Glucose and glycogenolysis	303-307	325-326
Glycolysis	308-313, 315-320	326-327
Fates of Pyruvate	320, 322-324	337-341
Anaerobic exercise and the Cori Cycle	502	503-504
Gluconeogenesis and Glycogen synthesis	324-330	341-347
Summary of glucose metabolism	335-336	352-353
Regulation by insulin and glucagon	504-510	505-509
Citric Acid Cycle and Oxidative Phosphorylation		
Introduction	342-344	359-360
Conversion of pyruvate to acetyl-CoA	344-347	360-364
Reactions of the Citric Acid Cycle	348-357	364-372
Regulation of the Citric Acid Cycle	357-358	372-373
Catabolism, anabolism and anapleurotic reactions	360-362	374-379
Overview of oxidative phosphorylation	371-372	384-385
Mitochondrial anatomy	375-377	389-390
Components of the electron transport chain	378-385	391-397

Chemiosmosis	385-386	398-399
ATP synthase	388-389	400-402
Stoichiometry of ATP synthesis	391-392	402
Regulation and coupling	392	402-404
ATP yield from aerobic catabolism of glucose	357	372
Metabolism of Fats, Fatty Acids and Cholesterol		
Overview of fat metabolism	Fig. 14-4	Fig. 17-4
Triacylglycerides (TAGs) and Cholesterol	235-237	218-219
Transport of lipids	425-426	434
TAG synthesis	446-447	454-455
Lipases and TAG breakdown	427-428	436
Degradation of fatty acids (activation and transport)	428-429	436-437
Degradation of fatty acids (β-oxidation)	429-432	437-440
Odd-chain length and unsaturated fatty acids	432-433, 436-437	440-444
Glyoxylate cycle	363	376-377
Fatty acid synthesis	437-441	445-449
Regulation of fatty acid metabolism	443	450
Fat metabolism and diabetes	517-519	512-513
Ketone bodies and ketogenesis	444-445	452-453
Cholesterol synthesis and regulation	450-454	457
Fates of cholesterol	454-455	457-460
"Good" and "Bad" cholesterol	425-426, Box 14A	434-435, Box 17A
Nitrogen Metabolism		
Nitrogen fixation and assimilation	463-466	466-469
Transamination and amino acid synthesis	466-467, 469-471	469-473
Essential amino acids	469	471
Catabolism of amino acids	483-486	486-489
The Urea Cycle and nitrogen disposal	487-493	490-494