



DEPARTMENT OF SCIENCE

COURSE OUTLINE – Fall 2014

BC 2000 – INTRODUCTORY BIOCHEMISTRY

INSTRUCTOR: Philip Johnson **PHONE:** 780-539-2863
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OFFICE HOURS: Tuesdays 1000-1250 hrs
Wednesdays 1300-1420 hrs
Fridays 1130-1250 hrs

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

REQUIRED TEXT/RESOURCE MATERIALS:

“Essential Biochemistry” (3rd Edition, 2014)
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 Monday & Wednesday 1000-1120 (J227)

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 result 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.

Refer to the Student Conduct section of the College Admission Guide at <http://www.gprc.ab.ca/programs/calendar/> or the College Policy on Student Misconduct: Plagiarism and Cheating at www.gprc.ab.ca/about/administration/policies/

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

BC 2000 Fall 2014-15 – Topic Outline

Topic		Textbook Readings (pages)		
		1 st Ed.	2 nd Ed.	3 rd Ed.
Biological Molecules				
	Types of biomolecules	6-7	4-6	3-6
	Biopolymers	8-10	6-10	6-10
	Nucleosides and nucleotides	54-55	52-54	52-55
	Basic structure of DNA and RNA	56-60	56-61	56-61
	Functions of Nucleic acids (Central Dogma)	62-65	61-65	61-65
Protein Structure and Function				
	Overview	90-93	87-89	87-88
	Amino acids	93-97	89-92	89-91
	Peptide bonds and primary structure	97-98	92-96	91-96
	Secondary structures	103-108	96-99	96-99
	Tertiary structure and stabilization	110-114	99-104	99-104
	Protein folding & Quarternary structure		104-109	104-108
	Oxygen binding to myoglobin and haemoglobin	116-126	121-131	122-133
Lipids and Biological Membranes				
	Fatty acids, triacylglycerols and membrane lipids	234-238	215-222	220-227
	Lipid bilayers and membrane fluidity	238-242	222-226	227-230
	Membrane proteins	242-243	226-229	230-233
	Fluid Mosaic Model	245-246	229-230	233-234
	Passive and active membrane transport	251	239	245-246
	Porins, ion channels and gated channels	252-256	240-245	246-252
	The Na ⁺ -K ⁺ ATPase and Na ⁺ -glucose transporters	256-258	245-248	252-255
	Introduction to hormones and receptors	503	249-252	255-260
Enzymes				
	What is an enzyme?	167-169	154-157	158-161
	Classifying enzymes	170-171	157-158	131-162
	How do enzymes work?	171-173	158-160	162-164
	Catalytic mechanisms	173-175	160-164	164-171
	Substrate binding	181-184	167-170	171-174

	Co-enzymes and dietary vitamins	288	54-56, 308-311	54-55 320-322
	Enzyme kinetics		184-192	189-198
	Enzyme inhibition	214-215	195-200	200-207
	Allosteric enzymes	219, 222-224	205-207	209-211
	Other <i>in vivo</i> regulatory mechanisms	224	207	211
	Co-enzymes and roles as electron carriers	284-286	304-306	316-317
Introduction to Metabolism				
	Energy and metabolism	11-14	10-14	10-14
	Food and Fuel	277-278	297-299	308-311
	Storage and use of fuels	279-282	299-302	312-314
	Organ specialization	Class notes	Class notes	Class notes
	Metabolic pathway and common intermediates	283-283	302-303	314-316
	Oxidation and reduction	284-286	304-306	316-317
	Overview of metabolism	286-287	306-307	318-320
	Free energy changes in metabolic reactions	289-290	311-313	323-325
	Energy currency, ATP, coupled reactions	291-297	313-317, Fig 3-4a	325-330 Fig 3-3a
Glucose Metabolism				
	Introduction	303-307	325-326	290-294, 359 338-339
	Glycolysis	308-313, 315-320	326-337	339-350
	Fates of Pyruvate	320, 322-324	337-341	350-354
	Anaerobic exercise and the Cori Cycle	502	503-504	513-514
	Gluconeogenesis and Glycogen synthesis	324-330	341-348	354-359
	Pentose phosphate pathway		348-351	361-363
	Summary of glucose metabolism	335-336	352-353	363-364
	Hormonal regulation	504-510	505-509 268-271 512-513	515-518 277-280 522-523
Citric Acid Cycle and Oxidative Phosphorylation				
	Introduction	342-344	359-360	370-371
	Conversion of pyruvate to acetyl-CoA	344-347	360-364	371-374
	Reactions of the Citric Acid Cycle	348-357	364-372	374-381

	Regulation of the Citric Acid Cycle	357-358	372-373	381-382
	Catabolism, anabolism and anapleurotic reactions	360-362	374-379	384-388
	Overview of oxidative phosphorylation	371-372	384-385	394-395
	Mitochondria and Electron transport chain	375-385	389-397	399-408
	Chemiosmosis	385-386	398-399	408-410
	ATP synthase	388-389	400-402	410-414
	ATP yield from aerobic catabolism of glucose	357	372	380-381
Metabolism of Fats, Fatty Acids and Cholesterol				
	Overview of fat metabolism	Fig. 14-4	Fig. 17-4	Fig. 17-4
	Transport of lipids	425-426	434	443-444
	TAG synthesis	446-447	454-455	463-465
	Lipases and TAG breakdown	427-428	436	445
	Degradation of fatty acids (activation and transport)	428-429	436-437	445-446
	Degradation of fatty acids (β -oxidation)	429-432	437-440	446-453
	Glyoxylate cycle	363	376-377	386
	Fatty acid synthesis	437-441	445-449	453-459
	Regulation of fatty acid metabolism	443	450	459-460
	Fat metabolism and diabetes	517-519	512-513	522-524
	Ketone bodies and ketogenesis	444-445	452-453	461-462
	Cholesterol synthesis and regulation	450-454	457	466-467
	Fates of cholesterol	454-455	457-460	467-467
	“Good” and “Bad” cholesterol	425-426, Box 14A	450 Box 17A	458 Box 17A
Nitrogen Metabolism				
	Nitrogen fixation and assimilation	463-466	466-469	475-478
	Transamination and amino acid synthesis	466-467, 469-471	469-473	478-482
	Catabolism of amino acids	483-486	486-489	494-498
	The Urea Cycle and nitrogen disposal	487-493	490-494	498-502