

DEPARTMENT OF SCIENCE

COURSE OUTLINE – Fall 2016 BC 2000 – INTRODUCTORY BIOCHEMISTRY 3 (3-0-0)

INSTRUCTOR: Philip Johnson **PHONE:** 780-539-2863

OFFICE: J224 E-MAIL: PJohnson@gprc.ab.ca

OFFICE HOURS: Tuesdays & Wednesdays 1300-1420 hrs

Thursdays 1000-1120 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.

LEARNING OUTCOMES:

- 1. Students should know the reactions of common metabolic pathways.
- 2. Students should understand how metabolic pathways are integrated.
- 3. Students should understand the relationship between metabolism and disease.

COURSE OBJECTIVES:

- 1. To gain an understanding of biochemical reactions and pathways.
- 2. To develop critical thinking skills with respect to biochemistry.

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

DELIVERY MODE(S): Classes Mondays 1130-1250 (J201)

Fridays 1000-1120 (J201)

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					
\mathbf{A}^{+}	4.0	90 – 100	EXCELLENT					
A	4.0	85 – 89	EXCELLENT					
A ⁻	3.7	80 – 84	FIRST CLASS STANDING					
B ⁺	3.3	77 – 79	FIRST CLASS STANDING					
В	3.0	73 – 76	GOOD					
B ⁻	2.7	70 – 72	ООО					
C ⁺	2.3	67 – 69						
C	2.0	63 – 66	SATISFACTORY					
C-	1.7	60 – 62						
D ⁺	1.3	55 – 59	MINIMAL PASS					
D	1.0	50 – 54	WIINIWAL PASS					
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:

Refer to the College Policy on Student Rights and Responsibilities available at:

www.gprc.ab.ca/about/administration/policies/fetch.php?ID=69

Refer to the section on Student Conduct on pages 42-44 of the 2016-17 GPRC Calendar especially the Statements on Plagiarism and Cheating on page 43

**Note: all Academic and Administrative policies are available at www.gprc.ab.ca/about/administration/policies/

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. <u>All other</u> <u>electronic devices are prohibited</u> 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.

BC 2000 Fall 2014-15 - Topic Outline

Touls	Textbook Readings (pages)		
Topic	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 in vivo regulatory mechanisms	224	207	211
	Co-enzymes and roles as electron carriers	284-286	304-306	316-317
In	troduction 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,	325-330
			Fig 3-4a	Fig 3-3a
Gl	ucose Metabolism			200 201 270
	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
	III	504-510	505-509	515-518
	Hormonal regulation		268-271 512-513	277-280 522-523
			512 515	
Ci	tric 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 gluc	cose 357	372	380-381
Metabolism of Fats, Fatty Acids and Choles	sterol		
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 to	transpor 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