



**DEPARTMENT OF SCIENCE
COURSE OUTLINE – Fall 2018
BC 2000 – INTRODUCTORY BIOCHEMISTRY
3 (3-0-0) 45 HOURS FOR 15 WEEKS**

INSTRUCTOR: Beatrice Amar Ph.D. **PHONE:** 780-539-2031
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OFFICE HOURS: Mondays 1400-1530 hrs
Wednesday 1400-1530 hrs
Friday 1400-1530 hrs

PREREQUISITE(S)/COREQUISITE: CH1010 and CH1610 or CH2610

REQUIRED TEXT/RESOURCE MATERIALS:

“Essential Biochemistry” (4th Edition, 2018 or 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. The course page on Moodle also provides access to a number of useful resources.

CALENDAR DESCRIPTION:

This course provides an introduction to the fundamental principles of biochemistry. The study includes the fundamentals on 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 1130-1250 (J201)
Friday 1000-1120 (J201)

TRANSFERABILITY:

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

EVALUATIONS:

Mid-term Exam I	25%
Mid-term Exam II	25%
Assignments	10%
<u>Final Exam</u>	<u>40%</u>
Total	100%

GRADING CRITERIA:

GRANDE PRAIRIE REGIONAL COLLEGE			
GRADING CONVERSION CHART			
Alpha Grade	4-point	Percentage	Designation
A ⁺	4.0	90 – 100	
A	4.0	85 – 89	
A ⁻	3.7	80 – 84	
B ⁺	3.3	77 – 79	
B	3.0	73 – 76	
B ⁻	2.7	70 – 72	
C ⁺	2.3	67 – 69	
C	2.0	63 – 66	
C ⁻	1.7	60 – 62	
D ⁺	1.3	55 – 59	
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:

Students are expected to attend **all** classes, seminars and laboratory sessions. All assignments must be completed in full and handed in by the date specified. Refer to the College Policy on Student Rights and Responsibilities at https://www.gprc.ab.ca/about/administration/policies/#academic_policies

STATEMENT ON PLAGIARISM AND CHEATING:

Cheating and plagiarism will not be tolerated and there will be penalties. For a more precise definition of plagiarism and its consequences, 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 <http://www.gprc.ab.ca/about/administration/policies/>

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

Topic		3 rd Edition pages	4 th Edition pages
1. Biological Molecules			
	Types of biomolecules	3-6	3-6
	Biopolymers	6-10	6-9
	Nucleosides and nucleotides	52-55	52-55
	Basic structure of DNA and RNA	56-61	56-61
	Functions of Nucleic acids (Central Dogma)	61-65	61-64
2. Protein Structure and Function			
	Overview	87-88	85
	Amino acids	89-91	86-90
	Peptide bonds and primary structure	91-96	90-94
	Secondary structures	96-99	94-97
	Tertiary structure and stabilization	99-104	97-101
	Protein folding & Quarternary structure	104-108	101-106
	Oxygen binding to myoglobin and haemoglobin	122-133	120-129
3. Lipids and Biological Membranes			
	Fatty acids, triacylglycerols and membrane lipids	220-227	215-222
	Lipid bilayers and membrane fluidity	227-230	222-225
	Membrane proteins	230-233	225-228
	Fluid Mosaic Model	233-234	228-229
	Passive & Active membrane transport	246-255	240-248
4. Enzymes			
	What is an enzyme?	158-161	154-157
	Classifying enzymes	161-162	157-158
	Co-enzymes and dietary vitamins	54-55; 320-322	54-55; 312-314
	Catalytic mechanisms	162-171	158-166
	Substrate binding	171-174	166-171
	Enzyme kinetics	188-198	183-192
	Enzyme inhibition	200-209	194-200
	Allosteric enzymes	209-211	200-203

	Other <i>in vivo</i> regulatory mechanisms	211	203
	Co-enzymes and roles as electron carriers	316-317	308-309
5. Introduction to Metabolism			
	Energy and metabolism	10-14	10-14
	Food and Fuel	308-311	301-303
	Storage and use of fuels	312-314	304-306
	Metabolic pathways and common intermediates	314-316	306-308
	Oxidation and reduction	316-317	308-309
	Overview of metabolism	318-320	310-312
	Free energy changes in metabolic reactions	323-325	314-316
	Energy currency, ATP, coupled reactions	325-330 Fig 3-3a	316-321 Fig 3-2a
6. Glucose Metabolism			
	Introduction	290-294, 359 338-33	283-287; 349; 329
	Glycolysis	339-350	330-340
	Fates of Pyruvate	350-354	341-344
	Anaerobic exercise and the Cori Cycle	513-514	499-500
	Gluconeogenesis and Glycogen metabolism	354-359	344-349
	Pentose phosphate pathway	361-363	350-352
	Summary of glucose metabolism	363-364	352-353
	Hormonal regulation	515-518; 277-280; 522-523	501-505; 270-273; 509-510
7. Citric Acid Cycle and Oxidative Phosphorylation			
	Introduction	370-371	362
	Conversion of pyruvate to acetyl-CoA	371-374	362-365
	Reactions of the Citric Acid Cycle	374-381	365-372
	Regulation of the Citric Acid Cycle	381-382	372-373
	Catabolism, anabolism and anapleurotic reactions	384-388	374-378
	Overview of oxidative phosphorylation	394-395	385
	Mitochondria and Electron transport chain	399-408	390-399
	Chemiosmosis	408-410	399-401
	ATP synthase	410-414	401-405
	ATP yield from aerobic catabolism of glucose	380-381	372

8. Metabolism of Fats, Fatty Acids and Cholesterol			
Overview of fat metabolism	Fig. 17-4	Fig. 17-4	
Transport of lipids	443-444	432-434	
TAG synthesis	463-465	452-454	
Lipases and TAG breakdown	445	435	
Degradation of fatty acids (activation & transport)	445-446	435-436	
Degradation of fatty acids (β -oxidation)	446-453	436-443	
Glyoxylate cycle	386	377	
Fatty acid synthesis	453-459	443-449	
Regulation of fatty acid metabolism	459-460	449-450	
Fat metabolism and diabetes	522-524	509-511	
Ketone bodies and ketogenesis	461-462	450-452	
Cholesterol synthesis and regulation	466-467	454-457	
Fates of cholesterol	467-467		
“Good” and “Bad” cholesterol	458 Box 17A		
9. Nitrogen Metabolism			
Nitrogen fixation and assimilation	475-478	464-467	
Transamination and amino acid synthesis	478-482	467-471	
Catabolism of amino acids	494-498	476-480	
The Urea Cycle and nitrogen disposal	498-502	480-484	