

DEPARTMENT OF SCIENCE COURSE OUTLINE – FALL 2020

BC2000 – INTRODUCTORY BIOCHEMISTRY 3 (3-0-0) 45 HOURS FOR 15 WEEKS

INSTRUCTOR: Beatrice Amar Ph.D. **PHONE:** (780)5392031 (O), (780)9782845 (C)

OFFICE: J208/Remote **E-MAIL:** BAmar@gprc.ab.ca

OFFICE HOURS: Wednesday, Thursday and Friday: 2.30 – 4.30 p.m.

FALL 2020 DELIVERY: Remote Delivery. This course is delivered remotely. There are no face-to-face or onsite requirements. Students must have a computer with a webcam and reliable internet connection. Technological support is available through helpdesk@gprc.ab.ca.

CALENDAR DESCRIPTION:

This course introduces 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.

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

RECOMMENDED 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 D2L course page to aid preparation for exams. These can be completed at any time by students.

DELIVERY MODE(S): Classes Monday 11.30 a.m. - 12.50 p.m. (Remote)

Friday 10.00 a.m. - 11.20 a.m. (Remote)

COURSE OBJECTIVES:

Students will gain a deeper understanding of how biomolecules interact and support life. Emphasis will be placed on the ability to analyze and interpret primary literature related to biochemical processes and metabolic diseases.

LEARNING OUTCOMES:

Students will be able to:

- 1. To gain an understanding of the relationship of structure to function in biomolecules.
- 2. To gain a knowledge of the fundamental processes involved in energy generation and storage in living systems.
- 3. To understand the metabolic pathways and the regulation of biochemical pathways.
- 4. To develop critical thinking skills and scientific research and presentation skills.

TRANSFERABILITY:

University of Alberta (Biochemistry 200)

University of Calgary (Biochemistry 341)

*Warning: Although we strive to make the transferability information in this document up-to-date and accurate, the student has the final responsibility for ensuring the transferability of this course to Alberta Colleges and Universities. Please consult the Alberta Transfer Guide for more information. You may check to ensure the transferability of this course at Alberta Transfer Guide main page http://www.transferalberta.ca or, if you do not want to navigate through few links, at http://alis.alberta.ca/ps/tsp/ta/tbi/onlinesearch.html?SearchMode=S&step=2

** 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

EVALUATIONS:

Mid Term Exam I	20%
Mid Term exam II	25%
Presentation	5%
Assignments	20%
Final Exam	30%
Total	100%

GRADING CRITERIA:

Please note that most universities will not accept your course for transfer credit **IF** your grade is **less than C**-.

Alpha	4-point	Percentage	Alpha	4-point	Percentage
Grade	Equivalent	Guidelines	Grade	Equivalent	Guidelines
A+	4.0	90-100	C+	2.3	67-69
A	4.0	85-89	С	2.0	63-66
A-	3.7	80-84	C-	1.7	60-62
B+	3.3	77-79	D+	1.3	55-59
В	3.0	73-76	D	1.0	50-54
B-	2.7	70-72	F	0.0	00-49

STUDENT RESPONSIBILITIES:

Since participation in lectures, and completion of assignments are important components of this course, regular attendance in class is strongly advised. Students who chose not to attend or complete assignments must assume the risks involved.

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 Calendar at http://www.gprc.ab.ca/programs/calendar/ or the College Policy on Student Misconduct: Plagiarism and Cheating at https://www.gprc.ab.ca/about/administration/policies

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

COURSE SCHEDULE/TENTATIVE TIMELINE:

BC2000 Fall 2020

Topic Outline &Text Readings

	1	
Торіс	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
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Other in vivo 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	316-321
	Fig 3-3a	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
7111 yield from acrosse catabolism of gracose	300-301	312

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	