

BC 351 Principles of Biochemistry Spring 2020 - Section 1

MTRF **8:00 to 8:50 AM**, CLARK A102

Instructor: Narasimha Sreerama (**Sree**)
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Office Hours: **MTWR Before class (~7:20 AM)**; **TR After class (~9:30)**
and By Appointment

Text (Optional): Lehninger Principles of Biochemistry, 6th or 7th Edition, by Nelson and Cox, (2013 or 2017), W.H.Freeman and Company, New York

You may use any Biochemistry text as reference (you have to find the relevant sections). I will be referencing specific pages from the text listed above.

<u>Exam Schedule</u>	<u>Q&A session</u>
Exam I Monday, Feb 17 Block of ~14 lectures	Sunday, Feb 16
Exam II Thursday, March 12 Block of ~13 lectures	Wednesday, Mar 11
Exam III Monday, April 20 Block of ~15 lectures	Sunday, Apr 19
Final Exam Wednesday, May 13 ~50% Lect. 43-52 (12:00-1:30) ~50% Lect. 1-42	Sunday, May 10



Exams: Three in-term exams (**Weeks 5, 9, 13**) and a final exam (**Finals Week**). Exams will be **objective questions (multiple choice)**. Final grade will be decided as a **cumulative of all Exams and Quizzes**. Exams I to III will have approx. 50 – 60 questions (each for 1, 2, 3, 4 points – total of 100 points) from a specified block of lectures.

Final Exam will have 80 – 90 questions (each for 1, 2, 3, 4 points – total of 160 points);

It is **cumulative** and about **half of the questions** will be from the topics covered in the **first three exams**.

Quizzes (on Canvas) 10 points each – End of week 3, 7, 11, and 14 (Canvas for dates and times)

Extra credit Quizzes (on Canvas) 5 points each –before exam (Canvas for dates and times)

Watch for Announcements in class and on Canvas

Reviews: There will be an **in-class brief-review** (lecture may include some new material) for each exam. **Open Q&A sessions** are planned – Day before the Exam

Grades: Assigned from total points from all exams and quizzes. Max: **500** (100 × 3 + 160 + 40)
The letter grades will follow the table below, but may be relaxed (the averages required for a specific grade may be reduced, e.g., A – 85 – 100%) to compensate a low class average.

Grade	Final Average
A	90 – 100 %
B	80 – 89 %
C	70 – 79 %
D	60 – 69 %
F	Below 60 %

Some factual information required for the exam-questions will be provided (See sample exams).

A **partial credit may be given** if a proper explanation for a wrong answer is provided (*need to see me in my office!*) – goes toward your understanding of the subject and critical thinking.

For the **final exam** a **cheat-sheet** (*one-page, A4, written on one side, DO NOT cut and paste questions from other exams – Exams 1-4 or sample exams*) may be allowed. **Details will be discussed in the class at appropriate time.**

Lecture Slides, Supplemental Material, Sample Exams, and Problem Sets will be posted on Canvas Periodically

Tentative Lecture Schedule (52 Lectures; May change depending on the circumstances)

(A) If there are errors (typing or otherwise) please let me know.

(B) Slides used will be placed as **PDF files on Canvas**. It is your responsibility to print a copy for taking notes.(C) Quizzes will be **online** (on Canvas). It is your responsibility to take them on time.They open on at **NOON** and close at **NOON****(Quiz 1, 2, etc – for Credit)** and **(Quiz 1A, 2A, etc, for Extra Credit)**. Notifications on Canvas.

(D) Exams will be in class.

Week	Day	Topic	Quiz
Week 1	T	Introduction; Biomolecules	
	W	Building blocks; Chemical basis of life	
	R	Thermodynamics : ΔH , ΔG ; ΔG° and K_{eq}	
Week 2	M	Oxidation number; Functional Groups	
	T	Water ; Non-covalent interactions; polar/nonpolar groups	
	W	pH, pK; acid/base and ionized forms; Buffers	
	R	Nucleic Acids : Central Dogma;	
Week 3	M	DNA & RNA : Sugar, Base, Nucleotides; Chargaff's rules	
	T	DNA & RNA: Secondary structures;	
	W	Gene ; mRNA, tRNA, rRNA	
	R	Gene expression : translation, Genetic Code	<i>Quiz 1 (Friday Noon – Monday Noon)</i>
Week 4	M	DNA Stability; DNA sequencing (Sanger's sequencing)	
	T	DNA sequencing cont.; PCR	
	W	Recombinant DNA; Cloning	
	R	REVIEW I (may include new material)	<i>Quiz 1A (Friday Noon – Sunday Noon)</i>
Feb 17	Monday	Exam I (Block of first 14 lectures)	
Week 5	M	EXAM I	
	T	Site-directed mutagenesis; mutations and disease	
	W	Proteins : classification; Levels of structure; Amino acids	
	R	Amino acids : classification, pK and charges	
Week 6	M	pH, pK, charges ; Peptide bond;	
	T	Ramachandran Plot; Secondary structures – α and β	
	W	Tertiary Structures - Globular Proteins	
	R	Secondary structure rules	
Week 7	M	Secondary structure rules	
	T	Structural Proteins : Fibrous Proteins - Keratin, Collagen	
	W	Protein Folding: principles and energetics; Protein sequencing;	
	R	2D-gel; Sanger and Edman reagents	<i>Quiz 2 (Friday Noon – Monday Noon)</i>
Week 8	M	Structure/Function : Myoglobin and Hemoglobin O ₂ binding; Binding curves;	
	T	Cooperative binding – Allostereism, BPG, Bohr effect, Mutations, O ₂ delivery	
	W	REVIEW II (may include new material)	<i>Quiz 2A (Tuesday Noon – Wednesday Noon)</i>
Mar 12	Thursday	Exam II (Block of about 14 lectures)	

SPRING BREAK – March 16 - 20

Week	Day	Topic	Quiz
Week 9	M	EXAM II Discussion; Hemoglobin, O ₂ delivery etc.	
	T	Sickle Cell anemia; Cytoskeletal proteins; Muscle structure;	
	W	Muscle contraction; Lipids : Fatty acids; Membrane and storage lipids	
	R	Fluid mosaic model, Membrane proteins	
Week 10	M	Membrane Permeability; Membrane transport	
	T	Active and Passive transport; Ion channels; gating	
	W	Enzymes : Catalysis, active site, Free Energy diagram; models	
	R	Enzyme Kinetics : rate constants, K_M , K_{cat} ; Enzyme Inhibition	
Week 11	M	Enzymatic reactions; Serine proteases; Chymotrypsin; Substrate specificity	
	T	Enzyme mechanism : Catalytic steps; Transitions state Stabilization;	
	W	Regulation of Enzyme activity; Biochemical reaction classes	
	R	Metabolism ; Fuels, ATP, NADH; <i>Quiz 3 (Friday Noon – Monday Noon)</i>	
Week 12	M	Metabolic flux; Carbohydrates : monomers, polymers, α and β forms	
	T	Glucose Metabolism : four pathways, locations and purpose;	
	W	Glycolysis – phases, reactions, intermediates	
	R	REVIEW III (may include new material) <i>Quiz 3A (Friday Noon – Sunday Noon)</i>	
April 20	Monday	Exam III (Block of about 14 lectures)	
Week 13	M	Exam III	
	T	Glycolysis continued; ATP yield	
	W	Gluconeogenesis – unique steps; futile cycle; Regulation of glycolysis/gluconeogenesis	
	R	Pentose Phosphate Pathway – purpose; PDH reaction – acetyl-CoA	
Week 14	M	Citric Acid cycle : Energy Generation, Regulation of the cycle	
	T	Oxidative Phosphorylation : Electron transport chain	
	W	ATP synthase; P:O ratio	
	R	Lipid Metabolism : lipoproteins–HDL, LDL, etc <i>Quiz 4 (Friday Noon – Monday Noon)</i>	
Week 15	M	β -oxidation, ATP yield, Ketogenesis – ketone bodies	
	T	Nitrogen Metabolism Nitrogen Fixation, N-Cycle, Glucogenic/ketogenic amino acids	
	W	Regulation of Metabolism : Insulin/Glucagon; diet and metabolic pathways	
	R	Final REVIEW <i>Quiz 4A (Friday Noon – Sunday Noon)</i>	

Finals Week

May 13 Wednesday Final Exam (12:00 PM – 1:30 PM)

Cumulative: 50% from 10 Lectures (last Block of lectures) + 50% from Earlier Lectures (Lectures 1 – 42)

Disclaimer: I hope to cover these topics. However, depending on the pace of the course I may have to skip certain topics.

Usually things get a little hectic towards the end.

*I will however give you a fair shake of the processes. **Exams will be on what is covered in class. Topics may spill over or move back between modules***