

# BIOCHEMISTRY I: Molecular Biology - BMD 321

## -Fall Semester 2006-

**Faculty:** Azin Agah, Ph.D. and Julio F. Turrens, Ph.D.  
**Class time:** Tuesday and Thursday, 12:30 to 13:45  
**Place:** UCOM 6001  
**Office hours:** Tuesday and Thursday from 11:30 to 12:30 or by appointment.  
**Telephone:** JFT 380-2785 (office) or 639-7111 (home)  
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### Objectives:

This course addresses different aspects of molecular biology including protein structure and function, DNA replication, transcription and translation. A special effort is made to present this information in context with new biochemical techniques used in biotechnology (gene cloning and expression, genetic engineering) and medicine (i.e., forensic medicine, diagnosis of genetic disease, etc).

### Goals:

Students will become familiar with basic aspects of molecular biology and are expected to understand the relationship between protein structure and function (particularly in connection with the mechanism of enzyme action), as this information will be used again for the next Biochemistry courses in the series (BMD 322 and BMD 323). Students also are also expected to understand the basis behind several current techniques in this field, and their applications in all areas of science, including forensic sciences.

**Text:** Biochemistry by Cambell and Farrell., 5<sup>th</sup> edition, Thomson.

### Grading Policy

The final grade will be the average of four examination grades (three regular exams and a comprehensive final exam). All regular exams will include multiple choice, true/false and essay questions. The final exam will not have essay questions. If the grade of the final exam is higher than the average from the other three exams, its weight will be increased to 40% in order to reward students for their effort.

Students will have one week after the exams are returned to discuss any discrepancies in grades.

After this time the grades will not be modified. Examinations missed due to an un-excused absence will not be made-up.

### Course grades:

A > 90 %  
B > 80 %  
C > 70 %  
D > 60 %  
F < 59 %

**Other:**

- **Students should have a general idea of the topics to be covered in every session.**
- **Students are expected to take notes and to actively participate in class.**
- **The use of beepers, portable phones and any other device that could distract the class is forbidden.**
- **The BMD department has established an email account ([BMDdept@usouthal.edu](mailto:BMDdept@usouthal.edu)) for the purpose of anonymous student feedback. The departmental secretary will be checking this email and will forward student comments to appropriate faculty without any identifiers.**
- **Students with specific disabilities requiring academic accommodations should notify the instructor and provide certification of Disability Services. For more information contact the Office of Student Services, Student Center # 270, Phone: 460-7212.**

## HUMAN BIOCHEMISTRY I (Molecular Biology) - BMD 321

Session	Date	Pages	Topic
1	T Aug 22	1-4, 26-30, 34-45	Course overview. Functional groups. Basic thermodynamics. Water. H-bonds. pH.
2	R Aug 24	45-55, 58-69	Titration curves. Henderson Hasselbalch equation. Buffers. Amino acids. Isoelectric point.
3	T Aug 29	72-77	The peptide Bond. Small peptides. Primary structure.
4	R Aug 31	80-91	Secondary structures. Motifs. Collagen.
5	T Sep 5	91-99, Handout	Protein folding and stability. Tertiary structure. Myoglobin. Saturation vs $pO_2$ .
6	R Sep 7	99-104	Denaturation. Chaperones. Prions. Mad cow disease and Creutzfeld-Jacob disease.
7	T Sep 12	104-110 , Handout	Quaternary structure. Hemoglobin. Saturation vs $pO_2$ . $P_{50}$ . Bohr effect. Fetal hemoglobin. Thalassemias.
8	R Sep 13	113-128	Protein purification and sequencing.
9	T Sep 19	Handout	Protein identification. Immunocytochemistry. ELISA. Western blots.
	R Sep 21	EXAM	EXAM # 1 (Lectures 1-9)
10	T Sep 26	131-142	Enzymes. Michaelis-Menten model. Meaning of $K_M$ .
11	R Sep 28	142-152	Lineweaver-Burk plots. Reversible and irreversible inhibitors. Drug development
12	T Oct 3	156-166	Regulation of enzyme activity. Allostery. Changes in $K_{m_{app}}$ Mechanisms of enzyme action. Superoxide dismutase.
13	R Oct 5	167-179, Handout	Zymogens. Serine proteases. Inhibitors. Emphysema. Catalytic antibodies.
14	T Oct 10	215-226, Handout	Sugars and bases. Phosphodiester bonds. RNA and DNA. The double helix. A-, B- and Z-DNA. Occurrence. Denaturation.
15	R Oct 12	226-237, Handout	Supercoiling. Topoisomerases. Cancer treatment. Histones. Human Genome Project. RNA. Chromosomes. Alkaline hydrolysis.
16	T Oct 17	240-250	Prokaryotic DNA replication. DNA polymerases. Proofreading.
	R Oct 19	EXAM	EXAM # 2 (lectures 10-16)
17	T Oct 24	250-261, Handout	DNA mutations and repair. Eukaryotic DNA replication. Skin cancer. Telomeres, telomerases and cancer treatment.
18	R Oct 26	264-271	Transcription. Promoters. RNA polymerase. Different $\sigma$ subunits. Regulation of transcription.

19	T Oct 31	272-284	CRP. Lac operon. Attenuation. Transcription in eukaryotes.
20	R Nov 2	285-298	RNA processing in prokaryotes and eukaryotes. Differences.
21	T Nov 7	301-318, Handout	Translation. Genetic Code. t-RNA. Amino acyl-tRNA synthetases. Wobble position. Ribosomes. Antibiotics.
22	R Nov 9	318-327	Translation in eukaryotes. Post-translational modifications.
23	T Nov 14	EXAM	EXAM # 3 (lectures 17-22)
24	R Nov 16	330-347	Recombinant DNA technology. Restriction endonucleases. Southern blots. Cloning. Genetic engineering. Transgenic plants and animals.
25	T Nov 21	348-358	Expression of proteins. Prenatal detection of genetic diseases. Site-directed mutagenesis. DNA fingerprinting. Application to forensic medicine.
26	T Nov 28	359-366	DNA microchips. DNA sequencing.
27	R Nov 30	367-369	Gene expression: Northern blots. Proteomics
28	T Dec 5		Current issues. Course review
29	Dec 12		<b>FINAL EXAM (from 1:00 to 3:00 p.m.)</b>