MOLECULAR BIOLOGY SYLLABUS

Biol 320 Sect 1 & 2 – Spring 2017

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Required Text:
Cox, M.M. et al. 2015. *Molecular Biology: Principles & Practice*, 2st ed. For rent in bookstore.

Required lined paper: Purchase lined paper for note taking and lab journaling. Another option is to purchase a small lab notebook with lines.

Lab Manual: Lab manuals will be provided for you and distributed in lab in the first week. They will be in a 3-ring binder, for the convenience of adding your own notepaper.

Lecture Meetings: Mon & Wed: 1:00 – 2:15pm; TNR 464

Lab Meetings:
Section 1: Tues 9:00 – 11:50 am, Sci B212; Section 2: Tues 1:00 – 3:50 pm, Sci B212

Exam Times: during lecture time, Check schedule for specific dates

Learning Outcomes:

University Level: *Investigation / Understanding the Physical World*: 1) Identify the basic taxonomy and principles of the scientific method as it pertains to the natural, physical world, 2) Infer relationships, make predictions and solving problems based on an analysis of evidence or scientific information, 3) Apply scientific concepts, quantitative techniques and methods to **solving problems** and making decisions, and 4) Describe the relevance of some aspect of the natural science to their lives and society.

Biology/Biochemistry Program Level: 1) Apply the scientific method, using appropriate theoretical and practical skills to design research studies, answer biological questions and/or solve problems. 2) Describe the flow of genetic information, the chromosome theory of heredity, and the relationship between genetics and evolutionary theory. 3) Evaluate and discuss contemporary social and ethical issues related to biology. 4) Apply theoretical and practical aspects of biology in a variety of laboratory and/or field experiences.

Course Level: 1) Compare the basic principles of inheritance in detail at the molecular, cellular and organismal levels, beyond the scope of Biol 210 (Genetics). 2) Relate DNA structure and manipulation to the function and control of genes. 3) Relate molecular techniques to discoveries in molecular biology. 4) Appraise ethical issues involved with the study of biotechnology and medicine. 5) Conduct basic molecular techniques to answer a variety of biological questions, and 6) Design molecular-based experiments using the scientific method.

Grading: The grading scale below is firm. There will be no borderline grades. If you attend and participate in class, keep up with your text reading each week, read lab manual **prior** to lab time, and **ask questions**, then you'll find success in this course. **Late lab reports are subject to 10% off each day late.**

Your final letter grade is calculated as follows: out of 100 pt.

	B+ = 87.5-89.4	C+ = 77.5-79.4	D+ = 67.5-69.4
A = 92.5-100	B = 82.5-87.4	C = 72.5-77.4	D = 60.0-67.4
A- = 89.5-92.4	B- = 79.5-82.4	C- = 69.5-72.4	F = $\leq$ 60.0

There are four (4) lecture exams, which are in short answer / essay format. **Exams typically do not cover the lecture before the scheduled time of each exam.** Grades will be posted on D2L, as well as weekly posts, suggested studying assignments, and practice questions to help you succeed in this course. There are also 4 formal lab reports and one in-class lab assignment. Below is a table indicating the percentage point values for each item.

Lecture Exams	60% Total	Lab Reports & Participation	40% Total
1	**15%**	**Gel Electrophoresis**	**4% / group of 2**
2	**15%**	**Detection of 3 Tickborne Pathogens by Multiplex PCR**	**12% / group of 2**
3	**15%**	**Designing Allele-Specific PCR Assay for Genotyping**	**2% / group of 2**
4	**15%**	**Identifying 3 genotypes of Interest in your Genome**	**12% / individual**
		Sequencing your Gene of Interest	**8% / individual**
		Success in Laboratory Technique	**2% / individual**

Attendance Policy: I strongly recommend you attend every lecture. Missing any class will put you at a distinct disadvantage when test taking. Students who must miss an exam due to religious observances or participation in university-sanctioned events should notify me within the first 3 weeks of the beginning of class, so makeup arrangements can be made. The only other valid excuses for missing an exam are: death in the family, violent illness, or accident. In such cases: (1) you must provide evidence of some kind (eg. note from health center), **and** (2) you must reschedule **within 24 hours** after the deadline.

E-mail: Students are expected to check their University e-mail regularly for information from the university and/or instructor. If you are using an e-mail account other than your campus account to contact me, be sure your full name is included in the message

Electronic Devices: Cell phones must be turned **off** and **not** displayed during class, lab or exam. No other communication or musical devices are allowed. Students needing a foreign language dictionary during exams may use one with permission from instructor.

Academic Conduct: You are responsible for the honest completion and representation of your work and for the respect of others' academic endeavors. Any act of cheating, plagiarism, or academic misconduct is subject to the penalties outlined in UWS Chapter 14.
For more information: **http://www.uwsp.edu/comm/wdeering/plag.pdf**

Study Habits: The best way to grasp the material is to form study groups with your classmates. (Students with a disability requiring accommodations should register with the Disability and Assistive Technology Center in the Learning Resource Center (the Library) and contact me at the beginning of the course.)

Excellent Studying Strategy Based on the Scientific Method:

Literature search: Print off lecture slides posted in D2L. Read the textbook chapter sections (and suggested readings) that pertain to the info in the lecture slides. While reading, take Some notes on the side of each slide from lecture to clarify class info.

Methods:

a) Rewrite your notes! On lined paper, prepare study guide sheets the following way… Take each slide and first write the heading (underline it) then next to it write the info learned. Try to describe the image (or table) in the slide in your own words. Try to do this on one or two sheets of paper per lecture – front side only – without skipping lines if you can, so that the headings are on the left side and the info next to them on the right side. Do this for each lecture BEFORE the next lecture (by Monday you have two lectures to cover already). Then read it over once to see the whole picture or overall theme of that lecture. Try to look for similarities and differences between the information. When appropriate, make a table of info to help compare concepts.

b) Come up with 1-2 questions of your own from each slide to either quiz yourself later, or anticipate future exam questions. Definitions, functions, comparisons, prok vs euk for all systems, etc.

c) At the end of each week you will have study guide sheets already made for the upcoming exam. Before all Mondays' lectures, read over your study sheets and highlight only the information you could not remember.

d) Rewrite notes again! On a blank sheet of lined paper: write down the info you couldn't remember. This will help reinforce those concepts that were more difficult for you.

e) Before the exam you will have a set of study sheets of all info AND a smaller set of study sheets containing info you needed reinforcing. Use this second set for studying one or two days before the exam. Reread, highlight info that you are having trouble learning or remembering and say it out loud, to yourself or with another person from class, a friend or study group.

f) At the end of each chapter, try the practice questions before looking at the answers in the back of the book. Write down the ones you do not understand and ask the instructor to go over those problems.

g) Try to answer your own questions that you accumulated from each slide. Study with someone in class and try to answer each other's questions.

Results:

a) There will be no need to cram in lots of info right before an exam, so you'll be able to get "good" sleep the night before.

b) You will feel less stressed, overworked or overwhelmed, and more confident when taking the exam.

c) Your grade should reflect the amount of cumulative effort you put into your studying – remember – for every hour of lecture, one needs AT LEAST DOUBLE the amount of studying time. In other words, for each exam you should be spending about 12-16 hr of studying! This really isn't possible to do effectively right before an exam.

Discussion:

a) A good grade results, due to **reading** your notes and the text, **hearing** my lectures, **seeing** the words and images, **writing** and **rewriting** notes from class and the text, **experiencing** by trying to answer questions from the back of each chapter or from a suggested list provided on D2L before each exam, and **discussing** topics with another person (saying it out loud).

b) If you can teach it to another person, then you know it! "**The best way to learn is to teach!**"

Laboratory Reports:

Genetic researchers generally perform multiple experiments on a daily basis. Therefore, it is very important that researchers keep excellent records of their experimental findings in laboratory notebooks. Lab books are a form of documentation of work that was performed and reported in published manuscripts. Your lab reports will be based on a revised version of a manuscript, whereas all detail of the introduction and methods sections will be omitted. However, the discussion and conclusion sections will be greatly emphasized. In order to keep accurate records during each lab investigation, it is critical that you document everything you do in a lab notebook. Although it will not be graded, it will help you to keep organized notes about each lab and collect the data for your reports.

Lab Reports are to be typed, 12 pt font, 1 inch margins all around, with nothing handwritten.

They will be graded based on completeness, proper interpretation of data, correctness of answers to questions in discussion, and ideas on optimizing results (improving protocol).

Use the following format:

Title, Group #, and **Names** of your partners

Purpose: State the reason for doing the experiment (1-2 sentences)

Hypothesis: State your hypothesis that you are testing. Place in purpose section in lab reports.

Methods: In sentence form, ONLY include the general headings of each part of each investigation from your lab manual. You are basically citing your manual. Therefore, there is no need to write the detailed protocols over again. However, include any changes in the methods you may have performed.

Results: Summarize your data. Include labeled gel images, tables, graphs, DNA sequences, DNA fingerprints, genetic trees. Describe procedural problems that may have occurred. Include answering any questions from the results section of each investigation. Do not rewrite the questions.

Discussion: In paragraph form, answer the questions addressed in the discussion section of each investigation. Do not answer all of the questions using one long paragraph. Use separate paragraphs when addressing different topics. If you did not get PCR products, then discuss what could have gone wrong with your experiment and give suggestions on how to improve your technique and/or adjust the protocol, etc.

Conclusion: Interpret your results according to those expected and why unexpected results may have occurred. State how the exercise addressed the purpose stated above. State how your work relates to broader questions in genetics and any conclusions you can draw relating to your stated hypothesis. If you were to continue this project, what would be the next step? What questions need further explanation?

References: Include any that you used besides your lab manual.

MOLECULAR BIOLOGY SCHEDULE

(exam dates are firm, chapter dates are tentative)

Week	Date	Topic	Chapter (Lab)
1	**Jan 23**	Syll /Mol Bio Timeline & Evolution/DNA as Genetic Material	1 & 2
	24	*Syllabus, Prepare 1X TAE buffer, Intro to Gel Electrophoresis Lab, Pour Gel*	*(1)*
	25	Chemical Basis of Information	3
2	**30**	Protein Structure	4
		Gel Electrophoresis: run gel & analyze	*(1)*
	Feb 1	Protein Function / Nucleic Acid Structure	5 & 6
3	**6**	DNA & RNA Structure	6
	7	**LAB REPORT #1 Due** *Isolate Tick & Human DNA*	*(2a)*
	8	Studying Genes: PCR & DNA Fingerprinting	7
4	**13**	**EXAM I**	**[1-6]**
	14	*Quantify Tick DNA, Multiplex-PCR for Borrelia, Anaplasma & Babesia, Pour gel,*	*(2a & 2b)*
	15	Studying Genes: DNA Sequencing & NGS	7
5	**20**	Studying Genes: Cloning, Hybridization & Screening	7
	21	*Run & Extract Bands from Multiplex-PCR gel*	*(2b)*
	22	Studying Genes: Transgenics & CRISPR	7
6	**27**	Microarrays & Genomes	7 & 8
	28	*Purify Positive PCR Products, Cycle-Sequence*	*(2c)*
	Mar 1	Changes in DNA Topology / Chromosome Architecture	9 & 10
7	**6**	DNA Replication	11
	7	*Purify Cycle-sequencing Products, Prepare for Sequencing*	*(2c & 2d)*
	8	DNA Replication / DNA Mutation	11 & 12
8	**13**	**EXAM II**	**[7-11]**
	14	*Edit Pathogen Sequences, Blast Search to Identify Species*	*(2e)*
	15	DNA Mutation	12
SPRING BREAK Mar 20 – 24			

Week	Date	Topic	Chapter (Lab)
9	**27**	DNA Repair / Immunoglobulin Genes	12 & 14
	28	**LAB #2 REPORT Due** *Design Primers to Identify SNPs in Your Genome*	*(3)*
	29	Immunoglobulin Genes / Transposons	14
10	**Apr 3**	Prokaryotic Transcription of RNA	15
	4	**LAB #3 WORKSHEET Due** *Allele-specific PCR of 3 human genes of your choice, pour gel*	*(4)*
	5	Eukaryotic Transcription	15
11	**10**	RNA Processing	16
	11	*Run gel & Identify Your 3 Genotypes, extract Control band*	*(4)*
	12	RNA Processing	16
12	**17**	**EXAM III**	[12, 14-16]
	18	*Purify Positive Control, Cycle-Sequence Forward & Reverse Direction*	*(5)*
	19	RNA Processing	16
13	**24**	The Genetic Code	17
	25	**LAB #4 REPORT Due** *Purify Cycle-sequencing Products, Prepare for Sequencing*	*(5)*
	26	Translation of Protein	18
14	**May 1**	Translation of Protein / Regulation of Gene Expression	18 & 19
	2	*Edit Forward & Reverse Sequences,* *Identify SNP and Allele Types*	*(5)*
	3	Regulation of Gene Expression / Lac Operon	19 / 20
15	**8**	Prokaryotic Gene Regulation: Trp & Ara Operons	20
	9	**LAB #5 REPORT Due** ***Course evaluation***	
	10	Genetic Control of Lambda Phage	20
EXAM IV – Mon, May 15, 12:30 – 2:30 pm [Ch 16-20]			