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BIOB 260.01: Cellular and Molecular Biology

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CELLULAR AND MOLECULAR (BIOB 260) SUMMER 2022

Professor: Dr. Katie Holick

Lectures: M-F 8:00-10:00 am, ISB 110

Email: katie.holick@umt.edu

Office Hours: By appt. Live or Zoom

BIOB 260 introduces the basic building blocks and higher order structures required for cellular processes. Students are expected to take a very active role in their learning by completing readings and homework before and after class and coming to class ready to participate directly with peers and through in-class technology. In this highly structured course, there is evidence that every student can achieve if they are motivated to be an active learner!

OFFICE HOURS: Don't feel intimidated if you've never been to a professor's office hours. You can come alone or with a friend. You can come in to talk about the course, study skills, concerns, your background, your career, advice for future courses to take, etc. Studies have shown that students who make an effort to get to know their professors outside of the classroom setting, such as in office hours or even asking questions after class, are more likely to succeed in college.

REQUIRED MATERIALS:

1. Essential Cell Biology, *Alberts*, 5th Edition

MOODLE: MOODLE will have postings from our lectures such as powerpoint slides, handouts, answer keys and supplemental material that I mention in lecture. I will also post announcements on this site.

It is your responsibility to check Moodle regularly and receive email announcements.

CLASS STRUCTURE: This class will require that you take an active part in the learning process. This may seem that it makes the course more challenging, but it is my goal to make this course more fun and interesting at the same time. In general, your time in class will be spent in a mix of traditional lectures, class discussions, and some activities.

COURSE GOALS:

1. This course should prepare you to succeed in future science courses. You should learn how to be an active learner in the lecture hall and you should learn how to actively study.

Educational research has shown that students who do reading/homework before class, actively participate in class, and review notes regularly can and will succeed. Feeling underprepared because of your background? The course is designed to equalize your readiness before class—while you may take several hours reading and preparing, another student may need less time. Yet when you get to class, your effort will pay off as we practice these concepts together and you gain confidence in your ability! How do you know you are learning? When you make mistakes and identify what you don't know. Making mistakes is KEY to learning. It makes more sense to make mistakes on homework and in-class when the stakes are very low, rather than on an exam, right?

And what if you don't plan to take any more science classes? Active learning and studying are skills needed for any discipline. You can achieve these goals through practice. Most students enter college very skilled at remembering and understanding (regurgitating memorized information.) To the right you can see the "Amended Bloom's Taxonomy" pyramid. It was developed as a method of classifying educational goals for student performance evaluation. I am looking for you to advance over the semester to *applying* and *analyzing*. True learning will take place, when you are challenged to apply, analyze, evaluate, and synthesize. I will challenge you to do this. You might find this difficult and uncomfortable at first, but you will be learning!



2. This course should provide you with the concepts and skills that make up the scientific field of biology. For those of you continuing in biology, this is just the tip of the iceberg. For others, this might be your one and only biology course! Our goal will be to touch upon many topics, finding common themes in the chapters we cover, such as how the theory of evolution applies to chapters not specifically about evolution. Thoroughly learning the principles is about making connections between material learned at the beginning, middle, and end of the semester! Practice is key to building a foundation of knowledge (and that is why you do reading, quizzes, homework, in-class activities, recitation, etc.).

LEARNING OUTCOMES:

- Define and distinguish atoms, molecules, compounds, chemical bonds, mechanisms of chemical bond formation, and name and recognize the components of biological molecules.
- Describe the structure and function of the organelles in a eukaryotic cell.
- Interpret and compare processes of metabolism including cellular respiration and photosynthesis.
- Describe the process of DNA replication, protein synthesis, mutation, and methods used in DNA technology, and predict the outcomes when given a particular nucleotide or amino acid sequence.
- Discuss the events of cell division.
- Critically evaluate current biological problems as they pertain to society and the environment.
- Make conclusions from data and draw graphs and models from data/information given to you.

3. This course should excite you about biology. Throughout the semester I hope you will ask yourself and me, why is this relevant to me? Some lessons will be more obvious as they relate to health and medicine. I hope that the biology that we learn this semester will cause you to ask more questions. You might even leave with more questions than answers! I'll continually encourage you to read about biological issues and advances in the popular media. If I succeed in getting you to read some articles on your own, I will be a happy professor!

Course Policies:**1. NO MAKEUP EXAMS, QUIZZES, OR HOMEWORK WILL BE GIVEN.**

2. Exam and assignment Regrades: You have two weeks following an exam return to request a regrade from Dr. Holick. Any request must be justified with a full written explanation. Please note that as your entire exam is reassessed, this has sometimes resulted in a loss of points when other grading errors were discovered. After the two-week period, no other regrades requests will be accepted.

5. Quizzes & Study Guides: Quizzes and Study Guide assignments can be found online on Moodle. Late quizzes/Study Guides will receive a zero. Study Guides are based on the assigned reading/posted lectures and assume you have done the reading prior to taking the quiz. Study Guides would be preferably done before class and will be due at the end of class (the last 30 mins will be dedicated to this). Quizzes are due by the end of the day on Thursdays. Many assignments will have a review component of previous material too. You may drop your three lowest Study Guides and three lowest quiz scores.

6. Exams: Five exams and one final exam will be given. Semester exams are given on Fridays during class time. Your lowest exam grade will be dropped. The final examination is cumulative and must be completed to receive a final grade. Failure to take the final exam will result in a failing grade. *All students are expected to take all exams when they are scheduled.* Students are expected to notify the instructor prior to missing an exam. Students are responsible for any changes in dates of scheduled exams, quizzes, or assignments or any other administrative announcement made during lectures.

7. Writing assignment - Your assignment is to write an opinion piece on any issue in cell biology you care about. Your piece must be 500-750 words. You must have at least 5 CREDIBLE citations and one must be from a primary literature source. You must take a stance on the issue. However, do not rant, but present a well-reasoned argument. Be sure to acknowledge to other side of the issue. If you think other side is wrong, you can also base you piece on dismantling it using your references. Offer solutions and/or compromises in your piece. Your piece must be for a general audience: persons with very limited biology knowledge. You should use examples and analogies to explain any biology concepts. Look for great examples that will bring your argument to life, including personal stories/connections.

Your performance will be evaluated as follows:	%	#	Points/Item	Total Points
Final Project	10.5%	1	100	100
Quizzes	14.2%	15	10	150
Study assignments	14.2%	15	10	150
Semester Exams	57.1%	4	150	600
Cumulative Final Exam	4.8%	1	50	50
Total	100%			1050

Final letter grades will be assigned as follows:

Points % Grade			Points % Grade		
930-1000	93-100	A	730-769	73-76.9	C
900-929	90-92.9	A-	700-729	70-72.9	C
870-899	87-89.9	B+	670-699	67-69.9	D+
830-869	83-86.9	B	630-669	63-66.9	D
800-829	80-82.9	B-	600-629	60-62.9	D
770-799	77-79.9	C+	<600	<60	F

Disability Modifications: The University of Montana assures equal access to instruction through collaboration between students with disabilities, instructors, and the Office of Disability Equity (ODE, formerly Disability Services for Students). If you think you may have a disability adversely affecting your academic performance, and you have not already registered with ODE, please contact ODE in Lommasson Center 154 or call (406) 243-2243. I will work with you and ODE to provide an appropriate modification.

Lecture Schedule

This is a tentative schedule. I reserve the right to make changes that I think are in the best interest of all students.

Week	Topics/Chapter	Objectives	Date	Lecture	Due
1	Chapter 1- Cells: The Fundamental Units of Life Chapter 2- Chemical Components of Cells	Describe the structure of the cell and organelles. Distinguish among elements, atoms, compounds and the different types of chemical bonds.	Monday Tuesday	1 2	SG1 SG2
	Chapter 3- Energy, Catalysis and Biosynthesis	Describe how the metabolic reactions in the cell transforms energy, produces ATP, and drives cell function. Recall chemical reactions and free energy.	Wednesday Thursday	3 4	SG3 SG4 Q1, Q2 Q3, Q4
	Exam 1 (Chapters 1-3)		Friday		Exam 1
2	Chapter 4- Protein Structure and Function	Explain how enzymes function. Describe protein structure, and how this influences function. Describe how proteins are regulated.	Monday Tuesday	5 6	SG5 SG6
	Chapter 5- DNA and Chromosomes Chapter 6- DNA Replication, Repair and Recombination	Describe the structure of DNA Compare DNA packaging in pro- and eukaryotes Outline the process of DNA replication Describe the different types of DNA repair	Wednesday Thursday	7 8	SG7 SG8 Q5, Q6, Q7, Q8
	Exam 2 (Chapters 4-6)		Friday		Exam 2
3	Chapter 7- From DNA to Protein: How Cells Read the Genome	Outline the steps of transcription & translation Compare transcription & translation in eukaryotes and prokaryotes Discuss RNA processing Compare DNA and RNA structure Discuss the "RNA world hypothesis"	Monday Tuesday	9 10	SG9 SG10

3	Chapter 11- Membrane Structure	Describe the structure and composition of the lipid membrane Discuss structure of membrane proteins Explain membrane potentials	Wednesday Thursday	11 12	SG11 SG12 Q9, Q10, Q11, Q12
		Exam 3 (Chapters 7, 11)	Friday		Exam 3
4	Chapter 12-Transport Across Cell Membranes	Compare passive and active membrane transport Describe the function of ion channels Describe an action potential	Monday	13	SG13
	Chapter 13- How Cells Obtain Energy from Food Chapter 14- Energy Generation from Mitochondria and Chloroplasts	Detail the steps and outcomes glycolysis Detail the steps and outcomes of the citric acid cycle Describe oxidative phosphorylation and the generation of ATP in mitochondria the electron transport chain. Detail the photosynthetic process, including the function of the photosystems.	Tuesday Wednesday Thursday	14 15 16	SG14 SG15 SG16
		Exam 4 (Chapters 12, 13-14)	Friday		Exam 4
5	Chapter 6- Cell Signaling Chpt. 17- Cytoskeleton Chpt. 8- The Cell Division Cycle Chpt. 19- Sexual Reproduction and the Power of Genetics	Describe the different mechanisms of cell signaling pathways. Describe the three types of cytoskeletal protein filaments. Describe the cell cycle. Compare and contrast mitosis & meiosis.	Monday Tuesday Wednesday	15 16 17	SG15 SG16 SG17
	Chapter 20- Cell Communities: Tissues Stem Cells and Cancer	Describe the properties and functions of stem cells.	Thursday	18	SG18, Q15, Q16, Q17, Q18
		FINAL EXAM (Cumulative)	Friday		Exam

You've read to the end of the syllabus!!