

## BS161 Section 1 - Introduction to Biology: Cells and Molecules - Fall 2019

### Class Meetings

Tuesdays and Thursdays from 4:10 – 5:30 PM in B119 Wells Hall

### Instructors

Dr. Jon Stoltzfus

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Phone: (517) 432-3618

Office: N204 North Kedzie

Office Hours: M 11:00 AM - Noon

Help Room (N202 N. Kedzie) Hours: F 1:30 – 2:30 PM

Additional office hours by appointment.

Dr. Honggao Yan

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Phone: (517) 353-5282

Office: 313A Biochemistry

Help Room (N202 N. Kedzie) Hours: Tu 5:40-6:30 PM  
and Th 5:40-6:30 PM

Additional office hours by appointment.

### Graduate Teaching Assistant (GTA) and Undergraduate Learning Assistants (ULAs)

#### GTA

Caitlin Mack ([mackcai1@msu.edu](mailto:mackcai1@msu.edu)) and Challis Karasek ([karasekc@msu.edu](mailto:karasekc@msu.edu))

#### ULAs

Sam Braxton ([braxton6@msu.edu](mailto:braxton6@msu.edu)), Paul Clancy ([clancyp1@msu.edu](mailto:clancyp1@msu.edu)), Lilia Rose ([roselili@msu.edu](mailto:roselili@msu.edu))

### Course Description

The goal of the course is to help you develop a basic mental model of how bacterial, plant, and animal cells work at the molecular level. You will develop this model using scientific evidence and basic scientific principles. The mental model you develop will assist you in your future career path and in self-directed study of relevant issues you encounter in daily life. This course is the first semester of a two-semester introductory biology series for life-science majors.

### Course Objectives

As successful students in this course, you will be able to do the following:

1. Develop mechanistic explanations of how biological phenomena or processes work, make predictions based on mechanistic explanations, analyze and interpret qualitative and quantitative data including graphical representations of data, and explain how data supports or refutes an explanation.
2. Describe the molecular structures of the four basic types of biomolecules, compare and contrast the structures and functions of these biomolecules, explain how molecular structure determines molecular interactions and relates to the cellular functions of these biomolecules, and make predictions about the cellular functions of biomolecules based on their chemical properties.
3. Describe the characteristics of basic cellular structures in bacterial, plant, and animal cells, explain how these characteristics relate to cellular functions, and predict how changes in cell structures impact cellular functions.
4. Describe basic metabolic reactions and pathways, explain the purposes of these pathways and how they are regulated, trace matter and energy through these pathways using a systems approach, predict how changes in these reactions or pathways impact their function, and explain how these reactions and pathways support life within the confines of thermodynamic principles including examples of cellular functions that require energy.
5. Explain how DNA is accurately replicated during the cell cycle and sorted during mitosis, how these processes are controlled, and predict how changes in the components of the cell will impact these processes.
6. Explain how genetic information is expressed to impact cell function, how cells regulate gene expression, and predict how changes in DNA, RNA and proteins will impact the expression of genetic information.
7. Explain similarities and differences in nucleic acid and protein structures and how changes in these structures over time relate to evolution.

## Inclusion in BS161

It is our intention that this class is a safe and productive learning environment for every person. However, we recognize that inclusion is a complex issue and we still have much to learn about and from your diverse backgrounds and perspectives. If actions of the instructional team or other students make you feel uncomfortable, please let us know and we will do our best to correct the situation. If you do not feel comfortable discussing this directly, you can reach us through your academic advisor, another student, GTAs and ULAs, or another avenue that is more comfortable.

## Grades

Your grade in BS161 will be determined by the grading scale and assessments shown on the right. This grading scale shows the percentage you must receive to guarantee a grade. The grades in the course will be adjusted if necessary based on the final distribution of scores. This adjustment may raise your grade from this scale, but it will not lower your grade.

<b>Grade</b>	<b>%</b>
4.0	>89%
3.5	>82%
3.0	>74%
2.5	>68%
2.0	>61%
1.5	>55%
1.0	>49%
0.0	≤49%

<b>Assessment Type</b>	<b>%</b>
Exam I	15%
Exam II	15%
Exam III	20%
Final Exam	30%
Clicker Points	4%
Foundation Models	4%
Classroom Activities	4%
Pre-Class Activities	4%
Homework	4%

## Required Course Materials – ALL COURSE MATERIALS REQUIRED ON FIRST DAY OF CLASS

### 1. Textbook and Launchpad Homework System

- *How Life Works* 3<sup>rd</sup> Edition by James Morris (either e-book or hard copy)
- Online access to Launchpad for *How Life Works 3e*
- See the "General Course Information" module in D2L for details

### 2. i>clicker2

This section of BS161 requires an i>clicker2. The original i>clicker or an i>clicker+ will not work. You will need this every day of class including the first day. See "General Course Information" in D2L for details on clicker types and registration.

### 3. D2L and Email

We will make announcements either in class **or** by D2L e-mail. Course materials including study aids and grades will be posted on D2L. Questions regarding grades, course mechanics, or of a personal nature should be sent by e-mail directly to Dr. Stoltzfus ([stoltzfu@msu.edu](mailto:stoltzfu@msu.edu)). Questions concerning i>clicker2 registration or Launchpad registration should be sent directly to Caitlin Mack ([mackcai1@msu.edu](mailto:mackcai1@msu.edu)).

## Assessments

### 1. Examinations (80%)

- **You must present a picture ID to hand in your completed exam.**
- Exams will have a mixture of multiple choice and free response questions.
- Each topic in this course builds on previous topics so each exam in the course is cumulative.
- Exams are individual efforts and you should neither give nor receive help during exams.
- **We will not answer questions during the exams:** If you feel a question is ambiguous or has an error, space will be provided on the front of the exam for you to "challenge" the question and explain your answer to and interpretation of the question. Even if you submit a challenge, you must enter your best answer at the appropriate place on the answer sheet.

## 2. Clicker Points (4%)

- Each class meeting except exam days will include clicker questions designed to promote classroom discussion, active learning, and provide instant feedback on your understanding of course concepts.
- If you send in answer to 75% of the questions asked during a class you will earn full credit for that class.
- The number of active learning questions will vary between lectures, but each lecture will have the same weight in calculating your overall active learning score.
- Three days of clicker questions will be dropped from your score allowing you to miss three days of class without penalty.
- **Bringing a friend's clicker to class when they cannot attend or giving your clicker to a classmate on days you cannot attend is academic dishonesty.**

## 4. Foundation Models (4%)

- We will complete six foundation models during the semester. Foundation model requirements, due dates, and submission details are located in the "Foundation Model" module in D2L. Submission of initial foundation models is worth 3% of your final grade.
- The foundation models are learning tools designed to help you build a mechanistic understanding of core concepts you will need to use both in this course and other courses here at MSU.
- Any initial foundation model not submitted properly by the due date and not showing honest effort to follow the modeling instructions will earn a zero with the first zero dropped during the final grade calculation.
- Creating a collection of revised versions of all six foundation models to your D2L portfolio is worth 1% of your final grade. You must have all six revised models, properly named, and added to the Chromosome Connections collection in your D2L ePortfolio by 10:00 AM on December 10 to earn this 1%.
- See the Foundation Model module in D2L for complete details.

## 4. Classroom Activities (4%)

- We will complete five classroom activities during class. The pre-class activity before classroom activity days will prepare you for the classroom activity.
- During classroom activities, you will work in groups and practice thinking like a scientist; developing mechanistic explanations for processes found in your cell models and making predictions about those processes.
- You will receive some feedback on your classroom activities, but they will not be graded for overall strength and accuracy. You will earn full credit if you make an honest effort to incorporate appropriate ideas in the activity. You are encouraged to work with classmates, visit office hours and the help room, and review the examples posted in D2L to ensure you have created a strong and accurate model.
- You must attend class, participate during the classroom activity, and your team must upload an image of the model to the appropriate dropbox in D2L to earn points. Your lowest classroom activity score will be dropped.

## 3. Launchpad (8%)

- **Pre-class assignments (4%)** are due at 10:00 AM before each class except days with exams.
- Pre-class assignment grades are based on completion.
- **Homework (4%)** assignments are due each Tuesday morning at 10:00 AM. Active discussions with classmates to understand the concepts behind the homework problems are encouraged. However, simply sharing answers with no attempt to understand the material is counterproductive and in egregious cases will be treated as academic dishonesty.
- Homework scores are based on correctness, but you have three attempts to complete the homework correctly and you receive feedback after each attempt.
- Your three lowest pre-class assignment scores and your three lowest homework scores will be dropped.

## BS161 Help Room

The help room provides you with resources including group tutoring, worksheets based on previous exam questions, a place to study with immediate answers to questions you develop, and help with homework and models. For complete details visit [tinyurl.com/bs161help](https://tinyurl.com/bs161help).

## Weekly Reviews

Each week Caitlin Mack will hold review sessions that include a presentation on key course topics and a chance to get questions regarding course content answered. For complete details visit [tinyurl.com/bs161help](https://tinyurl.com/bs161help).

## Attendance and Absences

Missing class or not having your i>clicker2 for any reason counts as an absence. This includes religious commitments, other MSU activities, and illness. To simplify absences in this large class, we will drop your three lowest clicker scores, and one lowest classroom activity score. There is no need to contact the instructional team regarding absences unless severe illness or extenuating circumstances prevent you from attending class for two or more weeks. Unless an extended absence has been approved in advance, additional absences will count as a 0 for that day of active learning, or modeling activity and will become part of your final score. If you unexpectedly miss an exam due to extenuating circumstances, you *must* contact Dr. Stoltzfus **within 24 hours** of the exam. To be considered for a make-up exam, it is your responsibility to provide adequate documentation of the extenuating circumstance. You may or may not be eligible for a makeup exam at the discretion of the instructional team. Make-up exams are administered at the instructor's convenience, typically **within 72 hours of the original exam. Make-up exams typically consist entirely of essay and short answer questions.**

## Academic Integrity/Cheating Policy

According to the MSU policy on the integrity of scholarship and grades, "The principles of truth and honesty are fundamental to the educational process and the academic integrity of the University". Every student should be familiar with this policy (<https://www.msu.edu/unit/ombud/academic-integrity/index.html>). All students have a right to expect fair and honest evaluation of their work. Cheating undermines this expectation and will not be tolerated. You are expected to work with classmates on active learning clicker questions and during modeling activities. However, bringing a friend's clicker to class when they cannot attend or giving your clicker to a classmate on days you cannot attend is cheating. Sharing answers during exams is cheating. Any student found by the instructors to be cheating will receive a failing grade for the exam or other graded work and be reported to the Dean. The instructors may, at their discretion, decide to give a failing grade for the course in severe, repeat, or egregious cases of academic dishonesty. **Please hold yourself, and your classmates, to the highest ethical standards in this regard!**

## Accommodations for Persons with Disabilities

Michigan State University is committed to providing equal opportunity for participation in all programs, services and activities. Requests for accommodations by persons with disabilities may be made by contacting the Resource Center for Persons with Disabilities at 517-884-RCPD or on the web at [www.rcpd.msu.edu](http://www.rcpd.msu.edu). Once your eligibility for an accommodation has been determined, you will be issued a verified individual services accommodation ("VISA") form. Please present this form to Dr. Stoltzfus at the start of the term or two weeks prior to the first accommodation date. Requests received after this date may not be honored.

## Lecture Schedule

lecture	date	day	topic	instru	LO	reading	PCA	HW	FM
1	29-Aug	Th	Intro: science practices and cell model.	JRS		Ch 1.1-1.3	PCA1		FM1
2	3-Sep	T	Bonds/interactions/forces and functional groups	HY	LO1	Ch 2.1-2.4	PCA 2	HW1	
3	5-Sep	Th	Introduction to Macromolecules	HY	LO1	Ch 2.5-2.6	PCA 3		
4	10-Sep	T	Protein Structure and Function	HY	LO2	Ch 4.1	PCA 4	HW2 & HW3	
5	12-Sep	Th	<i>Classroom Activity: Model of protein structure</i>				PCA 5		
6	17-Sep	T	Transcription and RNA Processing	HY	LO3	Ch 3	PCA 6	HW4 & HW5	FM2
7	19-Sep	Th	Translation	HY	LO3	Ch 4.2-4.3	PCA 7		
	24-Sep	T	<b>Exam I - 15%</b>					HW6 & HW7	FM2r
8	26-Sep	Th	Membranes and Transport	HY	LO4	Ch 5.1-5.2	PCA 8		
9	1-Oct	T	Compartmentation and Protein Targeting	HY	LO4	Ch 5.3-5.5	PCA 9	HW 8	
10	3-Oct	Th	Intro to Metabolism	HY	LO5	Ch 6	PCA 10		FM3
11	8-Oct	T	Cellular respiration I	HY	LO6	Ch 7.1-7.3	PCA 11	HW9 & HW10	
12	10-Oct	Th	Cellular respiration II	HY	LO6	Ch 7.4-7.7	PCA 12		
13	15-Oct	T	Photosynthesis	HY	LO7	Ch 8.1-8.3	PCA 13	HW11 & HW12	FM3r
14	17-Oct	Th	<i>Classroom Activity: Model of matter and energy transformation</i>				PCA 14		
	22-Oct	T	<b>Exam II 15%</b>					HW13 & HW14	
15	24-Oct	Th	Cell signaling I	JRS	LO8	Ch 9.1-9.3	PCA 15		
16	29-Oct	T	Cell signaling II	JRS	LO8	Ch 9.3-9.5	PCA 16	HW15	
17	31-Oct	Th	Cell Division Cell cycle control	JRS	LO9	Ch 11.1, .2, .4, .5	PCA 17		FM4
18	5-Nov	T	<i>Classroom Activity: Model of cell signaling and cancer</i>				PCA 18	HW16 & HW17	FM4r
19	7-Nov	Th	Gene expression I	JRS	LO10	Ch 18.1-18.2	PCA 19		FM5
20	12-Nov	T	Gene expression II	JRS	LO10	Ch 18.3	PCA 20	HW18 & HW19	FM5r
21	14-Nov	Th	<i>Classroom Activity: Model of differential gene expression</i>				PCA 21		
	19-Nov	T	<b>Exam III - 20%</b>					HW20 & HW21	
22	21-Nov	Th	DNA Replication	JRS	LO11	Ch 12	PCA 22		
23	26-Nov	T	Mutations and DNA repair	JRS	LO11	Ch 14	PCA 23	HW22	FM6
	28-Nov	Th	<b>Thanksgiving break</b>						
24	3-Dec	T	Molecular basis of evolution	JRS	LO12	Ch 20.1, .4, .6	PCA 24	HW23	
25	5-Dec	Th	<i>Classroom Activity: Model of molecular basis of evolution</i>				PCA 25		FM6r
	10-Dec	T	<b>Final Exam - 30% 5:45 to 7:45 Room To Be Determined</b>					HW24 & HW25	FM1r

LO = Learning Objectives; PCA = Pre-Class Activity; HW = Homework; FM = Foundation Model