

Biology 480 – Cell Physiology (aka Cell Biology)

Spring 2011

Mon., Wed., Fri. 11:15 am-12:10 pm
IPJ 218

Instructor: Dr. Natalie Prigozhina
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Office hours:

MWF 10-11am in ST476 and after W lectures in IPJ218

Other times can be set up by appointment – just let me know! I'm flexible.

I will provide virtual office hours through WebCT on evenings before the tests and/or by appointment.

I'm always available by e-mail and will respond ASAP, usually within a couple of hours.

Expected Learning Objectives:

- * Understand basic mechanics of the cell, as well as structure and function of all major organelles
- * Become familiar with the common cell biology techniques
- * Relate general knowledge about cells to everyday life (e.g. cancer, stem cell technologies, etc.)
- * Learn to read scientific papers and identify major points of a research article
- * Learn to work in groups and become comfortable making presentations in class

Materials:

- 1) Required text: *Essential Cell Biology, 3rd Edition*, by Alberts *et al.* Garland Science.
- 2) a pack of 3x4 cards
- 3) WebCT: go to <http://pope.sandiego.edu> and sign in. You are expected to log in often (at least 2-3 times a week); otherwise you might miss important deadlines, announcements and discussions. The chatroom and discussion forums will be set up for the whole class and for your group (once the groups are formed). Updated lecture plan can be found there as well. Throughout semester I'll be posting links to helpful websites, videos and other relevant materials, including Current Topic papers.

*****To make sure you don't miss any e-mails sent through WebCT, please set up e-mail forwarding!*****

The structure of the class: Lectures + student presentations and other activities

Grading: Your final grade will be based on the total points achieved on the four exams and the assignments. Grading will be straight scale.

Total points for the exams and assignments:

Midterm I	60 points
Midterm II	100 points
Midterm III	100 points
Final Exam	100 points
Comments/questions	70 points
Cancer module	10 points
Reading/ writing	30 points
Group work/talks	55 points
Total	525 points

A	93
A-	90
B+	87
B	83
B-	80
C+	77
C	73
C-	70
D	60

Exams:

All exams will be composed predominately of short-answer and essay questions with some multiple choice questions. The final exam will be comprehensive with approximately 50% of the exam covering material presented since the third midterm.

The only valid excuses for missing an exam are severe illness or family emergency. You must notify me prior to the scheduled exam in order to be considered for a make-up oral exam.

Team work: I generally give the same grade to all group members for their collective work. However, occasionally, I might have to assign individual grades in cases when one or two people clearly do most of the work, or when one or two people clearly contribute less than their group mates.

Please talk to me if you have any concerns regarding your group dynamics!!!

To facilitate your group work, appoint

- "manager" to coordinate the exercise and suggest ways to approach each question
- "recorder" to write the answers
- "encourager" to give positive feedback to participants

Rotate these positions at least once a week or for every new project.

Penalties: Written assignments will be accepted **only in printed form** and **only in class**. I will take 10% off for every late day.

That means if a 10 point assignment is due Fri and you don't bring it to class, you'll only be able to turn it in the following Monday, 3 days later, and it will be graded out of 7 points. Sorry, I will not accept assignments sent by e-mail.

Comments/questions (2 points each, 2x35=70 total):

At the end of each lecture (except the first one) submit one signed 3x4 card with the following:

Side 1: Write down what was the main point of the lecture (in your opinion) and what topic you understood best. Give a 2-3 sentence summary. This is not a quiz, and I am not grading the accuracy of your summary. I will take points off for too short summaries (e.g. do not write "the lecture was about microtubules"). Write "The lecture was about microtubule structure, and explained the function of centrosome as the primary MTOC. I understood that MTs are made of dimers and are polar structures."

Side 2: Write down what was not clear and/or you would like more discussion about.

Group work, reading assignments and presentations: Your writing assignments must be typed and turned in in class on the due dates. *I will not accept any assignments by e-mail => please plan your work to make sure that you have enough time to resolve all computer issues and find a working printer!*

For all group presentations you are required to submit a brief, typed **division of labor report**. This is due in class on the day of presentation and must include how many times you've met, who was present, and who did what parts of the project. If you've used WebCT communication tools, mention that as well. The report should not be more than a page long and must be signed by all group members. Without this report, 2 points will be immediately subtracted from your presentation grade.

- 1) Developing your group's policy (5 points). Get together with your group mates and think about the following questions:

How shall we schedule meetings?

Are we going to use WebCT in addition to face-to-face meetings?

How can we make sure that meetings are efficient?

What shall we expect of each other at the meeting in terms of preparation and behavior?

How can we ensure that everyone feels comfortable participating?

How do we handle disagreements?

What do we do if there is uneven load distribution?

What if there is a conflict?

What if someone is not doing his/her share?

What if someone is too bossy?

What grading system for group work would be the most fair?

Bring the printed summary of your rules to class on Jan. 26th

- 2) Methods Presentations I – II. Below is the list of methods from which you can choose two (1 from each group) that seem most interesting to your team. You may also choose a method not on the list but I will have to approve it first. Send me an e-mail with your team name and your selected methods (also include your second best choices from each group) **no later than 2pm 01/26** (you can also let me know in class). When assigning the methods to each group, I will try to accommodate your choices as much as possible, and I will also consider the order in which they were received. I will e-mail you the complete schedule of presentations in the afternoon of 01/26.

You will have approximately 7 minutes for your presentation. **Please explain how the method works and what it can be used for, and describe a "case" (a specific example of the method being applied to solve something interesting)**. At the end of your PowerPoint list all your references and individual contributions of each group member. Be prepared to answer questions. Keep in mind that you are essentially teaching your classmates; the first midterm will be based on the methods that you present. Each presentation will be worth **10 points (2x10=20)**.

Group I:

- 1) Restriction enzymes and genetic engineering
- 2) Southern and Northern blots
- 3) DNA transfection in animal cells - present at least 2 methods
- 4) PCR
- 5) DNA and protein microinjection into live cells
- 6) SDS-PAGE gel and Western blot

Group II

- 1) FACS sorting
- 2) Electron microscopy
- 3) Using fluorescent proteins (FP) to study protein function
- 4) Creating dominant-negative mutants to study gene function
- 5) Photobleaching and recovery after photobleaching – *suggested review on WebCT*
- 6) In vivo imaging (whole animal microscopy) - *suggested paper and movies on WebCT*

- 3) Scientific papers I-III – individual summaries and group presentations

You will need to present 3 original research papers throughout the semester (**see the Plan below for deadlines**). Each presentation should be related to the material studied in that section of the class (e.g. Paper I will be about membrane trafficking, etc.). I will provide a list of suggested papers on Classwire. You may also choose your own; just make sure to get my approval **at least 1 day before the general deadline**. I suggest you get together with your team members and look through the list of papers together. Select 3-4 papers that intrigue you and decide who is doing which (it's Ok if 2 people choose the same paper, but within your group you must do at least n+2 different papers, where n is the number of people).

Each person then writes a 1-2 page **summary** presenting the main points of the paper – the hypotheses to be tested or the questions answered, what methods were used, what experiments were done, what the results suggested, and what were the conclusions. Was there any controversy or unanswered questions? Did you think the paper was logical and the conclusions followed from the experiments? This will be your individual work; **DO NOT** collaborate with any of your teammates at this point. You need to summarize the article using your own words. Do not simply paraphrase the article paragraph by paragraph or use quotations from the article! Do not plagiarize (**please read the last page of this syllabus!**). Your summaries must be typed and turned in in class on the due dates. Each summary will be worth **10 points (x3=30)**.

After you turn in your summaries, you will get together with your teammates again and select one paper that you want to present to the class. You should all contribute to preparing the PowerPoint **presentation**, and the last slide should include the list of who did what. Please look for additional information on the subject to make sure you understand the background and most of the methods. See below for tips on presenting a scientific paper. Each presentation will be worth **10 points (3x10=30)**.

Bonus points

You can always post questions on the WebCT forum, and your classmates will have an opportunity to answer them (I'll monitor the accuracy of information). For every question asked prior to Midterm I you will get 0.5 points. Every correct, complete and understandable answer will bring you 1-2 bonus points throughout the semester. Incomplete answers or add-ons would be worth 0.5 points. Inaccurate answers will be corrected and/or deleted, and won't bring points. I might also occasionally award bonus points for particularly great comments/questions or exceptional participation in class.

Current Plan

Lecture #	What you do	Date	Topic
1		24-Jan	Intro/ Cell theory/Properties of cells
2	Group policies due in class Choices for Method Presentations I - II due by 2pm	26-Jan	Basic Cellular Organization (Organelles review). Cell culture (intro)
3		28-Jan	How we study cells (isolation, culture).
4	Team presentations	31-Jan	How we study cells (Group I techniques)
5	Last day to drop a class without a 'W'	2-Feb	Review methods I / Intro to microscopes
6		4- Feb	How we study cells (fluorescence microscopy)
7	Team presentations	7- Feb	How we study cells (Group II techniques)
		9- Feb	Review session
		11- Feb	Midterm I (Studying cells)
8		14- Feb	Intracellular compartments and Protein sorting. Nucleus, mito and peroxisome entrance
9		16- Feb	Anterograde secretion pathway (ER entrance)
10		18- Feb	Principles of vesicular transport, ER-to-GA transport
11	Individual Paper I summaries are due	21- Feb	Vesicles (cont.); transport through the Golgi
12	e-mail me your group's choice (and one follow up) for Paper I presentation by 6pm tonight	23- Feb	Transport through the GA (cont). Cells eating and drinking (overview)
13		25- Feb	Receptor-mediated endocytosis; recycling
14	Team presentations	28- Feb	Scientific paper presentation I
15	Team presentations	2-Mar	Scientific paper presentation I Review
		4- Mar	Midterm II (Intracellular trafficking)
16		7- Mar	Self-assembly and dynamic nature of Cytoskeleton – intro Intermediate filaments
17		9- Mar	Microtubules (MTs) intro
18		11- Mar	MT dynamic instability
		14-18 Mar	Spring break
19		21- Mar	MT functions Actin Microfilaments (MFs)
20	last day to switch to pass/fail	23- Mar	IF dynamics Role of cytoskeleton and FAs in cell motility
21	Individual Paper II summaries are due	25- Mar	Cell motility (cont.)
22	e-mail me your group's choice (and one follow up) for Paper II presentation by 6pm tonight	28- Mar	Role of intracellular trafficking in cell motility
23	Team presentations	30- Mar	Scientific paper presentation II
24	Team presentations Last day to withdraw with a "W"	1-Apr	Scientific paper presentation II Review session (concept map creation)
		4- Apr	Midterm III (Cytoskeleton and cell motility)
25		6- Apr	Cell-cell communication and Signal transduction
26		8- Apr	Signal transduction: Chemical Messengers & Their Receptors
27		11- Apr	Signal transduction (cont.) GPCR.
28		13- Apr	Cell cycle
29		15- Apr	Mitosis (cont.) Mechanisms of cancerogenesis
30		18- Apr	Mechanisms of cancerogenesis (cont.)
31	Individual Paper III summaries are due	20- Apr	Diagnosis and treatment of cancer (Guest lecture by Dr. Anna Mhoyan)
		22- 25 Apr	Easter break
	Cancer module must be completed	25-Apr	http://www.unc.edu/cell/cancer/index.html
32		27- Apr	Stem cells and early embryonic development.
33	e-mail me your group's choice (and one follow up) for Paper III presentation by 6pm tonight	29- Apr	Human Embryonic Stem cells discussion. Ethical issues.
34		2-May	Human Embryonic Stem cells discussion cont
35	Team presentations	4- May	Scientific paper presentation III
36	Team presentations	6- May	Scientific paper presentation III
		9- May	review
		13- May	Final exam 11:00 AM - 1:00 PM

Bloom's levels and WHAT YOU CAN DO to organize your learning:

	Knowledge	Comprehension	Application	Analysis	Synthesis	Evaluation
Keywords or Concepts	Define, list, fact, recognize, label	Knowing relationships (conceptual understanding), demonstrates understanding of terms	Use several pieces of information in a new situation	Infer from given information	Use/combine disparate sources of information to create something new	Distinguish relationships among pieces of information and assign a relative value

Kitty Cooks Apples and Anchovies Saturday Evenings

Bloom's level	Individual Activities	Group Activities
Knowledge (LOCS)	<ul style="list-style-type: none"> practice labeling diagrams list characteristics identify biological objects or components from flash cards quiz yourself with flash cards take a self-made quiz on vocabulary draw, classify, select, or match items write out the textbook definitions 	<ul style="list-style-type: none"> check a drawing that another student labeled create lists of concepts and processes that your peers can match place flash cards in a bag and take turns selecting one for which you must define a term Do the above activities and have peers check your answers
Comprehension (LOCS)	<ul style="list-style-type: none"> describe a biological process in your own words without copying it from a book or another source provide examples of a process write a sentence using the word give examples of a process 	<ul style="list-style-type: none"> discuss content with peers take turns quizzing each other about definitions and your peers will check your answer
Application (LOCS/HOCS)	<ul style="list-style-type: none"> review each process you have learned and then they ask yourself: what would happen if you increase or decrease a component in the system or what would happen if you alter the activity of a component in the system if possible, graph a biological process and create scenarios that change the shape or slope of the graph 	<ul style="list-style-type: none"> practice writing out answers to old exam questions on the board and have your peers check to make sure you don't have too much or too little information in your answer. take turns teaching your peers a biological process while the group critiques the content
Analysis (HOCS)	<ul style="list-style-type: none"> analyze and interpret data in primary literature or a textbook without reading the author's interpretation and then compare the authors' interpretation to your own analyze a situation and then identify the assumptions and principles of the argument compare and contrast two ideas or concepts create a map of the main concepts by defining the relationships of the concepts using one- or two-way arrows 	<ul style="list-style-type: none"> work together to analyze and interpret data in primary literature or a textbook without reading the author's interpretation defend your analysis to your peers work together to identify all of the concepts in a paper or textbook chapter, create individual maps linking the concepts together with arrows and words that relate the concepts, and then grade each other's concept maps
Synthesis (HOCS)	<ul style="list-style-type: none"> generate a hypothesis or design an experiment based on information you are studying create a model based on a given data set create summary sheets that show how facts and concepts relate to each other create questions at each level of Bloom's Taxonomy as a practice test and then take the test. 	<ul style="list-style-type: none"> each student puts forward a hypothesis about biological process and designs an experiment to test it. Peers critique the hypotheses and experiments.
Evaluation (HOCS)	<ul style="list-style-type: none"> Provide a written assessment of the strengths and weaknesses of your peers' work or understanding of a given concept based on previously determined criteria 	<ul style="list-style-type: none"> Provide a verbal assessment of the strengths and weaknesses of your peers' work or understanding of a given concept based on previously described criteria and have your peers critique your assessment.

How to present a scientific paper

1. Title, authors and affiliations of the authors. Journal, volume, pages. 1 slide
2. What's the question or hypothesis? What is its important? Present the problem, give sufficient background for the class to understand why this research was done in the first place. 1-2 slides
3. What did the authors do? Briefly mention methods and model system. 1 slide
4. What did the authors see? Present figures and explain what they mean. How did the authors interpret their results? Do you agree? Is there any other possible interpretation? Any remaining uncertainty? 1 slide per figure (Present only the most important figures. It's Ok to say "the authors then showed ABC by using XYZ methods").
5. What are the main conclusions of the paper? Do you agree? 1 slide
6. What are the future directions? If you were one of the authors, what would you do next? 1 slide
7. Conclude by explaining why you though the paper was interesting. What did you like about it? Why have you selected it? 0-1 slide
8. List all external references that you used to research material for this presentation as well as who contributed what to the presentation. 1 slide

General Considerations for Presentations

1. First of all, consider why you are presenting something orally, instead of just handing everyone a piece of paper. That will tell you a lot about what you should be doing up there.
2. By presenting orally, you can engage the listeners in different ways, and often better ways, than you can in writing:
 - You can use your voice and gestures to emphasize points
 - You can look at your audience and judge their reaction, and shift what you're doing accordingly: are they bored? confused? Engaged?
3. Think of the presentation as more of a conversation than a speech.
 - If it's going to just be a speech, give a piece of paper to them and let them read it.
 - If you're just going to read what you've written, without ever even looking up, then give them that piece of paper and let them read it.
 - That means that you may have notes, but NOT the whole thing written out.
 - If that makes you too nervous, write it all out, triple spaced in 14 point type, and then highlight the key points with a marker. You will find that you really only need to glance at it from time to time to make your points.
4. Let your presentation have 3 main parts:
 - an introduction (present the overall question/problem, give some background info, let the listeners know why your topic is interesting)
 - main part (results, data, information)
 - conclusion (strengths and weaknesses of the presented data, conclusions from presented data, summary of the main points, your opinion on the subject).
5. Make a real end to your presentation. One that is shown in your voice. Don't end with "So that's just about it, I guess."

Academic Integrity and Plagiarism

Copying of ANY material (e.g. your group members reports, scientific papers or Internet information) will not be tolerated!!! If I detect plagiarism, you'll get a zero for that assignment and, possibly, more serious trouble.

When completing your writing assignments, you must use your own words and ideas. Make sure you list all the reference materials you've used at the end of your paper. Using someone else's words or ideas is plagiarism and is a violation of the USD academic integrity policy. Plagiarism will not be tolerated! Any summary that contains plagiarized material (e.g., text taken directly from the original article, the textbook, or any other source) **WILL RECEIVE A ZERO AND POSSIBLY MORE SERIOUS CONSEQUENCES AS WELL!** This includes a zero for all outside reading assignments, a zero on all reading assignments (in-class and outside readings), and being reported to the Associate Dean for violation of the USD academic integrity policy.

One form of plagiarism that many people do not realize they are committing is re-paraphrasing a passage but doing so in a manner that is very similar to the original text and then passing it off as one's own work. Even if a reference is cited, this still is plagiarism. An example of this is shown below. The original text is from an article on cholesterol (J. Travis. 2001. Cholesterol enables nerve cells to connect. *Science* 160:309.); an example of a plagiarized passage follows.

Original text:

"While cholesterol has a bad reputation for clogging arteries and causing heart disease, this fatty molecule is an essential part of all cell membranes. Scientists have now found to their surprise that cholesterol may also regulate when and where nerve cells in the brain form the vital junctions known as synapses. Equally unforeseen, say investigators, is their finding that non-nerve cells called glia seem to provide the cholesterol that controls synapse building."

Plagiarized passage:

Cholesterol has a bad reputation for causing heart disease and clogging arteries. However, it is an important part of all cell membranes, too. Scientists have found that cholesterol may also control when and where neurons in the brain form synapses. They also found that non-nerve cells called glia appear to provide the cholesterol for synapse building (Travis, 2001).

Even with a reference to the article, the above paragraph is considered to be plagiarism. The basic idea of the paragraph and its wording is that of the original author. *Changing around a few words or punctuation marks does not make the new paragraph your own!* Use the article as a source of information and then develop your own ideas as to how to bring this information together to get your points across. You may find it necessary to look beyond the article for information that will help you to present your ideas (e.g., your course textbooks or a related article). A summary should show me that you understand the article.

This is an example of an alternative paragraph that would be acceptable:

Recent studies have shown that cholesterol, an important component of cell membranes, may be very important for the formation of nerve synapses in the brain. In the absence of cholesterol, synapses break down, thus inhibiting transmission of nerve impulses. The source of this cholesterol appears not to be the neurons themselves, but the glia cells.