PRINCIPLES OF BIOLOGY 1210-070
FALL 2007 MW 6-8pm Sandy 120
Schedule of Topics and Reading

Date	#	Topic		READ before class
M Aug 20	**1**	Syllabus		
	2	Introduction		
W Aug 22	**3**	Doing science		
	4	Properties that Unify Life		1
M Aug 27	**5**	The Chemistry of Life		4
	6	Macromolecules: Proteins and Nucleic Acids		4
W Aug 29	**7**	Macromolecules: Carbohydrates and Lipids		4
	8	Cells: Organelles		5
M Sept 3	☺	**LABOR DAY**		
	☺	**HOLIDAY**		
W Sept 5	**9**	Cells: Membranes and Transport	**QUIZ 1**	6
	10	Energy and Enzymes		7
M Sept 10	**11**	Photosynthesis	a**#1 due**	8
	12	Cellular Respiration: Glycolysis and Krebs		"
W Sept 12	**13**	Cellular Respiration: Electron Transport Chain		"
	14	Review Photosynthesis and Cellular Respiration		"
M Sept 17	**!!!**	**EXAM I (Lectures 1-13, Chapters 1, 4-8)**		
W Sept 19	**15**	Cell Division: Mitosis and Meiosis		9 B
	16	Meiosis and Mendel		"
M Sept 24	**17**	Mendel and Genetics	a**#2 due**	10
	18	Variations on Mendel		"
W Sept 26	**19**	Chromosomes	**QUIZ 2**	11
	20	DNA Structure and Replication		12
M Oct 1	**21**	Transcription and Translation	**QUIZ 3**	13
	22	Regulating Gene Expression		14
W Oct 3	**23**	Genetic Engineering		15, C
	24	Cloning and Stem Cells		"
M-F Oct 8-12	☺	**FALL BREAK**		
M Oct 15	**25**	Evolution and Natural Selection	a**#3 due**	16
	26	Evolution of Populations		17
W Oct 17	**27**	Speciation		18
	28	Classification		2
M Oct 22	**29**	Evolution of Microbes: Prokaryotes	**QUIZ 4**	3, 19
	30	Evolution of Viruses		19 +
W Oct 24	**31**	Evolution of Microbes: Protists		
	32	Evolution of Fungi and Plants		19 +
M Oct 29	**!!!**	**EXAM II (Lectures 16-32, Chapters 9 - some19)**		
W Oct 31	**33**	Evolution of Animals		19 +
	34	Evolution of Animals		19 +
M Nov 5	**35**	Evolution of Animals	a**#4 due**	19 +
	36	Vertebrate Evolution		
W Nov 7	**37**	Human Evolution		D
	38	Humans and the Biosphere		20, A
M Nov 12	**39**	Populations and Communities		21
	40	Ecosystems and Food Webs		22
W Nov 14	**41**	Interactions among Organisms		23
	42	Communities and Coevolution	a**#5 due**	24
M Nov 19	**43**	Chemical Cycles and Ecosystems		25
	44	Human Impacts on the Environment		E
W Nov 21		TAKE HOME QUIZ DUE MONDAY NOV 26		
M Nov 26	**45**	What is Your Ecological Footprint?	**QUIZ 5 due**	
	46	Solving Environmental Problems		
W Nov 28	**!!!**	**EXAM III (Lectures 33-46, Chapters 19 - 25)**		
M Dec 3	**47**	The Animal Body		+
	48	Organ Systems		+
W Dec 5	**49**	Homeostasis	**PROJECT due**	+
	50	Functions of Ions in Organ Systems		+
M Dec 10	**!!!**	**COMPREHENSIVE FINAL EXAM (Lectures 1-50, Chapters 1-25+)**		

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Knowledge is not something you passively acquire and accumulate, but something you construct, explore and test. What you wonder about, you remember. What you generate, you know.

Goals: If you intellectually engage in this course it will help you understand the process of science as a way of seeking knowledge and give you a framework of the concepts in biology. Biology is central to understanding the world around us. My goal is to help you become "biologically literate"–capable of using biological concepts to make decisions in your roles as individual, family caretaker, citizen and member of the biosphere. *Can a pill make you thin? Does sunlight cause cancer? Are the oceans and forests inexhaustible resources? How many people can the earth sustain?* These are important questions for all of us and require biological literacy. After this course, you will be better equipped to decide which foods are healthy; you will have more insight into world health crises like AIDS and antibiotic-resistant bacteria; and you will be able to discuss cutting-edge technologies like DNA fingerprinting and controversial topics like stem cell research and human cloning. In this course we will sample several levels of biological organization, from molecules to organisms to ecosystems, and we will discover the cycles and emergent properties that are key to the study of life.

Instructor: Renee Dawson, Ph.D. office hours: JTB 335 T and H 12:30-2:30 pm or by appointment
dawson@biology.utah.edu Your questions, suggestions, comments, and confusions are always welcomed. Don't wait until just before an exam to ask for help! You are welcomed to attend discussion for section-009. Times TBA
Please turn in your exercises/project/take home quizzes to me via email. PLEASE put 1210-070 and assignment title in the subject line or it may be misfiled.

Lectures: In this survey course, I will select and emphasize material that will help you build a framework for biological literacy. Lectures will include abstract principles and concrete examples to illustrate and help you make sense of those concepts. These examples are not "tangents" nor are they the only important details you need to know. The goal of lecture is to coach you through your reading and studying, not to repeat everything that is in the text. The lecture numbers on the following schedule are by topic not necessarily class period and are for the sake of reference. *Yes* you need to attend class, as there may be test questions from lectures topics not in text.

Electronic Course Reserves: Study questions will be posted on course reserves through Marriott Library **(NOT webCT).** These will help you learn the material and prepare for exams. I will also post slides, optional readings (articles) and additional information here. Go directly to "My.Utah.edu" portal on U web page, log in and select Academics from upper left, then click on Bio1210. To print slides 3 or 6 per page, open slides in Powerpoint and pull down "handouts" under "Print What". Call Help Desk 581-4000 or Media Services 581-6494 for help logging in.

Text: Our textbook Discover Biology by Cain, Dammon, Lue, &Yoon is available in the University bookstore. Copies are also available at Marriott Library Reserve Desk. Reading assignments are included below in the lecture schedule. Dates are tentative but we will proceed in this order. Yes I expect you to read this entire text. (There will be exam questions that are from the text that have not been discussed in class.) It is important to keep current on reading and to come to class prepared to actively listen. It will be to your advantage to do the problems at the end of the chapters and problems in the study guide.

Points: Course grade will be determined by percentage of **550** total points. Cumulative scores of 90%, 80%, 70% or 60% will guarantee grades of not less than A-, B-, C- and D- respectively.
Exams 200 points - Three midterm exams, drop the lowest score. ABSOLUTELY no late makeup exams, taking early can be prearranged with documentation and two weeks notice.
Final 100 points – Comprehensive. Think of it as your second chance to get it right. You CANNOT drop the final.
Quizzes 100 points - Five quizzes (25 points each) will help assess your comprehension and help you to stay current between exams. No makeup quizzes, lowest score of quizzes 1-4 can be dropped.
CPS Questions 50 points – In class questions will be given almost daily with CPS keypads (clickers) to encourage active participation. Questions may review previous lecture or highlight reading material for that day.
Online quizzes 50 points – www.discoverbiology.com, click book to right, select chapter and then self test. Answer 10 questions for each chapter and interlude. If you get 80% submit to gradebook (enter my email). Click Student gradebook and they send you a code so you can check to see if your quizzes are recorded. More details in class. This are due no later than Dec 5th
Articles 25 points – One paragraph summary and five great questions about a variety of topics. You must turn in five assignments. Approved topics and instructions are listed on course reserves under A for "Articles".
Project 25 points - A list of at least 25 well worded, specific questions addressing areas that you are curious about, and a four page *"exploration"* on one of the questions. Additional details provided on course reserves under P for "Project".

Grading: Check the math and contact me within a week of exam or quiz return if there are grading errors. If (*after checking the text and your notes*) you would like to discuss or contest your grade on specific questions please address your concerns *in writing* with the original graded page(s) attached. Include your email and phone number. Keep a zeroxed copy for yourself. Originals won't be returned. Be specific. (*What about the question mislead you? What were you thinking? Why do you deserve partial or full credit?*). I value sound scientific reasoning over rote memorization. Much can be learned (*by both of us*) by closely examining concepts that are missed.

Other policies: The University drop and withdrawal policy and dates are described in the Class Schedule. The University of Utah seeks to provide equal access to its programs, services and activities for people with disabilities. If you will need accommodations in the class, reasonable prior notice needs to be given to the Center for Disability Services, 162 Olpin Union Building, 581-5020 (V/TDD). CDS will work with you and me to make arrangements for accommodations. All written information in this course can be made available in alternative format with prior notification to the CDS.

WEB sites for further exploration:

http://www.ask.com or http://www.google.com (a good place to begin any search)
http://biology-pages.info (GREAT online biology text, **bookmark it!**)
http://www.ncbi.nlm.nih.gov (National Center for Biotechnology Information)
http://www.accessexcellence.org (The National Health Museum, News and Timelines)
http://earthtrends.wri.org (World Resources Institute, Earth Trends)
http://tolweb.org/tree/phylogeny.html (Tree of Life -- good, up-to-date information)

How to study: Biology is not suited to rote memorization. "Facts" are meaningless without the context of the procedures and patterns of thought that characterize this science. Thinking scientifically takes practice, and **active** reading, listening, and problem solving are good practice. Many students learn best in interactive contexts, so please create informal study groups outside of class. You will learn, understand and retain *much* more if you have good study habits starting NOW. The University recommends 2-3 hours of study outside of class for each credit hour. That means 8-12 hours per week for this class. Keep your notes and handouts in order. Learning biological terms is like learning a new language; keep a vocabulary list and look up definitions promptly. Write questions and look for 'big picture' patterns. Keep asking yourself "What is the main concept?" Chapter summaries will help you identify main concepts. Read them before and after chapter. Compare and contrast the information. Try outlines and concept maps. Don't get buried in the details-most are meant to support main concepts (more on this in Lecture 2). This course has amazing breadth; DO NOT TRY TO CRAM!

Lecture 2 Learning and Doing Science

T **F** The brain constantly remodels itself.
T **F** The brain makes new connections with every thought & action.
T **F** Repeated thoughts and actions build stronger synaptic connections.
T **F** The more connections the brain makes, the more efficiently it works.

Blooms Hierarchy of Thought

lowest
1. **Knowledge** - memorize, define, recall
2. **Comprehension** - summarize, describe, discuss
3. **Application** - use ideas in different situations, solve problems
4. **Analysis** - compare and contrast, ask questions, separate concepts into parts, understand relationships
5. **Synthesis** - combine known facts with new idea, creative solutions, hypothesize

highest
6. **Evaluation** - relevance, significance, identify new frontiers, personal judgments.

Science requires all six levels of thought. Successful businesses also require all six levels.
Science (or capitalism) cannot make value judgments, which is why it is important for us as citizens to be educated, to be knowledgeable, to learn to think, to ask questions and to **evaluate**.
A successful education begins your lifelong mission of learning and striving for higher levels of thought.

Scientific Method

1. Make observations
2. Ask questions
3. Create possible explanations (hypotheses)
4. Make predictions based on these models.
5. Test with controls
6. Observe results and
7. Repeat (modify, extend or reject)

"Good" scientific hypotheses are testable, falsifiable and suggest new experiments. Science is based on observations of measurable things. Strives for "objectivity". Assumes that our perceptions are unbiased or independent of mind, personality, feelings. Ideas are based on evidence, not authority. But science is a human endeavor. Look for examples of "subjectivity" and the influence of personality.
Science is a process. It is never done. Never proven. All conclusions are tentative.

Biology 1210 Fall 2007 **HOW TO STUDY BIOLOGY (and succeed)**

There are no tricks or short-cuts when it comes to succeeding in Biology classes. University-level Biology is difficult and there is no substitute for hard work. But what is meant by "hard work"? One component is time spent on task. When we speak of time, we should consider both the quantity of time spent and the quality of time spent.

There is so much material to be understood that a substantial time commitment is required. There is time spent in lecture, but also time spent preparing for class, reading the assigned pages, upgrading notes, and studying for tests (which might cover as many as ten chapters). Yet, a student can devote a lot of time to these activities and still do poorly in Biology. This is because the **quality** of time spent is also an important factor. Many students become discouraged when, though they spend hours and even days studying for tests, they still get unsatisfactory scores. Usually this occurs because what they do when they study is low-quality work.

What are some examples of low-quality work? One example would be reading the textbook just to get the reading assignment out of the way. A student who reads properly, on the other hand, reads with a critical eye, constantly asking him/herself questions like: "If I had to teach this to someone, could I do it?" or "What if this process where screwed up somehow; then how would the results differ?" or "The text's treatment of this topic differs from what I learned in high school (or what I learned in class today); what question could I ask in class that might clear this up?"

Another example of low-quality work is going over and over your class notes. This is an activity that assumes one will be tested in a low-quality fashion, i.e. with test items that require you to do nothing but recall and repeat. This is a false assumption. You will be asked to integrate concepts from different lectures, to apply the principles of biology covered in class to situations that were not covered in the lecture or text, to evaluate new situations in light of the material covered during the test unit. High-quality work entails preparing for such questions. Preparing entails organizing the mass of new information in such a way that it helps you understand the way the concepts are related to each other.

A final example of low-quality work is coming to class regularly and just taking notes. Why is this low-quality work? Because many people go on auto-pilot when they takes notes. They switch off their brains and become passive sponges or tape recorders, assuming that later on, they will only need to act like a pair of speakers to play back what was written down. As in other things, your attendance at lectures can be either low-quality or high-quality. High-quality attendance entails being critical during the lecture, asking questions like: "Why does it work that way?" or "How do we know that? What is the evidence?" "How does that relate to what the professor said the other day about...?" There is a world of difference between questions such as those listed above and questions like: "Could you repeat that?" or "Could you spell that?" or "Do we have to know this for the test?" The answers to these questions might be important, but asking them does not indicate that critical thinking has been going on, as do the earlier questions.

As you can see, the successful student will necessarily have to work hard. The suggestions above are labor-intensive; they require more mental gymnastics. But just as a gymnast would be foolish to expect to succeed at a complex maneuver on the first try at an important competition, as foolish would be a student who expected to pass tests requiring higher-order thought processes without first **practicing these same processes** (end of chapter questions and problem sets).

Successful students take pains to carry out some sort of lecture follow-up activity. For many, this means rewriting their lecture notes. A lot of students find this activity to be very tedious. An alternative follow-up activity is a strategy known as Concept Mapping. Like rewriting notes, this is an activity that helps you reorganize the information in a way that conforms to your mental "landscape." Better than rewriting your notes, it helps you to discern the patterns and relationships between concepts. Much research supports the effectiveness of this strategy in helping students learn complex material. Below is a summary of the steps in constructing a concept map, followed by guidelines to use in constructing the most helpful maps possible.

Steps in Making A Concept Map

1. Make a list of the concepts from the lecture.
2. Rank the concepts from most general to most specific.
3. Start each map at the center of the top of the page with the most general concept, which will generally be the chief topic of a particular lecture. Below it, place the second-most general concept(s), etc...
4. Circle these two concepts and link them with a solid line.
5. Label the line with a linking phrase.
6. Work your way down the page, adding increasingly specific concepts and looking for crosslinks, which should be drawn with dashed lines.
7. Add details (examples).
8. Do a second version of the map with the goal being to add formerly unnoticed crosslinks and to organize the map so that it flows as logically and as clearly as possible.

Guidelines for the Most Helpful Maps

1. A typical 50-minute lecture should contain at least 20 (and not more than 45) concepts. Concepts are usually nouns.
2. Label ALL links and crosslinks with linking phrases. Links generally consist of verbs, but other words may be used where appropriate.
3. Circle the concepts, leave examples uncircled.
4. Each concept should only appear once in a given map. Redundancy of concepts usually indicates that

you missed an important conceptual relationship.

5. Concept maps should flow down the page only.

6. Concept maps should NOT resemble flow charts or chronologically based outlines of the lecture. They should not be sentences with some words diagrammed. An important goal is to accurately relate as many concepts as possible using crosslinks. Maps with long strings of concepts or with several isolated and unlinked branches indicate misunderstanding of the goal of concept mapping.

Further Suggestions:

1. Attend ALL lectures: This gives you a good idea of what the professor thinks is most important. It also allows you to learn by hearing and seeing simultaneously -- much more effective than either one of these alone.

2. Go to discussion to go over questions you have. Make an appointment with your TA and/or instructor if you need extra help.

3. Come to class prepared by having outlined the assigned pages ahead of time. This will help you make more sense of the lecture as you listen to it and this, in turn, will help you to...

4. Engage your brain in the lecture. Don't allow yourself to become a note-taking automaton.
Think! Be critical! Be skeptical! Ask questions!
If you are shy, ask questions after class or during office hours.

5. Put proper closure on each lecture. Within 24 hours of each lecture -- the sooner the better --
(1) ask yourself what the lecture was about without using your notes, and
(2) write your answer in the form of a concept map. This is the best time to spot points of confusion or discrepancies between text and notes, which you should write down and follow-up on. It is very important to spend time in this fashion if you are serious about succeeding.

6. Pay attention to the figures in your text, especially the summary figures. Figures are expensive to produce and publishers try to use them sparingly in order to reinforce main points.

7. Budget your time. There is such a huge amount of material to be mastered that studying cannot be put off into an all-night cram session before tests. This is a time-tested recipe for failure; if not failure of the test itself, then failure to understand biology.

8. Don't be a hermit. Once you have studied a good bit on your own, get together with a few others who are interested in understanding biology in order to bounce questions off each other, compare concept maps, explain concepts to each other and to be able to answer your colleagues' questions regarding those same explanations.

9. Don't miss the forest for the trees. Concentrate on the concepts, not on the minutiae.

from http://www2.tltc.ttu.edu/din/BIOL1403/Regular/howtostudybioology.html

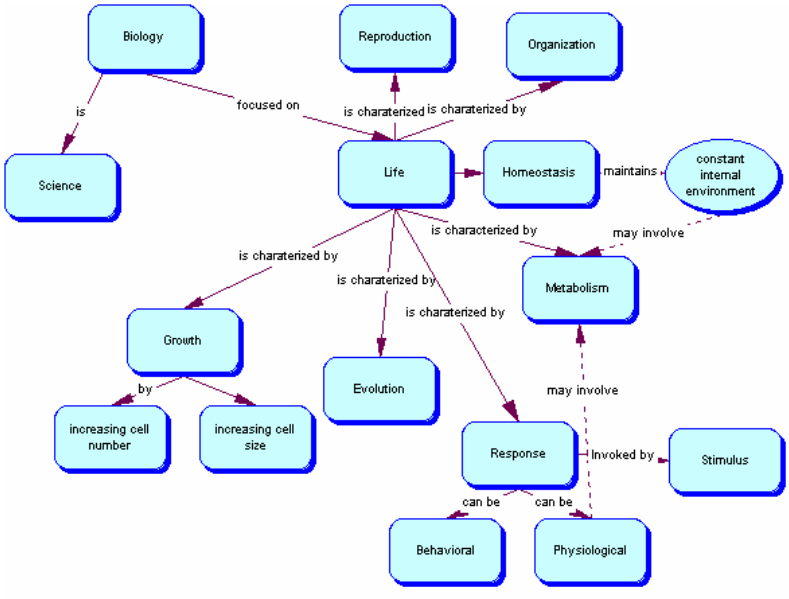
Concept maps

Using concept maps to organize the meaning of concepts and the relationships between them will increase your learning and decrease your anxiety. They get easier to make with practice. The figure shows a good example. Two types of knowledge relationships are evident:objects and processes. In organizing a concept map, ask yourself questions like the following:

Objects - *What is it part of? What parts does it have? What are its characteristics? What is its function? Where is it found? How big is it?*

Process - *What is its function? What are its inputs or substrates? What does it produce? Under what conditions does it occur? What are its active parts? Where does it occur?*

concept map from: http://zoology.okstate.edu/zoo_lrc/biol1114/study_guides/softboard/concept-maps/Biology.HTM



The SQR3 Method of Reading: Survey, Question, Read, Recite, Review.

Plan your study session. Set a time limit for working. Include breaks and rewards. Use the SQR3 method of reading to be an active and effective reader. The passive reader learns little. The aggressive reader organizes information and answers questions.

SURVEY the chapter.
-Read the chapter introduction and summary. Create a context for remembering information. Generate interest and a sense of what is important.
-Look over the major section headings.
-Pay attention to charts, graphs, maps and diagrams. These provide lots of information in an easy to read/understand format.
-Note whether key words or terms are italic, boldface, defined within the text, or listed at the beginning or end of the chapter. The author is trying to call your attention to these bits of facts, so pay due notice. In other words, know what these terms or key words are and how they are used.
-Look for any problems or questions for discussion at the end of chapters or sections. These will help you determine which concepts the author wants you to apply.
-You might want to sketch out a *quick* concept map here to orientate yourself with past material

QUESTION. Create and answer questions.
-Questioning helps your mind engage and concentrate on what you are reading.
-Turn boldface headings and subheadings into as many questions as you think will be answered in the section you are reading.
-Turning headings into questions directs your reading so that you can find the details and examples that support major points.
-As you read each section carefully, try to find the answers to questions you formed from the headings.
-The better the questions, the better your comprehension will be.
-For each section in the chapter, ask these 4 basic questions:

1. What is the main point?
2. What evidence supports the main point?
3. What are the applications or examples?
4. How is this related to the rest of the chapter, the book, the world, to me?

READ the section.
- Read slowly and carefully, concentrating on one section at a time. Don't worry about how long you take because you are trying to absorb ideas, not become a speed-reader.
-Look for answers to your questions.
-Read actively. Try to determine the main point of the section. Summarizing the main point in your notes or in the margin of your text will aid your recall when you review.
- Keep a list of terms in bold with definitions.
-Do not skip unfamiliar words or technical terms. If you cannot infer their meanings from context, look them up. Be sure to reread the sentence in which each new word appears to ensure you understand it.
-Creating notes, underlining or highlighting, and constructing study guides are essential to active reading.

RECITE the main points.
-At the end of each section that you read, try to state, aloud or silently, the important points covered.
-Look up from the book and verbalize the answers to your questions.
-Talk out loud and listen to the answers. Recite to remember.
-Recitation (retrieval) is an essential aid to memory and comprehension.
- If you have trouble doing this, then you probably have not understood the section and you need to reread it. Don't move on to the next section until you can recite.
-If the central idea comes easily to mind, then you can be confident that you understand what you have read.

REVIEW the material
-Do not highlight or underline main points while you read. Most students make too many marks. Wait until you've finished a paragraph or section, then reread, review and mark.
-Mark the text and the margin to outline the structure of the book. For each main point, indicate evidence, examples, steps, proofs, connections to other points, definitions and your own thoughts. The book holds the information. Your marks create organization. Mark to simplify review.
-Review a chapter immediately after you finish reading it.
-Review by skimming back over the chapter looking over any notes you made in the margin. Do they still make sense?
-Reread any passages that you underlined or highlighted.
-Go back over all the questions from all the headings, and see if you can still answer them. If not, refresh your memory and continue.
-This is the point when drawing a concept map is extremely valuable

Repeat SQR3 for each section. When finished, create a one page hierarchical summary of the entire chapter.

Now do any homework assignments (Online Quizzes and Additional Study Questions.) Do these without the text or notes first (practice retrieval!) If you are unsure of your answer don't check key!!!! Use your summary first, then the text to look for answers.

Review often and reward yourself for a job well done. A 5-10 minute review of your Chapter Summaries and Concept maps should be done often so that new material is viewed in context of past chapters.

Most of this text is from <http://educatoral.com/SQR3.html> but there are many other sites:
see also http://www.collegetransition.org/counseling/sqr3.html