

Introduction to Molecular and Cell Biology
Biology 11 Syllabus
Riverside City College
Fall 2010

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Office Hours: Mondays: 10:00 am – 11:00 am
Tuesdays: 9:00 am – 10:00 am (STEM)
Tuesdays: 10:00 am – 11:00 am
Thursdays: 1:15 pm – 2:15 pm
Fridays: 10:00 am – 11:00
and also by appointment

Lecture: M W 11:10 am – 12:05 pm (LFSC 108)
F 11:10 am – 1:05 pm (LFSC 108)

Laboratory: M W 2:20 pm – 5:35 pm (LFSC 105)

Required Materials:

Biological Science. (2010) 4th edition, by S. Freeman (Course Text)
Turning Point Clickers (Classroom Response System)

Note: Recent articles that are relevant to the course may be put on reserve in the library and become part of the assigned reading.

Course Description: An intensive course for all Life Science majors designed to prepare the student for upper division courses in molecular biology, cell biology, developmental biology, evolution and genetics. Course material includes principles of biochemistry, metabolism, cell physiology, genetics, development, cellular diversity and evolution.

The lecture component of the course will include discussions and demonstrations to initiate and foster critical thought during class. In addition to the traditional lecture format; videos, animations and group work may be used to convey challenging course material.

The laboratory component of the course will consist of hands-on, experimentation and data analysis and may also include computer-assisted learning modules.

By the conclusion of this course, students should be able to:

Lecture

- Use appropriate terminology in discussing biological principles and relationships.
- Explain the scientific method and dissect the process of scientific thought using some historically important examples.
- Give examples of how structure is related to function in biology.
- Relate the principles of chemistry to biological molecules and be able to apply biochemical principles to the interaction of molecules at the atomic, molecular, organelle, cell, tissue and organismal levels.
- Discuss the properties of life and expound on the current theories of the origin and evolution of life.
- List the key biochemical processes and structures that are inherent to cells and organisms, showing a basic understanding of the kinetics of biological energy transformations.
- Describe the methods by which cells reproduce & the strategies by which organisms maintain genetic flow
- Explain how biological systems are regulated at the gene and cellular level.
- Relate gene technology and other biological principles to other biological disciplines and to life in general.
- Describe the genetic basis of development.
- Discuss the diversity of life emphasizing the Prokaryota and Protista.
- Integrate evolutionary theory and principles into biological structure and function.
- List and explain some common cell and molecular biology techniques utilized by biologists.
- Be able to critically analyze and critique scientific literature.

Laboratory

- Apply the scientific method and the metric system to laboratory experiments.
- Synthesize a coherent and educated hypothesis before performing any laboratory experiment.
- Work effectively in both a group environment as well as individually in a laboratory setting.
- Practice appropriate laboratory safety techniques and protocols.
- Perform the calculations and procedures necessary to make up required chemical stock solutions and dilutions in a reasonably accurate manner.
- Become comfortable with scientific protocols and be able to write and follow an experimental flow chart.
- Manipulate and calibrate equipment to secure precise results and minimize experimental error.
- Analyze trends by the appropriate mathematical, graphical and statistical manipulation of raw data.
- Explain the differences between cause and effect, evidence and inference, qualitative, semi-quantitative and quantitative data.
- Critique and/or design an original biological experiment.
- Effectively utilize technology and library resources.
- Critically appraise experimental data, published experiments, scientific articles and current biological theories and models.
- Discuss the contribution of both historical and recent biological research to the evolution of current biological thought.

Key Course Questions

1. How do cells interact with and respond to their environment?
2. How do the organelles and macromolecules in cells function to regulate cellular processes?
3. What is the importance of regulating mitosis and what happens when this regulation fails?
4. How do cells obtain and utilize energy from their environment?
5. How do genes direct the processes carried out by cells and how does the cell, in turn, regulate genes?
6. How has the knowledge that you have gained from this course influenced the way you think about biomedical research?

LECTURE SCHEDULE

<u>Date</u>	<u>Topic</u>	<u>Reading</u>
Aug 30	Course Introduction	Syllabus
Sep 1	What is Cell & Molecular Bio? Historical Perspectives. Size & Scale	Ch 1, begin Ch 7
Sep 3	Prokaryotic & Eukaryotic Cells	Ch 7 and Ch 28
Sep 6	Holiday	
Sep 8	Begin our Tour of the Eukaryotic Cell	Ch 7
Sep 10*	The Endomembrane System and Cytoskeleton	Ch 7
Sep 13	Finish the Tour of the Eukaryotic Cell	Ch 7
Sep 15	Review Chemical Bonds / Properties of H ₂ O	Ch 2
Sep 17*	The Importance of Carbon and Functional Groups / Macromolecules	Ch 2 & 3
Sep 20	The Macromolecules – Proteins	Ch 3
Sep 22	Structure & Function of Proteins (Intro to Enzymes) / Nucleic Acids	Ch 3 & 4
Sep 24*	Nucleic Acids/Carbohydrates/Lipids – Membrane Structure & Function	Ch 4, 5 & 6
Sep 27	Evolution of & Evidence for the Fluid Mosaic Model	Ch 6
Sep 29	Membrane Proteins and Membrane Transport	Ch 6, 8
Oct 1	EXAM I – covering lectures 2/17 through 3/12	
Oct 4	Membrane Transport II	Ch 6
Oct 6	Membrane Potentials and the Action Potential	Ch 45 (p887-897)
Oct 8*	Bulk Transport Processes – Endocytosis (RME) and Exocytosis	Ch 7

Date	Topic	Reading
Oct 11	Introduction to Cell Metabolism - Bioenergetics	Ch 2 & 9
Oct 13	Coupled Reactions & Regulation of Enzymes	Ch 3 & 9
Oct 15*	Regulation of Enzymes, continued & Redox Reactions	Ch 9
Oct 18	Glycolysis & The Citric Acid Cycle	Ch 9
Oct 20	The Citric Acid Cycle & Oxidative Phosphorylation	Ch 9
Oct 22*	Fermentation & Alternate Metabolic Pathways	Ch 9
Oct 25	Metabolic Regulation & Intro to Photosynthesis	Ch 9 & 10
Oct 27	Photosynthesis	Ch 10
Oct 29	EXAM II – covering lectures 3/15 through 4/9	
Nov 1	Finish Photosynthesis & Begin Cell-Cell Interactions/Communication	Ch 10 & 8
Nov 3	Signal Transduction I – Signal Reception: Ligand-Gated Ion Channels	Ch 8 & 47 (943-947)
Nov 5*	Signal Transduction II – G-protein Coupled Receptors & RTK Signaling	Ch 8
Nov 8	Finish RTK Signaling / The Cell Division Cycle	Ch 8 & 11
Nov 10	The Regulation of Cell Division & CDC Checkpoints	Ch 11
Nov 12	Holiday	
Nov 15*	Medelian Genetics – Monohybrid & Dihybrid Crosses	Ch 13
Nov 17	Non-Mendelian Genetics	Ch 13
Nov 19	EXAM III – covering lectures 4/19 through 5/10	
Nov 22	The Chromosomal Basis of Inheritance / Sex-Linked Inheritance	Ch 13
Nov 24*	The Nature of Genes – The Search for the Genetic Material	Ch 14
Nov 26	Holiday	
Nov 29	DNA Structure & Function / DNA Replication	Ch 14 & 15
Dec 1	Gene Expression I – Transcription (prokaryotes & eukaryotes)	Ch 16
Dec 3*	Gene Expression II – RNA Processing & Translation	Ch 16
Dec 6	The Regulation of Gene Expression – <i>Prokaryotic and Strategies</i>	Ch 17 & 18
Dec 8	Differential Gene Expression and Early Animal Development	Ch 18 & 21
Dec 10*	Genetic Basis of Development and the Role of Stem Cells	Ch 21 & 22

* = LECTURE QUIZ SCHEDULED FOR THESE DAYS

PLEASE NOTE, THIS IS A *TENTATIVE* LECTURE SCHEDULE, AND IS SUBJECT TO CHANGE

Final Exam (comprehensive) – Friday, December 17th, 11:00 am – 1:30 pm (LS 108)

Attendance:

If you miss more than the equivalent of two class (lecture and/or laboratory) sessions, please be aware that on the third absence/tardy, you may be dropped from the class. Students who are allowed to add this class on or after the first day of class must officially register with Admissions by the ADD deadline and pay fees per Admissions and Records procedures. Note, you must attend the entire lecture or laboratory section. Arriving late or leaving early will be considered an 'absence'.

Students who choose not to continue the course are responsible for dropping the class. Do not assume that I have dropped you! Failure to officially drop the course may result in an "F". If you happen to miss assignments/tests after the deadline to drop and have an acceptable reason (like hospitalization), then an "Incomplete" would be more appropriate. When in doubt, communicate!