

Schedule for BioSc147: Molecular and Cellular Biology:

Fall 2017,
section 1361

Topics, Discussions, Readings, Labs, Due dates

Week	Date	Topics	Article	Chapter	Lab	Due
		.pdf of lecture slides arranged by topic on course web page.	From <i>SCIENCE</i> magazine. Find files on course web page	<i>LIFE: The Science of Biology</i> . 10th ed. Sadava, et	Lab manual posted on course web page.	Due at start of class, unless otherwise noted.
	F 8/11	Intro		1: Studying life	zero: Micropipette and measuring bootcamp.	
1	M 8/14	Structure and Function of Prokaryotic and Eukaryotic Cells	Microbial Survey of Human Body Reveals Extensive Variation			
	W 8/16	Cell theory: Distribution, structure, and functions of Eukaryotic and Prokaryotic cells.		2. Chemistry review		
	F 8/18				1a. Microscopes: Testing predictions that compare prokaryotic and eukaryotic cells	
2	M 8/21	Organelle structure and function	Mitochondrial Fission, Fusion, and Stress	5: Cells, the Working Units of Life		
	W 8/23	Organelles, molecules, and cellular function		27: The Origin and Diversification of Eukaryotes		Pre-lab 1 (1b, 1c)
	F 8/25				1b. Microscopes: Testing predictions about similarities and differences between cells. 1c. Using fluorescence and DIC microscopy to analyze protein expression, localization, and cell function	
3	M 8/28	Membrane structure and function	Composition of isolated synaptic boutons reveals the amounts of vesicle	6: Cell Membranes		
		Fluid mosaic model, trans-membrane proteins		3.2: Proteins		
		Cell signaling		7: Cell Communication and Multicellularity		
	W 8/30	Cellular transport				Pre-lab 2 (2)
		Endocytosis, exocytosis				
		Endomembrane and cytoskeletal system				
	F 9/1				2. Use of and analysis of data from common techniques used in the field of cellular and molecular biology	Lab 1. Microscopy - preparation and analysis of samples using compound and fluorescence microscopes.

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4	M 9/4	LABOR DAY - NO CLASS					
	W 9/6	Cell communication	Sleep Drives Metabolite Clearance from the Adult Brain	7: Cell Communication and Multicellularity		Pre-lab 3 (3a)	
		Cell signaling		37: Regulation Plant Growth, 41: Animal Hormones			
		Immune system (Part I)		42: Immunology			
	F 9/8				3a. Using enzyme activity assays to test predictions about enzyme function under various conditions. <i>Test enzymatic methods for tissue and cell lysis of model organisms</i>		
5	M 9/11	EXAM 1				EXAM 1	
	W 9/13	Cellular chemistry and biomolecules				Pre-lab 4 (3b)	
		pH scale, acids and bases.		2: Chemistry Review			
		Structures, formulae, functions of simple compounds and basic biological molecules: carbohydrates, lipids, proteins, nucleic acids		3: Proteins, Carbohydrates, Lipids			
	F 9/15	Structure and function of organic molecules	Nature's first functional food	4: Nucleic Acids and the Origin of Life	3b. Control and analysis of population growth using cell culture techniques. Use of cell culture and protein purification. <i>Make media</i>		
6	M 9/18	Cellular metabolism (respiration and photosynthesis)	A Glucose-to-Gene Link	8: Energy, Enzymes, and Metabolism			
	W 9/20	Cellular respiration and fermentation		9: Pathways That Harvest Chemical Energy	3b. Control and analysis of population growth using cell culture techniques. <i>Set up growth media/conditions and inoculate culture.</i>	Lab 2, 3a. Standard Curve and Enzyme assay - Protein standards, microscopy to analyze, quantitate cell lysis via enzymes	
	F 9/22	NATIVE AMERICAN DAY - NO CLASS					
7	M 9/25	Photosynthesis	Fine-tuning photosynthesis	10: Photosynthesis Energy from Sunlight			
	W 9/27				3b. Control and analysis of population growth using cell culture techniques. <i>Measure growth, harvest cells, and compare results from various cultures.</i>	Pre-lab 5 (3c)	
	F 9/29				3c. Use of protein extraction, purification and quantitation., spectrophotometry, standard curves to investigate protein expression, structure, and function. <i>Cell lysis to generate protein extracts from harvested cells. Separation of cell debris from extracts. Protein quantitation assay using standard curve.</i>		

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8	M 10/2	Cell reproduction and its controls	The elusive heart fix	11: The Cell Cycle and cell Division		Lab 3- Part 1. Techniques and data analysis related to protein structure and function. (lab 3b, 3c) GFP purification from various cultures (Yeast, C. elegans, E. coli, or Algae). Analysis of quantity (standard curve).
	W 10/4	Cellular reproduction: prokaryotic and eukaryotic		26: Bacteria, Archaea, and Viruses		Pre-lab 6 (3d)
	F 10/6				3d. Use of protein purification and detection to investigate protein expression, structure, and function.	
9	M 10/9	Cell cycle	Cancer Suppression by the Chromosome Custodians, BRCA1 and BRCA2	Review of: 11		
	W 10/11	Growth regulation		Review of 7, 37, 41, 42		Pre-lab 7 (3e)
		Control of prokaryotic reproduction and sporulation		Review of 26		
	F 10/13				3e. Use of antibody assay technologies (ELISA) to detect and analyze the presence of molecules in purified samples	
10	M 10/16	DNA structure and function	Replication Error Amplified	4: Nucleic Acids and the Origin of Life		Pre-lab 8 (3f)
		DNA structure and replication		13: DNA and Its Role in Heredity		
	W 10/18	EXAM 2				EXAM 2
	F 10/20				3f. Use SDS-PAGE to verify purification technique	

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11	M 10/23	Gene structure, gene expression and control of gene expression	Genomically Recoded Organisms Expand Biological Functions	14: From DNA to Protein; Gene Expression			
		Transcription and translation					
	W 10/25	Promoter, coding sequence, untranslated regions				Pre-lab 9 (4a)	
		17: Genomes		15: Gene Mutation and Molecular Medicine			
	F 10/27				4a. Measurement and analysis of cellular respiration and fermentation under varying environmental and genetic conditions	Lab 3-part 2. Techniques and data analysis related to protein structure and function (lab 3d, 3e, 3f). Purification detection (FPLC), identity (ELISA), and size (SDS-PAGE) of GFP.	
12	M 10/30	Classical/Mendelian genetics	A mutation in hairless dogs implicates FOXI3 in ectodermal development	12: Inheritance, Genes, and Chromosomes			
		Mendelian and non-Mendelian genetics		Review of 11.5: Meiosis.			
	W 11/1	Meiosis and life cycles		38.1: plant life cycles 30.3 Fungal life cycles. 44: Animal development		Pre-lab 10 (4b)	
	F 11/3				4b. Measurement and analysis of Photosynthesis under varying environmental and genetic conditions		
13	M 11/16	Molecular genetics	Functionally degenerate Y not so		5a. (day 1) Genetic analysis of meiosis and fertilization using punnett squares and observable data		
		Relationship of DNA sequence and gene expression to genotypes and phenotypes		Review 12.4-12.6 (Genes and heredity)			
	W 11/18	Analysis of alleles using DNA sequence technologies		17: Genomes	5a. (day2) Genetic analysis of meiosis and fertilization using punnett squares and observable data incl. <i>plant phenotypes</i>	Lab 4. Testing hypothesis about effects of genetics and environment on metabolic pathways	
	F 11/10	VETERANS DAY - NO CLASS					

Week	Date	Topics	Article	Chapter	Lab	Due	
14	M 11/13	Molecules and logic of regulation of gene expression / GUEST LECTURE	The genetics of resistant malaria	16: Regulation of Gene Expression		Pre-lab 11 (5b)	
	W 11/15	Gene regulation		19: Differential Gene Expression in Development	5b. Molecular and genetic analysis of eukaryotes using PCR genotyping and phenotypes (week 1, Day 1) <i>Tissue samples for PCR, minipreps, streak Pseudomonas. GUEST HELPER</i>		
	F 11/17				5b. Molecular and genetic analysis of eukaryotes using PCR genotyping and phenotypes (week 1, Day 2) <i>Infect plants, review 5a analysis. GUEST HELPER</i>		
Week	Date	Topics	Article	Chapter	Lab	Due	
15	M 11/20	Biotechnology	Harnessing DNA to improve environmental management	Review of labs 1-4	5b. Molecular and genetic analysis of eukaryotes using PCR genotyping and phenotypes (week 2 day 1) <i>Observe infected plants. Set up PCR reactions.</i>		
		DNA technology and its applications		17: Genomes			
		Biotechnology and Molecular Biology concepts:					
		Recombinant protein production		18: Recombinant DNA and Biotechnology			
		UV spectrophotometry					
		Column chromatography					
		Microtiter plate format protein assay					
		SDS-PAGE					
	W 11/22	EXAM 3				EXAM 3	
		Critical examination and analysis of data					
		Genomic DNA extraction					
		Polymerase chain reaction (PCR)					
		Agarose gel electrophoresis					
		Scientific Inquiry					
		Use of the scientific method to test and modify ideas about our understanding of molecular biology concepts					
	F 11/24	THANKSGIVING HOLIDAY - NO CLASS					

Week	Date	Topics	Article	Chapter	Lab	Due
16	M 11/27	Origin and evolution of cellular life and molecular evolution	Persisters Unmasked	4: Nucleic Acids and the Origin of Life		
		Evolution of cells, organelles, tissues, organs, and the molecules involved		24: Evolution of Genes and Genomes		
	W 11/29	GUEST LECTURE?		20: Genes, Development, and Evolution		Review Pre-lab 11 (5b)
		Applications of knowledge of natural selection, evolution in Biotechnology, Molecular Biology		26: Bacteria, Archaea, and Viruses		
	F 12/1	Viral structure and function, Immune System review		42: Immune	5b. (week 2 day 2) Molecular, genetic analysis of eukaryotes using PCR genotyping, phenotypes. <i>Run agarose gels.</i>	Pre-lab 12 (5c, 5d)
17	M 12/4	Review topics as needed	The Cancer Test:		5c. DAY 1 : Inoculate cultures	
	W 12/6	Review topics as needed			5c. DAY 2: Molecular and genetic analysis of prokaryotes using restriction digests, DNA electrophoresis, selective and differential media	
	F 12/8				5c. DAY 3 and 5d. Analysis of natural selection and evolution using comparative sequence analysis	
FINAL Week	M 12/11	EXTRA CREDIT ACTIVITY	Lab 5. Mendelian and Molecular Genetics -Testing hypothesis about relationships between genotypes, gene expression, and measurable pheontypes using classiscal and molecular genetic techinques			
	W 12/13	FINAL EXAM Wednesday 12/13 (9 am-10:50 am)				