

Week	Date	Lecture sequence#	Topics	Lecture sequence
1 pset 1 posted 3/6 Foldit opened 3/11	3/5/13 - 3/11/13	1	Introduction	Motivation/Overview 1. Introduce burning questions of human physiology and medicine 2. Focus on the fundamental, unifying level: cells 3. To understand, we must understand at unifying level: biochemistry 4. Lay out the conceptual triangle and the course
		2	Biochemistry 1	Macromolecules: lipids, carbohydrates 0. Triangle: Biochemistry – purifying an activity 1. Why learn Biochemistry? 2. Atoms relevant to biology, bonds between these atoms 3. Inter-molecular forces 4. Macromolecules in biology 5. Lipids and phospholipids: creating boundaries 6. Carbohydrates: stored energy
2 pset 1 due 3/13 pset 2 posted 3/13	3/12/13 – 3/18/13	3	Biochemistry 2	Proteins and Protein Structure 1. Amazing proteins 2. Primary secondary and tertiary structure and the forces involved 3. Folding
		4	Biochemistry 3	Enzymes 1. Discovery of enzymes in yeast 2. Enzymes catalyze transformations 3. Why does a cell use enzymes?
		5	Biochemistry 4	Pathways: Glycolysis 1. Glycolysis harvests energy from carbohydrates 2. Glycolysis is a pathway of enzymatic steps 3. Energy invested, energy gained 4. Overview of fermentation and respiration
3 pset 2 due 3/20 pset 3 posted 3/20 Foldit closed 3/25 practice problems posted 3/25	3/19/13 - 3/25/13	6	Genetics 1	Mendel 1. Mendel's First Law of Inheritance 2. Definitions 3. Mendel's Second Law of Inheritance 4. Cytology and the choreography of chromosomes 5. Meiosis
		7	Genetics 2	Rediscovery of Mendel and advances by TH Morgan 1. Flies as a model system 2. Morgan's genetic experiments with flies 3. Sturtevant and his insight into the chromosomal theory 4. X-linked, more support for the chromosomal theory

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4 pset 3 due 3/27 Exam 1 posted 3/29	3/26/13 - 4/1/13	8	Genetics 3	Basics of human genetics 1. Limitations 2. Inheritance of single gene traits can be shown as pedigree 3. Autosomal dominant inheritance 4. Autosomal and X-linked recessive inheritance 5. Complexities of genetics – incomplete penetrance 6. Population genetics
		9	Genetics 4	Biochemical Genetics 1. Garrod and inborn errors of metabolism 2. How to use genetics to study biochemistry: mutant hunt 3. Characterizing mutants with test of dominance, complementation, and epistasis
5 Exam I due 4/2 post pset 4 4/3	4/2/13 - 4/8/13	10	Molecular Biology 1	DNA as the hereditary material 1. Value of revisiting experiments 2. Discovery of the transforming principle 3. The structure of DNA 4. DNA replicates in a semi-conservative manner
		11	Molecular Biology 2	Central Dogma: DNA Replication 1. Kornberg and the replicative enzyme 2. Details of DNA replication 3. Fidelity of DNA replication
6	4/9/13 - 4/15/13	12	Molecular Biology 3	Central Dogma: Transcription and Translation 1. Transcription: making RNA copy of DNA 2. Translation: making a polypeptide from RNA 3. Translation details: start/stop, template, ribosome, tRNA, peptide bonds 4. Mutations: changing the DNA can change the polypeptide a little or a lot
		13	Molecular Biology 4	Variations on the Central Dogma 1. Replication in different organisms 2. Transcription in different organisms 3. Translation in different organisms
7 pset 4 due 4/17 post pset 5 4/17	4/16/13 - 4/22/13	14	Molecular Biology 5	A tale of two genes: β-galactosidase and β-globin 1. Putting it all together 2. Gene Structure/Function/Regulation
		15	Recombinant DNA 1	Cloning: Purifying a gene 1. Cutting and pasting molecules of DNA 2. Vectors, transformation and host cells 3. Making a library

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8	4/23/13 – 4/29/13	16	Recombinant DNA 2	Finding a specific gene in the library 1. Cloning by complementation 2. Cloning by expression
		17	Recombinant DNA 3	Analyzing a gene 1. Restriction digestion 2. Sequencing your insert 3. PCR
9 pset 5 due 5/1 Exam 2 posted 5/3	4/30/13 – 5/6/13	18	Genomics 1	Human genome and positional cloning 1. Why was the Human Genome Project launched? 2. Finding markers across the genome for positional cloning 3. Genome assemble and analysis 4. Examples of positional cloning
		19	Genomics 2	Secrets of the human genome Tour of the genome: features Protein-coding/RNA genes/Regulation/Transposons
10 Exam 2 due 5/7 Pset 6 posted 5/8	5/7/13 – 5/13/13	20	Genomics 3	Observing 1. Human genetics: multigenic disease 2. Gene expression: RNA chips 3. Modern genome sequencing 4. New approaches to finding Mendelian diseases
		21	Completing the Triangle	Perturbing the genome to probe function 1. Tagged protein to study localization 2. Knock-out gene to create mutants 3. Sequence modification of gene and knock-in to test structure and function
11	5/14/13 – 5/20/13	22	Rational medicine 1	Familial hypercholesterolemia
		23	Rational medicine 2	Cancer 1
12 pset 6 due 5/22 final posted 5/24 final exam due 5/28	5/21/13 – 5/28/13	24	Rational medicine 3	Cancer 2
		25	Conclusion	The future of biology