Week	2013 Date	Lecture sequence #	Unit	7.00x Lecture Topics	Deep Dives and Lab Videos
1 Pset 1 posted	Tuesday, June 17th – Monday, June 23th	1	Introduction	**Introduction** 1. Medical revolutions in Biology 2. Biological applications in forensics, history, and agriculture. 3. The diversity of life 4. An overview of evolution and a comparison of prokaryotic and eukaryotic cells 5. The fundamental principles and intellectual framework of biology	
		2	Biochemistry	**Biochemistry of life** 1. Framework, Buchner, and Fractionating life 2. Molecular composition of cells 3. Covalent bonds 4. Non-covalent bonds 5. Lipids and phospholipids: creating boundaries 6. High energy molecules: ATP and carbohydrates	DD: Reading Chemical Structures DD: Polarity of Molecules DD: Intermolecular Bonding DD: How to Use the Molecule Editor
2 Pset 1 due Pset 2 posted	Tuesday, June 24th – Monday, June 30th	3	Biochemistry	**Proteins and Protein Structure** 1. Amazing proteins: primary structure 2. Meet the amino acids 3. Secondary structure 4. Tertiary and quaternary structure	LV: Protein Purification–GFP LV: Protein Purification –β-gal LV: X-ray Structure DD: Explore a Protein
		4	Biochemistry	**Enzymes** 1. Design a channel protein 2. Enzymes and biochemical reactions 3. What do enzymes do? 4. How do enzymes work? 5. Influenza virus - tricks of a burglar	
		5	Biochemistry	**Pathways: Glycolysis** 1. The energetics of pathways 2. Logical tricks of pathways 3. Glycolysis: a pathway to break down sugar 4. Regulation of pathways 5. Cellular respiration and fermentation	
3 Pset 2 due Pset 3 posted	Tuesday, July 1st – Monday, July 7th	6	Genetics	**Mendel** 1. Background: Who was Mendel? Why Peas? 2. Mendel's Experiments: controls and crosses 3. Definitions 4. Multiple traits: Mendel's second law 5. Cytology 6. The chromosomal theory of inheritance	DD: Meiosis and Single Genes DD: Meiosis and Independent Assortment DD: Meiosis and Intro to Linkage DD: Recombination DD: Modes of Inheritance with Flies
		7	Genetics	**Rediscovery of Mendel and advances by TH Morgan** 1. Meiosis 2. Fruit flies and linkage 3. Linkage Maps 4. Linkage Mapping 5. Sex chromosomes and sex linkage	

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4 Pset 3 due Pset 4 posted	Tuesday, July 8th – Monday, July 14th	8	Genetics	**Basics of human genetics** 1. X-linked recessive inheritance 2. Autosomal dominant inheritance 3. Autosomal recessive inheritance 4. Real human genetics 5. Garrod and inborn errors of metabolism	DD: Pedigree Analysis
		9	Genetics	**Biochemical Genetics** 0. Garrod, Beadle, Tatum and the link between genetics and biochemistry 1. Yeast as a model organism 2. How to use genetics to study biochemistry: A mutant hunt 3. Tricks of a mutant hunt 4. Characterizing mutants: test of dominance 5. Characterizing mutants: complementation test 6. Characterizing mutants: epistasis test	LV: Yeast in the Lab
5 Pset 4 due Exam 1 posted Exam 1 due	Tuesday, July 15th – Monday, July 21th			**Exam 1**	
		10	Molecular Biology	**DNA as the hereditary material** 1. The Transforming principle 2. Structure of DNA: nucleotides and base-pairing 3. Bacterial viruses 4. DNA structure, the race	DD: Tour of a Nucleotide
		11	Molecular Biology	**DNA Replication** 1. Meselson and Stahl 2. Details of DNA replication 3. Additional details of DNA replication: topography and other enzymes 4. Additional details of DNA replication: fidelity 5. Kornberg's enzyme	DD: DNA Replication
6 Pset 5 posted	Tuesday, July 22nd – Monday, July 28th	12	Molecular Biology	**Central Dogma: Transcription and Translation** 1. RNA 2. Transcription: making RNA copy of DNA 2. Translation: making a polypeptide from RNA 3. Peering back in time.	DD: Transcription and Translation DD: The *lac* Operon DD: Edit a Gene
		13	Molecular Biology	**Variations on the Central Dogma** 1. Replication in different organisms 2. Transcription in different organisms 3. Translation in different organisms	
		14	Molecular Biology	**A tale of two genes: β-galactosidase and β-globin** 1. β-galactosidase in *E. coli* 2. *Lac* operon, lactose regulation 3, *Lac* operon, glucose regulation 4. Hormone receptors in mammals 5. β-globin gene structure.	

				6. β-globin mutations 7. The β-globin region	

7 Pset 5 due Pset 6 posted	Tuesday, July 29nd – Monday, Aug. 4th	15	Recombinant DNA	**Cloning: Purifying a gene** 0. Overview 1. Cutting and pasting molecules of DNA 2. Vectors 3. Transformation of host cells 4. Selection and creating a library	DD: What is an Origin of Replication/ What is a Promoter?
		16	Recombinant DNA	**Finding a specific gene in the library** 0. Review/Overview 1. Tricks for cloning 2. Different cloning vectors and source DNA 3. Finding your gene by complementation 4. Finding your gene by protein expression	LV: Gel Electrophoresis DD: Restriction Enzymes
		17	Recombinant DNA	**Analyzing a gene** 1. Gel electrophoresis 2. DNA sequencing, the concept 3. DNA sequencing, implementation 4. Polymerase Chain Reaction (PCR)	
8 Pset 6 due Exam 2 Posted Exam 2 due	Tuesday, Aug. 5th – Monday, Aug. 11th			**Exam 2**	
9 Pset 7 posted	Tuesday, Aug. 12th – Monday, Aug. 18th	18	Genomics	**Human genome and positional cloning** 0. Recombinant DNA review 1. Finding your gene: human Mendelian diseases 2. Finding markers across the genome for positional cloning 3. The Human Genome Project, genome assembly and analysis 4. Improvements since the Human Genome project 5. Improvements in DNA sequencing	LV: DNA Sequencing
		19	Genomics	**Secrets of the human genome** 1. Tour of the genome: the genomic landscape 2. Evolutionary comparison 3. Evolutionary comparison as a tool for biomedical research 4. DNA polymorphisms within humans	

10	Tuesday, Aug. 19th – Monday, Aug. 25th	20	Genomics	**Observing** 1. DNA polymorphism in medicine: Mendelian disease 2. DNA polymorphisms: polygenic disease 3. RNA variation 4. Protein localization on the genome	
		21	Completing the Triangle	**Perturbing the genome to probe function** 1. Adding and subtracting genes 2. RNA interference 3. Modern genome editing: TALEN proteins and CRSPR	
11 Pset 7 due	Tuesday, Aug. 26th – Monday, Sept. 1th	22	Rational Medicine	**Familial hypercholesterolemia** 1. Heart disease 2. Cholesterol 3. Lipoprotein particles 4. Connections to heart disease 5. Genetics of cholesterol levels 6. Rational therapy for FH heterozygotes 7. Modern strategies: PCSK9 and HDL	
		23		**Cancer** 1. Cancer 2. Regulation of cell growth: growth factors and receptors 3. Regulation of cell growth: Ras 4. Regulation of cell growth: Ras signaling 5. Mutations that cause cancer 6. Anti-cancer therapy	DD: Cancer Biology
		24	Science and Society	**Science and Society** 1. DNA and law 2. Other forensic technologies 3. Gene patenting	
12 Final Exam posted Final Exam due	Tuesday, Sept. 2nd – Monday, Sept. 8th	25		**Final Exam**	

Note:
All problem sets are released on Tuesdays at 15:00 UTC for the weeks indicated.
All problem sets are due on Tuesdays 14:00 UTC for the weeks indicated.
All exams are released on Tuesdays at 15:00 UTC for the weeks indicated.
All exams are due on **Mondays 21:00 UTC** for the weeks indicated.
For more information on conversion of the UTC time to your local time, try this website.
http://www.timeanddate.com/worldclock/converter.html