**AP Biology 2011-2012**

**Instructors**: Samin Houshyar samin@mit.edu

 Georgina Botka shuurei@mit.edu

*Note: If you send us an email you must have* ***DELVE / AP Biology*** *in the subject line, otherwise it may not be answered promptly.*

**Class Website:** <https://esp.mit.edu/teach/Delve/2011-2012/class_docs/4861>

**Class Time**: Sundays 10am – 3pm. You must attempt to arrive on time and to all the classes.

Schedule might vary due to holidays, snow days, etc. Please check the DELVE website for more information.

**Prerequisites**: Chemistry, Biology or Honors Chemistry, Honors Biology

 **Textbook**: Campbell Biology 7th edition

AP Biology is a college level course offered to high school students. We will cover material through readings from the textbook, lectures, quizzes, problem sets, projects and discussions. Since we only have 25-30 class sessions it is essential that students attend all the lectures. If students are comfortable with the basic concepts of AP Biology, we may choose to focus on a few interesting topics that are not covered in depth in the AP curriculum and relate to research at MIT such as cancer and RNAi.

Since time is limited it is possible not to finish the entire AP curriculum, therefor students are responsible for covering those materials themselves. This class is not graded and assignments are not required. It is assumed that the students are mature enough to study on their own and spend a *minimum* of 10 hours per week preparing for the class and the exam.

We will use sample tests and released AP Tests for practice for the AP exam in May.

AP Themes include:

1. Science as a process

2. Evolution

3. Energy Transfer

4. Continuity and change

5. Relationship of Structure to Function

6. Regulation

7. Interdependence in Nature

8. Science, technology, and society

Samin Houshyar and Georgina Botka

Delve 2011/12 AP Biology syllabus

|  |  |
| --- | --- |
| Class | Topics     |
| 9/18/2011         | **Biochemistry I**            -Introduction, presenting the exam format, give resource websites, etc.                    Samin            -review of chemistry background (p. 32-36, 39-43) -properties of water (p. 47-56)-organic chemistry (p. 59-66)                        lipids (p. 74-77)            -nonpolar        -fatty acids        -triglycerides                     -phospholipids                        Gina        carbohydrates (p. 68-74)    -sugar monomers        -disaccharides        -alpha and beta linkages        -starch vs. cellulose                        proteins     (p. 77-85)-made up of amino acids, 21 found in proteins, general formula        -N and C terminus, primary structure        -secondary, tertiary and quaternary structure    -primary sequence determines secondary structure, which determines tertiary (and if applicable, quaternary) structure, which in turn determines function |
| 9/21/2011         | **Biochemistry II**        Samin        membranes (Chapter 7)            -separate cells from environment and contain distinct enzymatic environments within eukaryotes e.g. ER            -fluid mosaic model: phospholipids, proteins, cholesterol, glycoproteins, glycolipids        -selective permeability        -transport e.g. Na+/K+ pump        -osmosis is the movement of water through a semi-permeable membrane    -solutions hypotonic, hypertonic or isotonic with respect to inside of cell-active transport vs. diffusion vs. osmosis                        Gina            enzymes (p. 145-147, 150-157)            -proteins-very specific biological catalysts        -3D structure and amino acid sequence determines specificity        -competitive and non-competitive inhibitors |
| 10/2/2011         | **Cell Biology I**            Gina            -classifying cells (eukaryotic vs prokaryotic) (p. 98-99)                    cellular elements → student presentations-ribosomes            -endoplasmic reticulum: smooth and rough    -nucleus            -Golgi apparatus    -lysosomes        -mitochondria and chloroplast, endosymbiotic theory         |
| 10/9/2011         | **Cell Biology II**                    Gina   (p. 293-306)            -Avery-McLeod-McCarty experiment → transforming principle            DNA        -Hershey-Chase experiment: DNA is the hereditary material        -Watson, Crick, Franklin: structure of DNA. Double helix, nitrogenous bases, phosphate, sugar        -Base pairing        -DNA replication: semiconservative, DNA Polymerase, ligase, RNA polymerase, helicase, topoisomerase, leading and lagging strands, Okazaki fragments                        Samin        Central Dogma (p. 315-324, 328-329)        -DNA → RNA → Protein            -RNA less stable than DNA, U instead of T, ribose instead of deoxyribose, single stranded        -mRNA, tRNA, rRNA    -transcription, complementary base pairing    -ribosomes, codons, genetic code is degenerate-post-transcriptional modifications: poly-A tail, GTP cap, excision of introns-retroviruses, reverse transcriptase-mutations         |
| 10/16/2011         | **Cell Biology III**        Gina        -review main properties of DNA and RNA            -chromosomes: centromeres, telomeres, genes, Down syndrome (trisomy 21)        mitosis    (p. 218-226)        -growth, repair, asexual reproduction-after DNA replication    -\*lots of illustrative diagrams here\*-spindle, centrosomes-cytokinesis            Samin        meiosis    (p. 243-249)    -sexual     reproduction-reduction division    -results in haploid gametes-segregation    -independent assortment    -crossing over-increases variation |