Honors Biology – Unit 7 Objectives

1. Vocabulary: open/closed circulatory system, atrium, ventricle, artery, capillary, vein, valve, cardiac cycle, vena cava, aorta, pulmonary arteries & veins, bicuspid & tricuspid valves, pulmonary & aortic semi-lunar valves, pacemaker, systolic & diastolic blood pressure, erythrocyte, leukocyte, hemoglobin, plasma, lymph, coagulate, platelet, clotting factor, fibrinogen, fibrin, hemophilia, cuticle, lignin, vascular tissue, xylem, phloem, cohesion-tension hypothesis, cohesion, adhesion, pressure-flow hypothesis, source, and sink.

2. Compare and evaluate the three types of circulatory system plans found in vertebrates.

3. Label a diagram of a human heart (including valves and attached vessels) and indicate the order of blood flow (including body regions) if given a starting location in the heart (ex: right atrium, pulmonary veins, semi-lunar valve, etc.).

4. Compare the structure of arteries, veins, and capillaries. Relate these structural characteristics to their function. Identify them correctly given a prepared, positioned, focused microscope & slide.

5. Explain how blood pressure is measured in terms of equipment use and events in the heart and brachial artery.

6. Describe events that lead to blood coagulation.

7. List the four main parts of blood and give their function(s).

8. Explain the significance of four adaptations that allowed plants to colonize the land. (Which adaptations are possessed by vascular & non-vascular plants? Limitations?)

9. Differentiate between xylem and phloem (what they transport, in what direction(s), and methods used). Identify them correctly given a prepared, positioned, focused microscope & slide.

Honors Biology – Unit 8 Objectives

1. Vocabulary: cell cycle, mitosis, interphase, G1, R, S, G2, G0, restriction point, nuclear division, cytokinesis, replication, 3', 5', replication origin, DNA polymerase, helicase, primase, ligase, replisome, primer, Okazaki fragment, leading strand, lagging strand, chromosome, mutation, mutagen, excision repair, base pair, sister chromatids, centromere, chromosome segregation, mitotic spindle, spindle poles, kinetochore, prophase, metaphase, metaphase plate, anaphase, telophase, cell plate, microtubule, cyclin, kinase, checkpoint, cell cycle arrest, protooncogene, oncogene, tumor suppressor gene, cancer, & metastasis.

2. Differentiate between interphase, mitosis, and cell cycle.

3. Sketch a model of the cell cycle, label each significant point/stage, and briefly describe their function(s).

4. Replicate a given sequence of DNA:
   a. indicate the location of one or more replisomes;
   b. label the 3' and 5' ends of the old and/or new DNA;
   c. sketch in an appropriate leading and lagging end (inc. fragments);
   d. describe the roles played by the enzymes involved.

5. From scratch, sketch a short section of DNA depicting its full nucleotide structure so hydrogen bonds and the 3'/5' ends are convincingly displayed and labeled.

6. Label (pictures and/or indicated cells on a 'scope), describe, and / or sketch a cell in any stage of mitosis and briefly explain the significance of that stage.

7. Describe the experiments that lead to the discovery of the actions of kinetochores, the semi-conservative model of DNA replication, and cyclin-kinase control of the cell cycle. What were the results? What did the evidence prove / disprove?

8. Explain the relationship between cyclins, kinases, and their control of the cell cycle. Tie this into the activity levels of tumor suppressor proteins, proto-onco proteins, and checkpoint proteins.

9. Use the terms protooncogene and tumor suppressor gene to explain how cancer can develop. Explain what a tumor is, how it interferes with the body, and what metastasis is.

Honors Biology – Unit 9 Objectives

1. Vocabulary: mRNA, tRNA, rRNA, transcription, translation, RNA polymerase, ribosome, ribosomal subunit, initiation, elongation, termination, promoter region, coding sequence region, terminator region, protein coding strand, start codon, stop codon, codon, primary transcript, mature RNA, anticodon, mG, poly A tail, intron, exon, splicing, amino acid binding site, charged/uncharged tRNA, A site, P site, E site, signal sequence, reading frame, frame shift, virus, lytic, and lysogenic.

2. Describe what happens in each stage of transcription.

3. Given a primary transcript, explain and/or sketch what modifications must be made to make it into mature mRNA, tRNA, and/or rRNA.

4. Given a mature strand of mRNA, describe the translation events that will create a protein. Include relevant details concerning codons, anticodons, ribosomal sites, etc.

5. Given a mature strand of mRNA, use a table to determine the order of amino acids it codes for.

6. Given a series of amino acids and relevant information regarding their structure and properties, show how functional groups interact to join the amino acids together and predict aspects of protein bending by using the affinity of each R group to its neighbors and the surrounding aqueous environment.

7. Compare and contrast the lytic and lysogenic methods of viral reproduction. Which aspect of their reproduction is used in biotechnology?

Honors Biology – Unit 10 Objectives

1. Vocabulary: clone, diploid, haploid, n, 2n, homologous chromosomes, somatic cell, gamete, ovum, sperm, meiosis, first & second meiotic divisions, crossing-over, polar bodies, Mendel, Mendel's "factor," allele, gene, genome, monohybrid cross, parental generation, first filial, second filial, dominant, recessive, principle of segregation, principle of independent assortment, genotype, phenotype, homozygous, heterozygous, progeny, dihybrid cross, X & Y chromosomes, incomplete dominance, codominance, multiple alleles, linked genes, sex (X) linked traits, nondisjunction, multigene trait, and multifactorial.

2. Compare and contrast the processes and results of mitosis and meiosis.

3. Explain and illustrate how both meiosis and Punnett squares demonstrate Mendel's principles of segregation and independent assortment.

4. Assume the persona of Gregor Mendel. Explain to someone else in the 1860's how the data you have gathered is explained by your principles. Do not use modern vocabulary (gene, allele, chromosome, meiosis, etc.).

5. Figure probabilities, genotypic ratios, and phenotypic ratios for given genetics problems. Any type of inheritance we practiced is fair game, both as monohybrid and dihybrid crosses.

6. Given a scenario depicting crosses and phenotypic ratio evidence, determine the type of inheritance exhibited. (codominant, sex-linked, linked genes, etc.)

7. Given linkage group characteristics and the phenotypic distribution of offspring, determine parental genotypes and the distance between the linked genes expressed as a % chance for crossing over.

8. Given phenotypic frequencies in a population, use the Hardy-Weinberg equation to calculate allele frequencies and predict the number of the population that are homozygous dominant and heterozygous for the trait.

Honors Biology – Unit 13 Objectives

1. Vocabulary: abiotic factor, biotic factor, trophic level, 10% rule, biomass, productivity, energy pyramid, niche, competitive exclusion principle, symbiosis, mutualism, parasitism, commensalism, biogeochemical cycle, carbon cycle, nitrogen cycle, water cycle, limiting factor, carrying capacity, exponential growth, linear growth, logistic growth, population density, boom-and-bust cycle, predator-prey cycle, biome, colonize, exotic (invasive) species, succession, primary succession, secondary succession, annuals, and climax community.

2. Construct an energy pyramid that accurately depicts the energy relationships between trophic levels.

3. Illustrate and explain the workings of the carbon, nitrogen, and/or water cycle.

4. Classify described relationships between organisms as examples of mutualism, parasitism, or commensalism.

5. Describe the process of succession from bare rock to an appropriate climax community. Explain why succession stops at the level of climax community.

6. Explain how evolution, through natural selection to different abiotic environments, produces trade-offs involving an organism's ability to tolerate extreme environments.

7. Describe conditions that lead to exponential growth, logistic growth, boom and bust cycles, and predator prey cycles.

8. Explain why some exotic species are able to dominate the ecosystems they invade.

Honors Biology
Unit 13 Objectives

1. Vocabulary: Darwin, natural selection, decent with modification, hypothesis, theory, law, microevolution, macroevolution, species, local population, population genetics, gene pool, allele frequency, polymorphic, Hardy-Weinberg model, gene flow, genetic drift, founder effect, population bottleneck, inbreeding, inbreeding depression, artificial selection.

3. Explain the concept of natural selection in terms of resources, variation, mutation, allele frequencies, and adaptation to the environment.

4. Given information concerning a change in allele frequencies within a population, use the concept of equilibrium to explain the frequency change in light of local environmental conditions.

6. Given phenotypic frequencies in a population, use the Hardy-Weinberg principle to calculate allele and genotypic frequencies of sample populations. Tie the use of this principle into the measurement of microevolution.

7. Describe the consequences of natural selection, genetic drift, gene flow, and mutation on small and large populations.

Honors Biology – Unit 11 Objectives

1. Vocabulary: Human Genome Project, functional genomics, DNA sequencing, restriction enzymes, gene splicing, target DNA, restriction enzyme, sticky vs. blunt ends, recombinant DNA, polymerase chain reaction (PCR), Taq polymerase, denature, anneal, elongation, restriction fragment length polymorphism (RFLP), electrophoresis, Southern blot, probe, gene therapy, germ-line therapy, somatic therapy, vector, & single nucleotide polymorphism (SNP).

2. Explain how the process of electrophoresis works and perform RFLP analysis by examining a stained gel.

3. Describe the Southern blot technique and explain why it is necessary for DNA fingerprinting.

4. Given a gene and target DNA, evaluate restriction enzymes to determine which will be best suited for the procedure. Describe why your choice is best.

5. Perform and/or describe DNA sequencing in any of the following ways:
   a) Describe how to set up the technology (stop nucleotides, etc.) and what the results will be.
   b) Given a series of colored bands on a gel, determine the length and sequence of all the fragments on the gel.
   c) Given fragments of various lengths and colors, predict the banding pattern produced by electrophoresis.

6. Describe how to conduct a PCR cycle and explain its "exponential" nature.

7. Describe what gene therapy is and how it is done. Also explain the difference between the end results of germ-line and somatic gene therapy.

8. Explain the importance of sequencing more than one restriction enzyme digest when trying to assemble chromosomal fragments into the correct genomic order.

9. Given the electrophoresis results of standard fragments and a plasmid digested with various restriction enzymes, create a map of the plasmid that shows the location of and distance between each recognition site.