Honors Biology – Course Overview

First Quarter

I. The Science of Life - Introduction
   A. Characteristics of Living Things
   B. Science Methods used in Life Science
   C. Importance of Data Verification
   D. The Tools of Biology
   E. Science and Ethics

II. Chemistry
   A. Atomic Structure
   B. Bonding (Ionic, Covalent, Hydrogen)
   C. Properties of Water
   D. Acids and Bases

III. Biochemistry
   A. Carbohydrates
   B. Lipids
   C. Proteins/Enzymes
   D. Nucleic Acids
   E. Minerals
   F. Vitamins
   G. Cells exist in a narrow range of conditions (Temperature, pH)

BIOLOGICAL MOLECULES BENCHMARK

END OF FIRST QUARTER

Second Quarter

IV. Cell Biology
   A. History (…including the Cell Theory)
   B. Cell Structure and Function
   C. Diversity (Specialization) of Cells
   D. Roles of Systems (Excretory, Circulatory, Skeletal/Muscular, Endocrine, Nervous/Sensory, Respiratory, Digestive, Reproductive, Lymphatic, Integumentary)
   E. Dissection – Lab Practical

V. Cell Transport
   A. Cell Membrane Structure
   B. Passive Transport (Diffusion, Osmosis)
   C. Active Transport (Endocytosis, Exocytosis)
   D. Maintaining Homeostasis

VI. Energy Transfer in Cells
   A. Photosynthesis
   B. Cellular Respiration

VII. Cell Reproduction
   A. Chromosomes (Karyotypes)
   B. The Cell Cycle
   C. Mitosis

CELLS AND ORGANISMS BENCHMARK

END OF FIRST SEMESTER

Third Quarter

VII. DNA and Protein Synthesis
   A. Structure of DNA, RNA, and Protein
   B. Replication, Transcription, and Translation
   C. Gene Mutation

VIII. Genetics
   A. History (including Mendel's Three Principles)
   B. Meiosis (link to Sexual Reproduction)
   C. Fertilization
   D. Analyzing Genetic Crosses
      1. Monohybrid
      2. Dihybrid
      3. Co/incomplete dominance
      4. Sex-linkage
   E. Human Genetics
      1. Pedigrees
      2. Analyzing Karyotypes
      3. Chromosomal Mutations

IX. Genetic Engineering
   A. Gel Electrophoresis
   B. Recombinant DNA
   C. Cloning
   D. Gene Splicing
   E. Benefits and Consequences of Genetic Engineering

INHERITANCE OF TRAITS BENCHMARK

END OF THIRD QUARTER

Fourth Quarter

X. Evolution
   A. History (including Darwin’s Theory of Natural Selection)
   B. Artificial and Natural Selection
   C. Adaptation, Variation
   D. Cladistics
   E. Evolutionary Relationships (Anatomical Similarities/Embryological & Biochemical Comparisons – DNA & Amino Acid Sequences & Analyzing Results from Gel Electrophoresis

XI. Classification
   A. History of Taxonomy
   B. Linnaeus and Binomial Nomenclature
   C. Modern Classification (Three Domains and Six Kingdoms)
   D. Dichotomous Keys

XII. Ecology
   A. Abiotic/Biotic Factors
   B. Biotic Relationships (Predator-Prey, Parasite-Host, Mutualism, Commensalism, Competition)
   C. Transfer of energy (Producers, Consumers, Trophic Levels)
   D. Succession
   E. Biogeochemical Cycles (Water, Nitrogen, and Carbon) – Photosynthesis & Cellular Respiration (ATP)
   F. Factors Influencing Populations (Urbanization/Population Increase, Pollution, Natural Disasters, Disease, Food Depletion, Destruction of Habitat)

EVOLUTION AND INTERDEPENDENCE OF ORGANISM BENCHMARK

END OF SECOND SEMESTER