Course Title: Biology Honors

Course #: 1513-1514

Course Description: This course will prepare students for taking AP Biology. Approval from the Science Department Chair required. Honors Biology is a rigorous, accelerated laboratory science course, which focuses on investigating major biological concepts. Emphasis will be placed on developing critical thinking as applied to ecology, biomolecules and cell function, cellular energy, genetics, and evolution. The course is open to students who will continue with Advanced Placement sciences at Cathedral.

Local Honors weight only, not UC/CSU approved as an Honors course.

UC/CSU Approval: “d” approved

Grade Level: 9

Estimated Homework Per Week: 2-3 hrs

Prerequisite: Incoming Freshman - qualifying score on the High School Placement Test and concurrent enrollment in Algebra I or higher math.

Recommended Prerequisite Skills: Strong foundations in: critical reading at grade 10 level or above, note taking skills, basic knowledge of chemistry (periodic table, chemical reactions), measurements, the metric system, and applying the scientific method (formulating a hypothesis, conducting research, collecting data, and drawing conclusions from data).

Course Grade Categories:
- Homework/Classwork 10%
- Labs and Projects 25%
- Quizzes and Tests 50%
- Final Exam 15%

Major Assessments/Units/Topics:
Unit 1 - Biology - Exploring Life
- Order, reproduction, growth and development, energy processing, regulation, response to the environment. evolutionary adaptation.
- Qualitative and quantitative measurements
- Applying the scientific method
- independent and dependent variable, control group, data, sources of error, conclusion
- Metric measurements and conversions

**Unit 2 - Ecology**
- Ecology, biotic factors, abiotic factors, organization of the biosphere
- Historical environmental problems and the modern environmental movement
- Trophic structure in food chains and energy pyramids
- Energy flow through ecosystems
- Chemical cycling in the biosphere
- Primary productivity and biomass in ecosystems
- Anthropogenic effects on the biosphere

**Unit 3 - Chemistry The Basis of Life**
- Chemistry review, atoms, water, bonding, valence numbers.
- Basics of biochemistry, carbon, functional groups
- Macromolecules, polymers, monomers, dehydration reaction, hydrolysis
- Saccharides, lipids, proteins, nucleic acids
- Protein structure and function, primary structure, secondary structure, hydrogen bonds, tertiary structure, quaternary structure
- Enzymes, activation energy, substrate, active site, induced fit

**Unit 4 - The Working Cell**
- Cell theory, organelles and functions, surface to volume ratio
- The fluid mosaic model of the plasma membrane, selectively permeable
- Passive diffusion, concentration gradient, passive transport
- Solutions, tonicity, isotonic, hypotonic, hypertonic
- Facilitated diffusion, aquaporin
- Active transport, exocytosis, endocytosis, phagocytosis, receptor mediated endocytosis

**Unit 4 - Cells Energy**
- ATP, phosphorylation
- Photosynthesis, electromagnetic spectrum, photons
- Light reactions, Calvin cycle, carbon fixation
- Cellular respiration, glycolysis, citric acid cycle, oxidative phosphorylation
- Lactic acid fermentation, alcohol fermentation

**Unit 5 - Cellular Reproduction**
- Cell division, chromosomes
- Asexual and sexual reproduction, zygote
- Mitosis, meiosis
- Binary fission
- Anchorage dependence, density dependent inhibition, growth factor
- Tumor, benign tumor, malignant tumor, metastasis

**Unit 6 - Molecular Biology of the Gene**
- Historical experiments from Griffith, Hershey and Chase, Morgan
- Model building of Watson and Crick, sugar-phosphate backbone, nitrogenous bases and base pair rule
- DNA replication
- Gene expression, transcription, mRNA editing
- Translation, ribosome
- Protein editing
- Epigenetics

**Unit 7 - Patterns of Inheritance**
- Mendelian genetics, monohybrid cross, dihybrid cross
- Testcross, calculating probability, pedigree analysis
- Genetic disorders, incomplete dominance, multiple alleles, pleiotrophy, polygenic inheritance, sex-linked disorders

**Unit 8 - How populations evolve**
- Darwin's voyage, natural selection
- Evidence for evolution
- Evolutionary tree
- Populations, Hardy-Weinberg calculations
- Genetic drift
- Speciation, geographic isolation, reproductive barriers
- Lactose persistence