

**URBANDALE COMMUNITY SCHOOL DISTRICT  
CURRICULUM FRAMEWORK OUTLINE**

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**SUBJECT:** Science  
**COURSE TITLE:** College AP Biology  
**GRADE LEVEL:** 2 Credits  
**PREREQUISITES:** C or better in Biology and C or better in Chemistry, or teacher approval

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**COURSE DESCRIPTION:**

This is a college level biology course. It covers a full range of concepts from microbiology to macro-biology. First semester will focus on microbiology, such as biochemistry, cell biology, biochemical pathways, genetics, and heredity. Second semester will emphasize macro-biology, such as evolution, taxonomy and classification of species, and the structure and physiology of plants and animals. A fundamental understanding of chemistry concepts is important to a student's success in this class. In order to receive college credit, an AP College Board exam must be taken. The exam is given in May and a student's score on the exam determines the amount of college credit a school will grant the student.

**CONTENT STANDARDS:**

In order that our students may achieve the maximum benefit from their talents and abilities, the students of Urbandale Community School District's AP Biology should be able to . . .

**Content Standard I. Understand and apply the concepts of life science.**

Benchmarks:  
Discuss the role of evolution in our understanding of life.  
Explain energy transfer on both a microscopic and macroscopic scale.  
Formulate examples of continuity and change within life on earth.  
Defend the biological relationship of structure and function.  
Discuss mechanisms involved in the regulation of living organisms.  
Summarize interdependence in nature.  
Connect the ideas of science, technology, and society.

**Content Standard II: Understand and apply the concepts of earth and space science.**

*Not addressed in this course.*

**Content Standard III: Understand and apply the concepts of physical science.**

*Not addressed in this course.*

**Content Standard IV. Understand and apply the concepts of health science.**

*Not addressed in this course*

**Content Standard V: Understand and apply the scientific method.**

Benchmarks:  
Deduce the importance of science as a process.  
Hypothesize and develop experiments to test those hypotheses.  
Assess laboratory data.  
Communicate the outcomes of an experiment.



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**CONTENT STANDARDS AND COURSE BENCHMARKS WITH INDICATORS FOR  
AP BIOLOGY**

**Standard I. Understand and apply the concepts of life science. The students in AP Biology should be able to . . .**

**Benchmark: Discuss the role of evolution in our understanding of life.**

- Indicators:
- Discuss how chemical evolution on a young Earth set the stage for the origin of life. (A)
  - Compare the structural and biochemical adaptations for photosynthesis found in C<sub>4</sub> and CAM plants. (A)
  - Defend how mutations and genetic recombination generates heritable variation that is subjected to natural selection. (A)
  - Summarize how a population must adapt, migrate or die when its local environment changes unfavorably. (A)
  - Explain how the system of taxonomy used by most biologists today reflects our current understanding of phylogenetic relationships among organisms. (D)

- Assessments:
- District Assessment
  - Multiple choice test
  - Laboratory experiments and reports
  - Essay responses
  - Weekly Quizzes
  - Theme portfolio

**Benchmark: Explain energy transfer on both a microscopic and macroscopic scale.**

- Indicators:
- Dissect the process of plants transforming light energy into chemical energy. (A)
  - Explain how a proton gradient across membranes powers the synthesis of ATP in mitochondria, chloroplasts, and prokaryotes. (A)
  - A cell must spend energy to organize monomers into complex macromolecules. This includes replication, transcription, and translation. (A)
  - Discuss the movement of energy from producers to consumers in an ecosystem. (D)
  - Explain how ion pumps in membranes reestablish a resting state following a neuron firing an impulse or a muscle contraction. (D)

- Assessments:
- District Assessment
  - Multiple choice test



Laboratory experiments and reports  
Free response questions  
Weekly Quizzes  
Theme portfolio

**Benchmark: Formulate examples of continuity and change within life on earth.**

Indicators: Explain how replication clones the cell's DNA during interphase. (A)  
Discuss how the process of mitosis allows for genetic continuity from generation to generation while at the same time, through mutation, it provides for diversity. (A)  
Deduce how the process of meiosis creates genetic variation through three means: independent assortment of chromosomes, crossing over, and random fertilization of gametes. (A)  
Explain the changes in gene pools over time in part by natural selection. (A)  
Determine how homologous structures are variations on a common ancestral prototype. (D)  
Explain how organogenesis results from differential gene activation in various regions of an embryo at various times. (D)

Assessments: District Assessment  
Multiple choice test  
Laboratory experiments and reports  
Free response questions  
Weekly Quizzes  
Theme portfolio and reports

**Benchmark: Defend the biological relationship of structure and function.**

Indicators: Distinguish changes in molecule behavior due to various functional groups. (D)  
Compare the structures and consequent functions of a mitochondrion and chloroplast. (A)  
Infer that the complementary nature of the two DNA strands explains replication. (A)  
Discuss the importance in increasing surface area in benefiting the function of a cell, tissue or organ. (A)

Assessments: District Assessment  
Multiple choice test  
Laboratory experiments and reports  
Free response questions  
Weekly Quizzes  
Theme portfolio and reports

**Benchmark: Discuss mechanisms involved in the regulation of living organisms.**



Indicators: Investigate the flow of molecules across the membrane in maintaining a favorable intracellular environment. (A)  
Explain how regulator molecules in the cell interact with some enzymes and control their activity by changing the shape of the enzymes. (D)  
Discuss the role of cell communication in controlling cell activity, such as transcription of proteins. (D)  
Consider how predation of the most common or average phenotype creates balanced polymorphism by allowing two or more alleles to stay within a gene pool for a trait. (A)  
Summarize how the nervous and endocrine systems mediate an animal's responses to changes in the environment. (A)

Assessments: District Assessment  
Multiple choice test  
Laboratory experiments and reports  
Free response questions  
Weekly Quizzes  
Theme portfolio and reports

**Benchmark: Summarize interdependence in nature.**

Indicators: Simplify the metabolic processes of photosynthesis and cell respiration to show they are mutually symbiotic. (A)  
Explain how energy for many biosynthetic processes is provided by the hydrolysis of ATP. (A)  
Infer how an organism's phenotype is the synergistic product of genes and environment. (A)  
Generalize how the sporophyte and gametophyte generations of a plant are interdependent. (D)  
Discuss how competition, predation, and parasitism between populations in a food web contribute to the stability of an ecosystem. (D)

Assessments: District Assessment  
Multiple choice test  
Laboratory experiments and reports  
Free response questions  
Weekly Quizzes  
Theme portfolio and reports

**Benchmark: Connect the ideas of science, technology, and society.**

Indicators: Argue that advances in cancer research depend on progress in our basic understanding of how cells work. (A)  
Determine how new techniques in microscopy have led us to a better understanding of basic cell structure and function. (A)  
Debate the effect of DNA technology on society, from promising health advances to new ethical issues arising from the science. (D)



Assess the human impact on the biosphere using basic ecological principals. (D)

Assessments: District Assessment  
Multiple choice test  
Laboratory experiments and reports  
Free response questions  
Weekly Quizzes  
Theme portfolio and reports

**Standard II: Understand and apply the concepts of earth and space science.**  
*Not addressed in this course.*

**Standard III: Understand and apply the concepts of physical science.**  
*Not addressed in this course.*

**Standard IV. Understand and apply the concepts of health science.**  
*Not addressed in this course*

**Standard V: Understand and apply the scientific method . . . The students in AP Biology should be able to . . .**

**Benchmark: Deduce the importance of science as a process.**

Indicators: Critique long-term ecological research and the lessons it teaches about human impact on the biosphere. (D)  
Discuss scientists and their discoveries that led to our knowledge of DNA as a heredity material. (A)  
Summarize the discoveries that led to the current fluid mosaic model of a cell membrane. (A)  
Discuss how the invention and improvement of the microscope impacts our understanding of cell structures and functions. (A)

Assessments: District Assessment  
Laboratory experiments and reports  
Posters and collages  
Timeline construction

**Benchmark: Hypothesize and develop experiments to test those hypotheses.**

Indicators: Design procedures to test a hypothesis for a given science problem. (A)  
Perform laboratory experiments safely and accurately. (A)

Assessments: District Assessment  
Lab planning sheets  
Teacher observation

**Benchmark: Assess laboratory data.**



Indicators: Verify the value of data collected. (A)  
Summarize patterns found in data relationships. (A)  
Construct graphs from data. (A)

Assessments: District Assessment  
Analysis questions  
Results section of lab report

**Benchmark: Communicate the outcomes of an experiment.**

Indicators: Construct a laboratory report following the correct scientific format. (A)  
Conclude if the hypothesis was correct and use data to support the conclusion. (A)  
Recommend changes in laboratory procedure and further experiments needed based on data collected. (A)

Assessments: District Assessment  
Lab report rubric  
Discussion section of lab report

No student enrolled in the Urbandale Community School District shall be excluded from participation in, be denied the benefits of, or be subjected to discrimination in the District's programs on the basis of race, color, creed, sex, religion, marital status, ethnic background, national origin, disability, sexual orientation, gender identity, or socio-economic background. The policy of the District shall be to provide educational programs and opportunities for students as needed on the basis of individual interests, values, abilities and potential.

