

CHINO VALLEY UNIFIED SCHOOL DISTRICT
INSTRUCTIONAL GUIDE
BIOLOGY ADVANCED PLACEMENT

Course Number	5406
Department	Science
Suggested guidelines	B or better in English 9 or 10 H, B or better in Chemistry or teacher recommendation
Length of Course	Two (2) semesters/One (1) year
Grade Level	11-12
Credit	5 units per semester/10 total credits - life science
Repeatable	Not repeatable for credit
UC/CSU	Meets "d" laboratory science requirement
Board Approved	November 6, 2008

Description of Course - Biology Advanced Placement (AP) includes those topics regularly covered in a college biology course for majors: molecules and cells, heredity and evolution, and organisms and populations. The Biology (AP) course differs significantly from the usual high school course with respect to the kind of textbook used, the range and depth of topics covered, the kind of laboratory work done by students, and the time and effort required of students. This course utilized the Biology (AP) curriculum provided by the College Board.

Rationale for Course - The Biology AP course is designed to be the equivalent of a college introductory biology course usually taken by biology majors during their first year of college. By taking the course and passing the Biology AP examination, some students, as college freshmen, are permitted to enroll in upper-level courses in biology or to register for courses for which biology is a prerequisite.

Student Selection - Admission to an AP course should depend on the student interest in the subject as well as on such formal credentials as an outstanding record of academic performance. Many highly motivated students with less-than-outstanding records have successfully completed AP courses and have obtained college credit, advanced placement, or both, through an AP Examination.

Standard 1- Chemistry of Life

1.1 Objective: Be able to describe the relationship of water, acids and bases, and energy to biochemical processes.

1.1.1 Performance Indicator: Students will be able to describe how structure of water molecules relates to properties of water.

- 1.1.2 Performance Indicator: Students will be able to relate properties of water to survival of organisms.
- 1.1.3 Performance Indicator: Students will be able to relate hydronium ion concentration to pH value and neutralization reactions.
- 1.1.4 Performance Indicator: Students will be able to describe how buffer systems work.
- 1.1.5 Performance Indicator: Students will be able to relate the role of buffers in maintaining homeostasis.
- 1.1.6 Performance Indicator: Students will be able to relate structure of proteins to various functions within organisms.
- 1.1.7 Performance Indicator: Students will be able to relate enzyme structure to function.
- 1.1.8 Performance Indicator: Students will be able to describe free energy changes.

Standard 2 - Structure and Function of Cells

- 2.1 Objective: Be able to describe cellular structure and processes as they relate to the function of the cell.
 - 2.1.1 Performance Indicator: Students will be able to describe the Cell Symbiosis Hypothesis.
 - 2.1.2 Performance Indicator: Students will be able to describe the process of cellular respiration, relating role of intermediate products to final products.
 - 2.1.3 Performance Indicator: Students will be able to relate structure of mitochondria to Krebs

Cycles and chemiosmosis.

- 2.1.4 Performance Indicator: Students will be able to relate structure of chloroplasts to phases of photosynthesis.
- 2.1.5 Performance Indicator: Students will be able to observe chloroplast pigments from paper chromatography studies.
- 2.1.6 Performance Indicator: Students will be able to describe the process of photosynthesis, relating the light phase products to the dark phase reactant and products.

- 2.1.7 Performance Indicator: Students will be able to relate the history of photosynthesis research to the process of science through the work of key plant physiologists.
- 2.1.8 Performance Indicator: Students will be able to relate photosynthesis and cellular respiration to the first and second laws of thermodynamics.
- 2.1.9 Performance Indicator: Students will be able to describe how water potential affects movement of water across cell membranes, using equations, based on laboratory data.
- 2.1.10 Performance Indicator: Students will be able to describe how sexual reproduction in diploid organisms is dependent on meiosis.
- 2.1.11 Performance Indicator: Students will be able to describe differences in spermatogenesis and oogenesis in mammals.
- 2.1.12 Performance Indicator: Students will be able to relate meiosis to specific events to compare life cycles of various protists, fungi, plants, and animals.
- 2.1.13 Performance Indicator: Students will be able to identify gametophytes and sporophytes, based on role in life cycles of plants.
- 2.1.14 Performance Indicator: Students will be able to relate chromosomal anomalies to timing of nondisjunction during gamete formation.
- 2.1.15 Performance Indicator: Students will be able to produce karyotypes of chromosomal anomalies, describing symptoms and prognosis for the individual.
- 2.1.16 Performance Indicator: Students will be able to describe factors involved in enhancing genetic diversity and the potential for increased survival in a changing environment.
- 2.1.17 Performance Indicator: Students will be able to calculate for *Sordaria* a map distance for a chromosome, based on data collected from asci counts achieved from cultured crosses.

Standard 3 - Genetics

- 3.1 Objective: Be able to describe genetic processes as they relate to viruses and bacteria as well as the role of DNA and RNA in replication.
 - 3.1.1 Performance Indicator: Students will be able to describe genetics of viruses and bacteria in microbial models.

- 3.1.2 Performance Indicator: Students will be able to Relate RNA processing to protein synthesis.
- 3.1.3 Performance Indicator: Students will be able to describe control of gene expression in prokaryotes and eukaryotes.
- 3.1.4 Performance Indicator: Students will be able to relate knowledge gained from the Human Genome Project to understanding human genetic disorders, identifying mutations and mode of inheritance of disorders.
- 3.1.5 Performance Indicator: Students will be able to Describe DNA technology for basic research and commercial applications.
- 3.1.6 Performance Indicator: Students will be able to conduct electrophoresis investigations for protein identification and DNA analysis.
- 3.1.7 Performance Indicator: Students will be able to Conduct fruit fly genetics crosses and analyze data to support the mode(s) of inheritance that are operating.

Standard 4 - Evolution and Biodiversity

- 4.1 Objective: Be able to describe and discuss evolutionary process and biodiversity.
 - 4.1.1 Performance Indicator: Students will be able to relate homologies of embryos, skeletons, and biomolecules to evidence for evolution.
 - 4.1.2 Performance Indicator: Students will be able to describe how punctuated equilibrium influences evolution.
 - 4.1.3 Performance Indicator: Students will be able to calculate Hardy-Weinberg values for q and p and frequencies of homozygous dominant and heterozygous individuals in populations.
 - 4.1.4 Performance Indicator: Students will be able to show how values of q and p for a population support or refute that evolution is occurring in a population.
 - 4.1.5 Performance Indicator: Students will be able to show how selection, migration, mutation, non-random mating affect stability of a gene pool.
 - 4.1.6 Performance Indicator: Students will be able to describe the process of speciation. Relate how Darwin's finches illustrate principles of evolution.
 - 4.1.7 Performance Indicator: Students will be able to show relationships between available niches and biodiversity. Relate how loss of biodiversity has far-reaching consequences for life on Earth.

- 4.1.8 Performance Indicator: Students will be able to show how systematic change connects biological diversity to phylogeny.
- 4.1.9 Performance Indicator: Students will be able to compare and contrast allopatric and sympatric speciation.
- 4.1.10 Performance Indicator: Students will be able to show effect of genetic drift on a small population's gene pool.
- 4.1.11 Performance Indicator: Students will be able to relate ideas about evolution to a new synthesis for understanding the process of evolution.

Standard 5 - Human Anatomy and Physiology

- 5.1 Objective: Be able to describe various functions and structures of the human body.
 - 5.1.1 Performance Indicator: Students will be able to show examples of ratios of surface area-to-volume.
 - 5.1.2 Performance Indicator: Students will be able to relate examples of efficient surface area to volume ratios to well-adapted organism functioning.
 - 5.1.3 Performance Indicator: Students will be able to demonstrate physiology of the circulatory system via laboratory investigations that measure blood pressure, effects of exercise on heart rate, effects of temperature on heart rate.
 - 5.1.4 Performance Indicator: Students will be able to relate kidney function and homeostasis.
 - 5.1.5 Performance Indicator: Students will be able to show how the endocrine system helps control the internal environment.
 - 5.1.6 Performance Indicator: Students will be able to relate the role of hormones in regulation.
 - 5.1.7 Performance Indicator: Students will be able to describe nonspecific defenses of the immune system.
 - 5.1.8 Performance Indicator: Students will be able to describe humoral and cell-mediated immunity.
 - 5.1.9 Performance Indicator: Students will be able to describe the production and function of antibodies.

5.1.10 Performance Indicator: Students will be able to describe the role of neurotransmitters in regulation.

5.1.11 Performance Indicator: Students will be able to describe specific diseases that interfere with normal physiology.

Standard 6 - Ecology

6.1 Objective: Be able to describe principles of ecology as they relate to energy, biogeochemical cycles, photosynthesis and respiration.

6.1.1 Performance Indicator: Students will be able to relate the first and second laws of thermodynamics to principles of ecology.

6.1.2 Performance Indicator: Students will be able to describe biogeochemical cycles and roles of organisms within them.

6.1.3 Performance Indicator: Students will be able to relate dissolved oxygen concentration to the processes of photosynthesis and respiration.

6.1.4 Performance Indicator: Students will be able to show how primary productivity is related to rates of photosynthesis and respiration.

6.1.5 Performance Indicator: Students will be able to show effect of varying light intensity and/or inorganic nutrient concentrations on primary productivity in a controlled experiment.

Standard 7 - Plant Anatomy and Physiology

7.1 Objective: Be able to identify and describe various functions of plant anatomy and physiology.

7.1.1 Performance Indicator: Students will be able to separate plant pigments by chromatography; calculate R_f values.

7.1.2 Performance Indicator: Students will be able to determine photosynthetic rate by varying light intensity, wavelength of light, and temperature in controlled investigations.

7.1.3 Performance Indicator: Students will be able to relate cell structure to role of plant organs for plant survival. - Compare structure and function of cells and tissues for angiosperms.

7.1.4 Performance Indicator: Students will be able to identify cells and tissues during laboratory investigations.

- 7.1.5 Performance Indicator: Students will be able to describe water transport by cohesion-tension.
- 7.1.6 Performance Indicator: Students will be able to investigate transpiration rates.
- 7.1.7 Performance Indicator: Students will be able to describe organic nutrient transport by pressure flow hypothesis.
- 7.1.8 Performance Indicator: Students will be able to relate roles of hormones in regulation of plant activities.
- 7.1.9 Performance Indicator: Students will be able to describe adaptations of plants for survival.
- 7.1.10 Performance Indicator: Students will be able to compare photosynthesis in C3, C4, and CAM plants.
- 7.1.11 Performance Indicator: Students will be able to describe function of stomata and factors that regulate their function.

Standard 8 - Invertebrate Zoology

- 8.1 Objective: Be able to describe anatomical development and adaptation of invertebrates.
 - 8.1.1 Performance Indicator: Students will be able to describe body plans of selected members of various phyla.
 - 8.1.2 Performance Indicator: Students will be able to relate body plans to embryonic development patterns.
 - 8.1.3 Performance Indicator: Students will be able to relate structural adaptations to survival in comparative habitats.
 - 8.1.4 Performance Indicator: Students will be able to show examples of life cycles for parasitic organisms.
 - 8.1.5 Performance Indicator: Students will be able to relate roles of invertebrates in ecosystems.

Standard 9 - Vertebrate Zoology

- 9.1 Objective: Be able to describe anatomical development and adaptation of vertebrates.

- 9.1.1 Performance Indicator: Students will be able to describe structure of typical vertebrates from an evolutionary perspective.
- 9.1.2 Performance Indicator: Students will be able to relate structure and function of typical cell types for invertebrates.
- 9.1.3 Performance Indicator: Students will be able to dissect a fetal pig and relate structure and function of organs.
- 9.1.4 Performance Indicator: Students will be able to describe patterns of reproduction and development for vertebrates.

Standard 10 - Animal Behavior

- 10.1 Objective: Be able to describe aspects and functions of animal behavior.
 - 10.1.1 Performance Indicator: Students will be able to describe some aspects of animal behavior.
 - 10.1.2 Performance Indicator: Students will be able to relate how behaviors can have adaptive functions.

Standard 11 - Reproduction and Development

- 11.1 Objective: Be able to describe patterns of development and reproduction in plants, invertebrates, and vertebrates.
 - 11.1.1 Performance Indicator: Students will be able to follow patterns of development in plants, invertebrates, and vertebrates and compare and contrast these patterns.
 - 11.1.2 Performance Indicator: Students will be able to show how hormones affect the human menstrual cycle.
 - 11.1.3 Performance Indicator: Students will be able to relate the role of maternal influence on embryonic development.
 - 11.1.4 Performance Indicator: Students will be able to identify stages of development for sea urchins.
 - 11.1.5 Performance Indicator: Students will be able to show life cycles of algae and fungi.

Standard 12 - Diversity of Organisms

12.1 Objective: Be able to describe the functions of prokaryotes and eukaryotes.

12.1.1 Performance Indicator: Students will be able to show that prokaryotes have nutritional and metabolic diversity.

12.1.2 Performance Indicator: Students will be able to show that prokaryote diversity was cause and effect of evolution.

12.1.3 Performance Indicator: Students will demonstrate that eukaryotic diversity is shown by fungi, protists, non-vascular plants, vascular plants, invertebrates, and vertebrates.