

AP Environmental Science Course Syllabus

Course Description:

The goal of AP Environmental Science is to provide students with an experience equivalent to an introductory college level environmental science course.

AP Environmental Science requires a serious commitment from students. Students should be prepared to devote a significant amount of time to reading a college level text book, working on question sets, reviewing articles and writing journal entries, completing experiments and writing lab reports, and working on projects outside of class. This class will be conducted primarily through inquiry based laboratory experiments and research projects, reinforced with class discussion and outside reading.

Course Objectives:

Provide students with a college level environmental science experience.

Develop strong problem solving and critical thinking skills, that students can carry with them.

Develop and reinforce laboratory skills including: questioning, developing an experimental procedure, observing, data collection, and data analysis.

Develop and reinforce appropriate laboratory safety skills.

Develop an understanding of our environment as a system, how we interact with our environment, and how we cause and can work towards solving environmental problems.

Course Requirements:

Prerequisites: Students should have successfully completed lab biology and lab chemistry before taking this course.

Attendance: This course meets every other day for one block period (eighty minutes) Students are expected to attend all class periods. Missed work must be made up within one week.

Labs: The laboratory is the most important part of this course. Unless otherwise noted, all labs are hands on and inquiry based. In most cases, students will only be provided with a problem and materials, and must develop their own procedures. In addition to problem solving, emphasis will be placed on evaluation and analysis of data. All students must keep a laboratory notebook. All data, observations, and calculations should be recorded in the lab notebook. Lab reports should be recorded in the lab notebook, using the required lab report format. The lab notebook is a critical tool for the instructor to evaluate student understanding in this course.

Journals: Throughout each unit, students will be given or asked to find newspaper, magazine, and scientific journal articles about current environmental issues. Students will be required to summarize these articles in their journals, focusing on the stakeholders and their relationships to each other and the problem.

Reading Assignments and Question Sets: Students will be required to complete text book and supplemental reading assignments and corresponding questions throughout each unit. Questions will focus on the evaluation and analysis of relationships and data, particularly through the interpretation of maps, tables, and graphs.

Quizzes: Quizzes will be given regularly to allow the instructor to gauge student understanding prior to the unit test.

Tests: Tests will be given at the end of each unit. Tests will include multiple choice questions, similar to the AP format, challenging short essays, and free response questions that require students to analyze and interpret data sets, graphs, and maps.

Projects: Long term inquiry based projects, where students are collecting and analyzing their own data or analyzing already existing data, will be an emphasis of this course. The following projects will be required.

First Semester:

Mineral Resources: Students will choose a particular mineral or metal and write a research paper, focusing on the manner in which this material is obtained from the earth and the environmental effects of obtaining this resource. Students will also evaluate the relationships between the economy, the environment, culture, stakeholders, and the process of obtaining this resource.

Watershed Preservation: Students will examine our local watershed. They will look at a particular body of water within the watershed, examining water quality parameters in this water body, including temperature, pH, dissolved oxygen and nutrient levels. They then will evaluate land use in the area and how it could be affecting water quality and develop and present a potential management plan.

Energy Audit: Students will evaluate energy usage around the school's campus. After mapping out areas where the school could save energy, they will choose one area and develop a feasible plan to improve energy usage. They will then present their plan to school administration.

Second Semester:

Forestry Project: Students will set up quadrats in the forest area near campus. They will collect information about tree types and tree health within their quadrats, looking for signs of disease and invasive species. Students will then use this information along with soil and watershed information collected earlier to develop a map of the forest area. They will present a report on the current condition of the forest area, including the factors that are affecting the tree health and how the history of human use of the area has affected the succession of tree species in the area.

Ecology Project: Using the quadrats established for the forestry project, students will look for signs of bird and mammal species (this project will be conducted during the winter months). They will then map out their findings and present them to the class, including a discussion of what species were present and why, and how these species interact.

Population Research Paper: Students will choose a country and conduct research on how the population of that country has changed over the last fifty years, examining major events that have affected the population. They will also look at how the country's economy, resource use, and environmental conditions have changed during this period. They will present their findings in a research paper, including self generated maps and charts that show changes in the country's population and how this relates to the availability of resources and environmental conditions.

Benthic macroinvertebrates: Students will sample for benthic macroinvertebrates (BMIs) in several local bodies of water, in addition to measuring temperature, pH, and dissolved oxygen concentrations. They will also evaluate land use in the surrounding areas. They will then compare their results between bodies of water to determine if there is a relationship between land use and the presence of indicator species. Finally, after the AP exam is completed, students will develop and present a hands on lesson about BMIs to local elementary school students.

AP Exam: It is expected that all students taking this course will take the AP Environmental Science Exam in May. Financial assistance with the exam fee is available if needed.

Text:

Raven, Peter H., Berg, Linda R., and Hassenzahl, David M., *Environment*. Sixth edition, 2008, John Wiley & Sons, Inc.

Grading System:

Students will be graded on question sets, quizzes, tests, journal entries, lab reports, class activities and projects.

problem sets	10%
quizzes	10%
journal entries	10%
labs	45%
tests/projects	25%

Extra Help: Students needing extra help can see the instructor during learning lab, before school, or after school. Students may also email the instructor any time that they have questions.

Course Outline**Summer Assignment:**

Over the summer students will be expected to read and complete selected problems in chapter one of the course textbook. Students will also be required to find and summarize three articles pertaining to environmental issues. This assignment will allow students to gain perspective on the relationship between humans and the environment and the importance of sustainability.

Semester One:**Unit One: Earth Systems**

Estimated Time: 10 weeks

Corresponding Textbook Chapter(s): 1, 14, 15, 16, 20, 21, 22

Topics:

- review and discussion of summer work
 - humans and their environment
 - history of environmental science
 - sustainability
- geology overview
 - plate tectonics
 - geography
 - movement
 - environmental effects
 - rock cycle
 - groups
 - processes
- geologic history
 - time scale
 - major changes in the earth
 - glacial geology and historic climate change
- mineral resources
- soils

- soil formation
- soil properties, composition, and structure
- land use and soils
 - development
 - agriculture
 - erosion/soil loss
- conservation and management
- water
 - water cycle and global water distribution
 - water resources
 - global distribution
 - watersheds
 - surface water
 - groundwater
 - water quality and pollution
 - water use/consumption
 - management and conservation
 - oceans
 - circulation
 - relationship to climate
 - pollution
 - management and conservation
 - atmosphere
 - structure and composition
 - ozone depletion
 - circulation
 - weather and climate
 - climate change
 - air pollution
 - acid rain
 - management

Labs:

- relating plate boundaries, tectonic activity, and human activity (internet research)
- identifying rock types and deducing their formation
- relating soil types and locations (internet research)
- soil profiles: horizons, texture, structure, and slope
- soil chemistry: analyzing pH and nitrate and phosphate concentrations
- delineating a watershed (map lab)
- water quality: temperature and dissolved oxygen
- water quality: analyzing nitrate and phosphate concentrations
- water quality: road salt, run-off, and pH

Unit Two: Ecology, Living Things, and the Environment

Estimated Time: 8 weeks

Corresponding Textbook Chapter(s): 3, 4, 5, 6, 17

Topics:

- energy movement
 - thermodynamics
 - photosynthesis and respiration
 - food webs and ecological pyramids
 - ecosystem productivity
- ecosystems

- biodiversity and richness
- evolution
 - natural selection
 - adaptations
- biomes
- communities
- succession
- species migration
 - climate
- relationships and niches
- biogeochemical cycles
 - carbon cycle
 - nitrogen cycle
 - phosphorus cycle
 - sulfur and oxygen cycles
- loss of biodiversity
- management and conservation

Labs:

- food chain in a local stream
- mapping a quadrat
- data collection for forestry project
- data collection for ecology project
- spruce lines: examining species migration and climate (internet research)
- primary productivity (adapted from Natural Resource Council recommended labs)

Unit Three: Population Dynamics

Estimated Time: 6 weeks

Corresponding Textbook Chapter(s): 8, 9, 10

Topics:

- population density and growth
- carrying capacity
- species interactions
- reproduction and survivorship
 - r vs. k species
- human population dynamics
 - growth
 - demographics
 - developing vs. industrial nations
 - birth and death rates
 - infant mortality
 - age structure
 - resource demands
 - sustainability
 - migration
 - cultural perspectives, economic factors, and environmental impacts

Labs:

- modeling r vs. k species

examining population changes through a cemetery
(adapted from Natural Resource Council recommended labs)
population growth of mold
(adapted from Natural Resource Council recommended labs)

Unit Four: Energy Resources and Consumption

Estimated Time: 3 weeks

Corresponding Textbook Chapter(s): 11, 12, 13

Topics:

- law of conservation of energy
- energy, work, and power
- review of thermodynamics
- energy use and needs
 - history
 - demographics
- fossil fuels
 - obtaining resources
 - economic and environmental considerations
 - sustainability
- nuclear
 - how it is used
 - safety issues
 - pollution
- renewable energy
 - solar
 - wind
 - hydro
 - biochemical
 - economic, cultural, and environmental considerations
 - sustainability
- conservation

Labs:

- comparing car exhaust
- combustion: energy in a potato chip
- producing biodiesel
- tour of industrial wind turbines

Unit Five: Land Use, Pollution, and Waste Management

Estimated Time: 3 weeks

Corresponding Textbook Chapter(s): 10, 18, 19, 23, 24

Topics:

- urban development and sprawl
- sustainable development
- agriculture
- forestry
- fishing
- industrialization
- solid and hazardous wastes
- human health and the environment
 - risk assessment
- management and conservation
- policy and laws
- economic considerations

Labs:

tour of a wastewater treatment facility
tour of a landfill
risk assessment

Unit Six: Course Summary and AP Exam Review

Estimated Time: 2 weeks

Corresponding Chapter(s): 25

Topics:

course summary and review
focus on systems, relationships, and global change through time
AP practice questions and exam

Labs:

insect population sampling
collect of data for BMI project
analyzing biodiversity with BMI data

***Following the AP Exam, students will continue to work on the BMI project.*