

AP[®] Environmental Science

AP[®] Environmental Science is intended to provide a rigorous introductory college Environmental Science course with laboratory activities for high school students. The following course materials are in no way intended to replace the extensive materials provided by the College Board. The AP[®] course outline and recommended laboratory experiences are revised periodically by the College Board. The teacher of this course should be sure to have the most current AP[®] Environmental Science course description book materials from the College Board. These materials are available at the AP Central website <http://apcentral.collegeboard.com>. The AP[®] Environmental Science course is equivalent to a one semester introductory college Environmental Science course.

Learners will study natural and technological systems. The strands and unifying concepts provide a context for teaching content and process skill goals. All goals should focus on the unifying concepts:

- Systems, Order and Organization
- Evidence, Models, and Explanation
- Constancy, Change, and Measurement
- Evolution and Equilibrium
- Form and Function

COMPETENCY GOAL 1: The learner will develop abilities necessary to do and understand scientific inquiry.

Objectives

- 1.01 Identify questions and problems that can be answered through scientific investigations
- 1.02 Design and conduct scientific investigations to answer questions about the world.
 - Create testable hypotheses.
 - Identify variables.
 - Use a control or comparison group when appropriate.
 - Select and use appropriate measurement tools.
 - Observe and measure real phenomena.
 - Collect and record data.
 - Organize data into charts and graphs.
 - Analyze and interpret data.
 - Communicate findings.
- 1.03 Formulate and revise scientific explanations and models using logic and evidence to:
 - Explain observations.
 - Make inferences and predictions from data and observations.
 - Explain the relationship between evidence and explanation.
 - Communicate results, including suggested ways to improve experiments and proposed questions for further study.

- 1.04 Apply safety procedures in the laboratory and in field studies:
- Recognize and avoid potential hazards.
 - Safely manipulation materials and equipment needed for scientific investigations.
- 1.05 Analyze reports of scientific investigations of phenomena from an informed scientifically literate viewpoints including considerations of:
- Adequacy of experimental controls.
 - Replication of findings.
 - Alternative interpretations of the data.

COMPETENCY GOAL 2: The learner will build an understanding of the interdependence of Earth's systems.

Objectives

- 2.01 Analyze the flow of energy.
- Forms and quality of energy.
 - Laws of Thermodynamics.
 - Energy units and measurements.
 - Sources and sinks, conversions.
- 2.02 Investigate the cycling of matter.
- Water.
 - Carbon.
 - Nitrogen.
 - Phosphorus.
 - Sulfur.
- 2.03 Investigate the solid Earth.
- Earth history and the geologic time scale.
 - Influences of plate tectonics on evolution and biodiversity.
 - Volcanism.
 - The rock cycle.
 - Soil formation.
- 2.04 Investigate the atmosphere.
- Atmospheric history: origin and evolution.
 - Composition.
 - Structure.
 - Atmospheric dynamics: weather and climate.
- 2.05 Investigate the biosphere.
- Organisms: adaptations to their environment.
 - Populations and communities: exponential growth and carrying capacity.
 - Ecosystems and change: biomass, energy transfer, succession.
 - Evolution of life: natural selection, extinction.
 - Biomes: global distribution

COMPETENCY GOAL 3: The learner will build an understanding of human population dynamics.

- 3.01 Analyze human population history and global distribution.
 - Demographics.
 - Age structure diagrams.
 - Survivorship curves.
 - Patterns of resource distribution.
- 3.02 Investigate local, regional and global carrying capacities.
 - Limiting factors.
 - Density-dependent and density-independent factors.
- 3.03 Analyze cultural and economic influences on population
 - Pronatalist factors.
 - Antinatalist factors.
 - Demographic transition.

COMPETENCY GOAL 4: The learner will build an understanding of the distribution, ownership, use and degradation of renewable and nonrenewable resources.

- 4.01 Analyze sources and uses of freshwater and oceans.
 - Renewal rates.
 - Agricultural, industrial and domestic water uses.
 - Increasing water supplies: Dams and desalination.
 - Fisheries and aquaculture.
 - Water management and conservation.
- 4.02 Analyze local, regional and global mineral resources.
 - Mining types.
 - Processing and environmental effects.
 - Mining Laws.
- 4.03 Analyze local, regional and global soil aspects.
 - Soil composition and profiles.
 - Soil characteristics.
 - Soil types.
 - Erosion and conservation .
- 4.04 Analyze biological resources.
 - Benefits of biodiversity.
 - Threats to biodiversity.
 - Endangered species management.
 - Nutrition and food supplies.
 - Green revolution.
- 4.05 Analyze and compare conventional and alternative energy sources.
 - Coal.
 - Natural gas.
 - Oil.
 - Nuclear power.
 - Solar energy.
 - Biomass.
 - Energy from the Earth's forces: Wind, Water, Geothermal, Tidal.
 - Energy conservation.

- Identify facility parts (Coal, Nuclear).
 - Monthly/annual costs.
- 4.06 Analyze land types and uses.
- Residential and commercial, land use planning.
 - Agricultural and forestry.
 - Recreational and wilderness.
 - Ecotourism, Parks and preserves.

COMPETENCY GOAL 5: The learner will build an understanding of air, water and soil quality.

- 5.01 Analyze the sources of major pollutants.
- EPA Criteria Pollutants.
 - Indoor air pollutants.
 - Thermal pollution.
 - Pesticides.
 - Acid deposition.
 - Units and measurements.
 - Point and nonpoint sources.
- 5.02 Investigate the effects of pollutants on:
- Aquatic systems (Eutrophication).
 - Vegetation.
 - Natural features, buildings and structures.
 - Wildlife.
- 5.03 Analyze and investigate pollution reduction, remediation and control measures.
- Legislation.
 - Historical examples and global case studies.
 - Waste water treatment plant.
- 5.04 Analyze and investigate local, regional and global issues concerning solid waste.
- Types, sources and amounts.
 - Disposal methods and environmental effects.
 - Decreasing waste: Reduce, reuse, recycle.
- 5.05 Analyze impacts on human health.
- Infectious disease.
 - Chemical agents.
 - Radiation.
 - Toxicology: LD50, acute and chronic effects.
 - Risk assessment.

COMPETENCY GOAL 6: The learner will build an understanding of global changes and their consequences.

- 6.01 Investigate human effects and consequences on the atmosphere.
- Stratospheric Ozone: chemistry, historical aspects and legislation.
 - Greenhouse gases and global warming.
- 6.02 Investigate effects and consequences on the oceans.
- Sea level changes.
 - El Nino.
 - Surface temperatures and currents.

- 6.03 Investigate effects and consequences on biota:
- Habitat fragmentation and destruction.
 - Introduced species.
 - Overharvesting.

COMPETENCY GOAL 7: The learner will build an understanding of environmental decision making.

- 7.01 Analyze economic forces affecting societies.
- Supply demand curves.
 - Cost benefit analysis.
 - Marginal, internal and external costs.
 - Communal property resources, Tragedy of the Commons.
 - Economic resource categories.
- 7.02 Analyze cultural and ethical considerations regarding the environment.
- Environmental worldviews.
 - Indigenous peoples.
 - Sustainable development.
- 7.03 Recognize significance of major environmental laws and regulations: regional, national and international.
- Clean Air Act.
 - Clean Water Act.
 - Comprehensive Environmental Response, Compensation and Liability Act.
 - Convention on International Trade in Endangered Species.
 - Endangered Species Act.
 - Federal Insecticide, Fungicide and Rodenticide Control Act.
 - Kyoto Protocol.
 - Lacey Act.
 - Mining Act.
 - Montreal Protocol.
 - National Environmental Policy Act.
 - Resource Conservation and Recovery Act.
 - Wilderness Act.
- 7.04 Develop an awareness of environmental options.
- Conservation.
 - Preservation.
 - Restoration.
 - Remediation.
 - Mitigation.

COMPETENCY GOAL 8: The learner will build an understanding of Earth in the Solar System and its position in the universe.

- 8.01 Analyze the formation of the solar system.
- 8.02 Analyze planetary motion and the physical laws that explain motion.
- Rotation.
 - Revolution.
 - Apparent diurnal motion of the sun and stars.

- Tilt of Earth's axis.
 - Parallelism of the Earth's axis.
- 8.03 Evaluate astronomers' use of various instruments to extend their senses:
- Optical telescopes.
 - Radio telescopes.
 - Spectroscopes.
 - Cameras.
- 8.04 Assess the current scientific theories of the origin of the universe.
- 8.05 Examine the sources of stellar energies.
- 8.06 Assess the spectra generated by stars and our sun as indicators of motion:
- Doppler effect.
 - Red and blue shifts.
- 8.07 Evaluate Hubble's Law and the concept of the ever-expanding universe.
- 8.08 Evaluate the life cycle of stars in the Hertzsprung-Russell diagram (H-R Diagram).