

AP[®] Environmental Science

Syllabus 4

Text

Living in the Environment by G. Tyler Miller Jr., 12th edition, 2002, Thomson Brooks/Cole Publishers

Other Resources

In addition to the textbook, we will draw information from supplemental environmental science textbooks, lab manuals, periodicals, readings/case studies, and the Internet.

Course Description

The AP[®] Environmental Science course is a full-year course designed to be the equivalent of a one-semester, introductory college course in environmental science. Unlike most other introductory-level college science courses, environmental science is offered from a wide variety of departments, including geology, biology, environmental studies, environmental science, environmental science, chemistry, and geography. The AP Environmental Science course has been developed to be like a rigorous science course that stresses scientific principles and analysis and includes a laboratory component; as such, it is intended to enable students to undertake, as first-year college students, a more advanced study of topics in environmental science or, alternatively, to fulfill a basic requirement for a laboratory science and thus free time for taking other courses. In both breadth and level of detail, the content of the course reflects what is found in many introductory college courses in environmental science. [C8]

C8—The course provides students with the scientific principles, concepts, and methodologies required to understand the interrelationships of the natural world. The curriculum draws upon various scientific disciplines.

The goal of the course is to provide students with the scientific principles, concepts, and methodologies required to understand the interrelationships of the natural world, to identify and analyze environmental problems both natural and human-made, to evaluate the relative risks associated with these problems, to examine alternative solutions for resolving and/or preventing them, and to develop and focus their own political perspective. [C8, C9, C10]

C9—The course includes methods for analyzing and interpreting information and experimental data, including mathematical calculations.

Environmental science is interdisciplinary; it embraces a wide variety of topics from different areas of study. Yet there are several major unifying constructs, or themes, that cut across the many topics included in the study of environmental science. The following themes provide a foundation for the structure of the AP Environmental Science course:

- Science is a process.
- Energy conversions underlie all ecological processes.
- The Earth itself is one interconnected system.
- Humans alter natural systems.
- Environmental problems have a cultural and social context.

C10—The course teaches students how to identify and analyze environmental problems, to evaluate the ecological and human health risks associated with these problems, and to critically examine various solutions for resolving or preventing them.

- Human survival depends on developing practices that will achieve sustainable systems.

Homework

May include but not be limited to:

- reading the current unit content and answering textbook questions
- reviewing lecture notes (from PowerPoints)
- readings and case studies
- making and studying wordslides (flash cards) for unit tests and quizzes
- lab write-ups
- essays
- creating posters, surveys, etc.

Tests

Tests will be given approximately as entered on the course calendar and they will be composed of multiple-choice and essay questions. At the beginning of the year the tests will be multiple choice only. Essays will be given as homework assignments. Between Thanksgiving and winter break, essays will be incorporated into the tests, and after the break the essay portion of the test will be timed in order to make the test environment as similar to the AP Exam as possible.

The majority of the multiple-choice questions will come from lecture notes, text questions, and crossword puzzles. We will work our way up to 100 questions as the AP Exam approaches.

You will be given four free-response (essay) questions on the AP Exam. To be effective, you'll need to organize your thoughts and construct an essay in 22 minutes (four questions in 90 minutes). In this class we will take a very pragmatic approach to our writing. We'll write training essays early in the year and, again, incorporate **timed essays into our tests by the middle of the year.**

Possible essay topics will be given to you before the test to allow you to outline your answers.

- Students must pass a safety test before participating in labs.
- One quiz and one test are given per unit.
- We are on a block schedule. Each class meets every other day for 90 minutes.
- On average, a minimum of one period per week is spent engaged in lab and/or field work.

Course Planner

<p>Chapter 1:</p> <p>Earth Systems and Resources [C1]</p> <p>Parts: 1, 2, 3, 6, 10, 13</p> <p>4 weeks total</p>	<p>Unit 1</p> <ul style="list-style-type: none"> • Introduction to Environmental Science (pp. 1, 2) • Earth Science Concept (geologic time scale; plate tectonics, earthquakes, volcanism; seasons; solar intensity and latitude) (pp. 6, 10) • The Atmosphere (composition; structure; weather and climate; atmospheric circulation and the Coriolis Effect; atmosphere-ocean interactions; ENSO) (p. 6) <p>Internet Activity: What Is Your Ecological Footprint? [C1]</p> <p>Labs: Heating Up the Earth [C11]</p> <ul style="list-style-type: none"> • Students use blocks cut at different angles representing sunlight at different latitudes. • Outline on graph paper. • Illustrates seasons, latitude, tilt of Earth on axis. (½ block period). • Using Detritus and Determining Arthropod Biodiversity in Relation to Ecosystem Types • Use of Berlese apparatus collected from local Greenbelt. • 2 block periods <p>Demo: Groundwater Activity Model</p> <p>Videos:</p> <ul style="list-style-type: none"> • <i>El Nino and Ocean Currents</i> • <i>Plate Tectonics: The Puzzle of the Continents</i> 	<p>C1—The course provides instruction in Earth Systems and Resources.</p>
		<p>C11—The course includes a laboratory and/or field investigation component. A minimum of one class period or its equivalent per week is spent engaged in laboratory and/or field work.</p>

	<p>Unit 2</p> <ul style="list-style-type: none"> • Global Water Resources and Use (freshwater/saltwater; ocean circulation; agricultural, industrial, and domestic use; surface and groundwater issues; global problems; conservation) (p. 13) • Soil and Soil Dynamics (rock cycle; formation; composition; physical and chemical properties; main soil types; erosion and other soil problems; soil conservation) (p. 10) [C4] <p>Field Activity: Soil Analysis of Local Greenbelt</p> <p>Labs: [C11]</p> <ul style="list-style-type: none"> • Mineral and Rock Lab (1 block period) • Plate Tectonics (1 ½ block periods) <p>Demo: Stream Table</p>	<p>C4—The course provides instruction in Land and Water Use.</p>
<p>Chapter 2: The Living World [C2] Parts: 4, 5, 6, 7, 8 4 weeks total</p>	<p>Unit 3</p> <ul style="list-style-type: none"> • Ecosystem Structure (biological populations and communities; ecological niches; interactions among species; keystone species; species diversity and edge effects; major terrestrial and aquatic biomes) (p. 4) • Energy Flow (photosynthesis and cellular respiration; food webs and trophic levels; ecological pyramids) (pp. 4, 6, 7) • Ecosystem Diversity (biodiversity; natural selection; evolution; ecosystem services) (p. 5) • Natural Ecosystem Change (climate shifts; species movement; ecological succession) (p. 8) • Natural Biogeochemical Cycle (carbon, nitrogen, phosphorous, sulfur, water conservation of matter) (p. 4) <p>Field Activity: Coast Sage Scrub biome at the local Greenbelt. Identify plants (peer tutoring), familiarize students with biome.</p> <p>Labs: [C11]</p> <ul style="list-style-type: none"> • Peanut Power Lab (45 min.) • Comparison of GPP and NPP (1 block) • Grass Decomposition Investigation (1 hour + ongoing) • Analysis of Leaf Litter Critters from Greenbelt (1 block at Greenbelt, 1 in class) <p>Video: <i>National Geographic Strange Days on Planet Earth, Episode 2, The One Degree Factor</i></p>	<p>C11—The course includes a laboratory and/or field investigation component. A minimum of one class period or its equivalent per week is spent engaged in laboratory and/or field work.</p> <p>C2—The course provides instruction in The Living World.</p>

<p>Chapter 3: Population [C3] Parts: 9, 11 3 weeks total</p>	<p>Unit 4</p> <ul style="list-style-type: none"> • Population Biology Concepts (population ecology; carrying capacity; reproductive strategies; survivorship) (p. 9) • Human Population • Human population dynamics (historical population sizes; distribution; fertility rates; growth rates and doubling times; demographic transition; age-structure diagrams) • Population size (strategies for sustainability; case studies; national policies) • Impacts of population growth (hunger; disease; economic effects; resource use; habitat destruction) (p. 11) <p>Labs: [C11]</p> <ul style="list-style-type: none"> • Population Ecology Exercise (+ graphing = 1 block period) • Duckweed Population Lab (1 hour + ongoing) <p>Video: <i>World Population</i> by ZPG</p>	<p>C3—The course provides instruction in Population.</p>
		<p>C11—The course includes a laboratory and/or field investigation component. A minimum of one class period or its equivalent per week is spent engaged in laboratory and/or field work.</p>

<p>Chapter 4: Land and Water Use [C4] Parts: 12, 14, 20, 23, 25 4 weeks total</p>	<p>Unit 5</p> <ul style="list-style-type: none"> • Agriculture • Feeding a growing population (human nutritional requirements; types of agriculture; Green Revolution; genetic engineering and crop production; deforestation; irrigation; sustainable agriculture) <ol style="list-style-type: none"> 1. Controlling Pests (types of pesticides; costs and benefits of pesticide use; integrated pest management: relevant laws) (pp. 12, 20) • Forestry (tree plantations; old-growth forests; forest fires; forest management; national forests) (p. 23) • Rangelands (overgrazing; deforestation; desertification; rangeland management; federal rangelands) (p. 12) • Other Land Use <ol style="list-style-type: none"> 1. Urban Land Development (planned development; suburban sprawl; urbanization) 2. Transportation infrastructure (federal highway system; canals and channels; roadless areas; ecosystem impacts) 3. Public and federal lands (management; wilderness areas; national parks; wildlife refuges; forests; wetlands) 4. Land conservation options (preservation; remediation; mitigation; restoration) 5. Sustainable land-use strategies (pp. 23, 35) • Mining (mineral formation; extraction; global reserves; relevant laws and treaties) (p. 14) • Global Economics (globalization; world bank; tragedy of the commons; relative laws and treaties) (p. 25) <p>Labs: [C11]</p> <ul style="list-style-type: none"> • Fire Ecology Charate Lab (1 block + ongoing) • Nonrenewable Resource Depletion Activity (1 block) • Fishing in the Commons (1 block) • Hetch Hetchy Debate (1 block) <p>Videos:</p> <ul style="list-style-type: none"> • <i>Ocean Fisheries Managing for the Future: The Tragedy of the Commons Revisited</i> • <i>Huell Howser's California's Gold: Hetch Hetchy</i> 	<p>C4—The course provides instruction in Land and Water Use.</p>
		<p>C11—The course includes a laboratory and/or field investigation component. A minimum of one class period or its equivalent per week is spent engaged in laboratory and/or field work.</p>

<p>Chapter 5:</p> <p>Energy Resources and Consumption [C5]</p> <p>Parts: 2, 3, 14, 15, 25</p> <p>4 weeks total</p>	<p>Unit 6</p> <ul style="list-style-type: none"> • Energy Concepts (energy forms; power; units; conversions; laws of thermodynamics) (p. 3) • Energy Consumption <ul style="list-style-type: none"> 1. History (industrial revolution; exponential growth; energy crisis) • Present global energy use • Future energy needs (p. 2) • Fossil fuels and use (formation of coal, oil, and natural gas; extraction/purification methods; world reserves and global demand; synfuels; environmental advantages/disadvantages of fossil fuel energy sources) (p. 14) • Nuclear Energy (nuclear fission process; nuclear fuel; electricity production; nuclear reactor types; environmental advantages/disadvantages; safety issues; radiation and human health; radioactive wastes; nuclear fusion) (p. 14) • Energy Conservation (energy efficiency; CAFÉ standards; hybrid electric cars; mass transit) (pp. 15, 25) • Renewable Energy (solar energy; solar electricity; hydrogen fuel cells; biomass; wind energy; small-scale hydroelectric; ocean waves and tidal energy; geothermal; environmental advantages/disadvantages) (p. 15) <p>Labs: [C11]</p> <ul style="list-style-type: none"> • Half-Life in a Box (45 min.) • Alternative Energies (1 ½ block periods) • Capturing the Wind (1 block) <p>Videos:</p> <ul style="list-style-type: none"> • <i>Fossil Fuels</i> • <i>Nuclear Energy, Nuclear Waste</i> • <i>Alternative Energies: Fuels for the Future</i> 	<p>C5—The course provides instruction in Energy Resources and Consumption.</p>
		<p>C11—The course includes a laboratory and/or field investigation component. A minimum of one class period or its equivalent per week is spent engaged in laboratory and/or field work.</p>

Chapter 6:

Pollution [C6]

Parts: 16, 17,
19, 21, 25, 26
9 weeks total

Unit 7

- Pollution Types
 1. Air Pollution (sources—primary and secondary; major air pollutants; measurement units; smog; acid deposition—causes and effects; heat islands and temperature inversions; indoor air pollution; remediation and reduction strategies; Clean Air Act (and amendments to it) and other relevant laws) (p. 17)
 2. Noise Pollution (sources; effects; control measures) (p. 25)
 3. Water pollution (types; sources, causes, and effects; cultural eutrophication; groundwater pollution; maintaining water quality; water purification; sewage treatment/septic systems; Clean Water Act and other relevant laws) (p. 19)
 4. Solid Waste (types; disposal; reduction) (p. 21)

Field Analysis: Water testing at Colorado Lagoon (1 ½ block periods)

Labs: [C11]

- Parts per Million (45 min.)
- Sewage Treatment (3 periods)
- Personal Solid Waste Inventory (15 minutes in class; ongoing outside of class)
- Salinization Lab (1 hour; ongoing for one week)

Video:

- *The Power of Water*
- *National Geographic, Strange Days on Planet Earth; Troubled Waters*

C6—The course provides instruction in Pollution.

C11—The course includes a laboratory and/or field investigation component. A minimum of one class period or its equivalent per week is spent engaged in laboratory and/or field work.

	<p>Unit 8</p> <ul style="list-style-type: none"> • Impacts on the Environment and Human Health <ol style="list-style-type: none"> 1. Hazards to Human Health (environmental risk analysis; acute and chronic effects; dose-response relationships; air pollutants; smoking and other risks) 2. Hazardous Chemicals in the Environment (types of hazardous waste; treatment/disposal of hazardous waste; cleanup of contaminated sites; biomagnification; relevant laws) (pp. 16, 17, 21) • Economic Impact (cost-benefit analysis; externalities; marginal costs; sustainability) (p. 26) <p>Labs: [C11]</p> <ul style="list-style-type: none"> • Risk-Assessment Activity (1 hour) • Bioassay of Ammonia on Brine Shrimp: Determining LD50 (1 block) • Nicotine and <i>Lumbriculus variegates</i>: Toxicity Lab (1 block) 	<p>C11—The course includes a laboratory and/or field investigation component. A minimum of one class period or its equivalent per week is spent engaged in laboratory and/or field work.</p>
<p>Chapter 7:</p> <p>Global Change [C7]</p> <p>Parts: 18, 22, 23, 24</p> <p>4 weeks total</p>	<p>Unit 9</p> <ul style="list-style-type: none"> • Stratospheric Ozone (Formation of stratospheric ozone; ultraviolet radiation; causes of ozone depletion; effects of ozone depletion; strategies for reducing ozone depletion; relevant laws and treaties) (p. 18) • Global Warming (greenhouse gases and the greenhouse effect; impacts and consequences of global warming; reducing climate change; relevant laws and treaties) (p. 18) • Loss of Biodiversity (habitat loss; overuse; pollution; introduced species; endangered and extinct species; maintenance through conservation; relevant laws and treaties (pp. 22, 23, 24) <p>Labs: [C11]</p> <ul style="list-style-type: none"> • How Hot Is It Here on Earth? (1 block) • Global Warming and Greenhouse Effects Lab (1 block) <p>Videos:</p> <ul style="list-style-type: none"> • <i>The Climate Puzzle</i> • <i>Wetlands Steward</i> • The Animal Planet's <i>The Brown Tree Snake on Guam</i> 	<p>C7—The course provides instruction in Global Change.</p>

First-Semester Assignment

- nAPES—APES notebook
- 1. 23 relevant, current environmental science articles from newspapers or magazines with minimum 100-word summaries in 3-ring binder

Second-Semester Assignment

- Environmental Science book report
- 1. Chosen from list of approved books dealing with environmental science
- 2. Book brought to class to answer questions to avoid summaries printed on Internet.

Field Trips

- Water Replenishment District tour
- El Dorado Nature Center
- 1. Southern California biomes
- 2. Native plants
- 3. Identify birds, fish, mammals, reptiles
- 4. Biogeochemical cycles
- 5. Weather station

Saturday community service hours at Belmont Heights Greenbelt with Los Cerritos Wetlands Task Force:

- Available second Saturday of each month
- 1-hour nature walk led by Los Cerritos Wetlands staff
- 2 hours, maintenance of greenbelt