

WELCOME TO APES! (A.P. ENVIRONMENTAL SCIENCE)

AP Environmental Science- Fall 2009

From <http://www.collegeboard.com> – your site for AP course information:

“ The goal of the AP Environmental Science 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, and to examine alternative solutions for resolving and/or preventing them.”

ABOUT APES

- 1) It is an applied science.
- 2) It is interdisciplinary: biology, chemistry, physics, geology, ecology, economics, political science, math.
- 3) It is both theoretical and practical.
- 4) 4) It has a relevant lab component.

THEMES

- 1) Science is a process.
- 2) Energy conversions underlie all ecological processes.
- 3) The earth itself is one interconnected system.
- 4) Humans alter natural systems.
- 5) Environmental problems have a cultural and social context.
- 6) Human survival depends on sustainability.

Overview:

This course is designed to be the equivalent of a college-level semester course in Environmental Science. Environmental Science is an interdisciplinary field of study, and the goal in this class is to integrate what you know about Biology, Chemistry, Math, History, Sociology, Law, etc. to come to an understanding of the natural world and the forces that affect it. It will follow the curriculum recommended by the College Board, and students are required to take the AP exam offered by the College Board in May. Honors Biology and Chemistry are prerequisites and students who have not taken these courses need to see me immediately.

This class will consist mainly of lecture and lab work or fieldwork. Approximately one class period a week will be devoted to lab work, but remember that many times lab reports or data analysis will have to be completed at home. Independent work is an expectation of this course, and you will be expected to keep up with the reading and be prepared for class.

APES covers a wide range of topics. A topic outline is included in this syllabus. The order of topics in the outline is not necessarily the order in which the topics will be addressed, and many of the topics will be interwoven repeatedly throughout the course.

Lab Safety:

During lab activities, you may be learning the use of new equipment and substances and working with different energy sources. It is important that you approach your work seriously and follow all guidelines and safety rules.

Attendance:

To make the most out of the course, try to attend every single class and always be on time. You are considered late if you are not in your seat with your materials out and ready for class when the bell rings.

Deadlines:

It is essential that you turn in all assignments on time. If an assignment is not in on the due date, your grade will be reduced according to the importance of the assignment and the number of days late. Please see me in advance if you will need an extension on an assignment.

If you are absent, it is your responsibility to get the assignment and any missed notes from a classmate. You must see me within two days after your return so that I can give you an appropriate date for the missed material. If you miss a quiz or test, it is your responsibility to make sure that you make up that quiz or test. You will receive a zero if the work is not complete at the end of the six weeks.

Grading:

Graded work in this class will consist of tests, quizzes, labs, homework, class work, projects, and participation. You will be graded by total points, not percentages.

Unit Tests- approximately 100 points

Quizzes- Will range in value depending on the assessment, but will usually be about 25-30 points. I do expect you to learn straightforward ideas independently when reading your assignments, so you should expect occasional quizzes on reading assignments at the beginning of class.

Labs- You will be required to write lab reports, and I will give you detailed instructions as to the format and point value of each assignment, but labs will usually be work between 25-50 points. Even if you miss a lab, you are responsible for knowing the procedure, results, and conclusions of the experiment.

Reading questions- 20 points- they WILL be graded and it is essential that you complete these. They will be invaluable in studying for the APES exam in May.

Projects- points will be assigned on a case by case basis.

Class participation- Please be ready for class, ask questions, answer questions in class, participate when we have class debates, and carry your weight in lab.

Tutoring:

Please don't hesitate to come in for help. My tutoring hours will be posted on the school website, but I will make myself available to you if you schedule an appointment. I am also available by email at *****

Canvas:

Our course website will be updated regularly on Canvas. This will be your source for reading questions, review materials, podcasts, as well as our course calendar. Please become familiar with this site and refer to it on a regular basis.

Textbook

The textbook is *Living in the Environment: Principles, Connections, and Solutions* 17th ed. by G. Tyler Miller, published Brooks/Cole Thomson Learning.

Course Outline

The following is a summary of all units that will be taught during the semester. Listed with each unit are the chapters that we will focus on. Also associated with each chapter is a listing of labs/activities.

* denotes inquiry-based lab activity

Unit 1: Introduction to Environmental Science

Chapter 1: Environmental Problems, Their Causes, and Sustainability

General overview of environmental sciences and sustainability.

Chapter 2: Environmental History: An Overview

Analysis of human impacts on the environment; environmental history of the US, identification and comparison of various environmental laws

Video: *The Lorax*

Labs/Activities:

- Tragedy of the Commons
- Environmental Scrapbook (ongoing all semester)
- Ecological Footprints (internet activity)
- Student presentations- environmental history and laws
- Environmental Timeline project

Unit 2: Science, Matter, and Energy Basics

Chapter 3: Science, Systems, Matter, and Energy

Scientific method, some Chemistry review, laws of matter and energy

Labs/Activities:

- Scientific Method Practice *
- Chemistry Review
- Serial Dilutions Lab *
- Nutrient Cycle Maps

Unit 3: Ecosystems, Evolution, and Biodiversity

Chapter 4: Ecosystems: Components, Energy Flow, and Matter Cycling

Populations, communities, food chains, and webs; ecological pyramids and productivity; biogeochemical cycles

Chapter 5: Evolution and Biodiversity: Origins, Niches, and Adaptations

Microevolution/Macroevoolution, niches (fundamental and realized, generalists, and specialists), Labs/Activities:

- Ecosystem field walk
- Design a food web
- Ecosystem column lab *
- Simulation of natural selection with jelly beans *
- Darwin's voyage research project

Unit 4: Biomes and Biodiversity

Chapter 6: Biogeography: Weather, Climate, Biomes, and Terrestrial Biomes

Weather and climate, what are biomes and how do they differ

Chapter 7: Aquatic Ecology: Biodiversity in Aquatic Ecosystems

Saltwater life zones, freshwater lifezones, eutrophication, overturn, characteristics of streams and rivers

Chapter 8: Community Ecology: Structure, Species Interaction, Succession, and Sustainability

Keystone species, indicator species, exotic species, competition, symbiotic relationships, succession

Video: Assignment Discovery Oceans

Biomes series

Lab/Activities:

- Coriolis Effect Lab *
- Internet Project: powerpoint on biomes
- Creating and understanding climatograms
- Introduction to Shannon-Weiner Biodiversity Index, schoolyard diversity *

Unit 5: Biodiversity and Conservation

Chapter 9: Population Dynamics, Carrying Capacity, and Conservation Biology

Population growth (exponential vs. logistic), biotic potential and environmental

resistance, characteristics of r-strategists and K-strategists, limiting factors (density dependent vs. density independent), survivorship curves

Chapter 22: Sustaining Wild Species

Human impact on biodiversity, estimation of extinction risks, values of biodiversity (ecological, economic, and intrinsic), causes of extinction, laws and treaties protecting biodiversity, wildlife management

Chapter 23: Sustaining Terrestrial Biodiversity: The Ecosystem Approach

Land use, laws managing public land use, sustainable forest management, national parks, gap analysis and ecological behavior

Chapter 24: Sustaining Aquatic Biodiversity

Freshwater vs. saltwater habitats, human impacts on aquatic environments, laws associated with protecting and maintaining aquatic biodiversity

Labs/Activities:

- Internet Activity: Population Change of Songbirds
- Biological sampling activity *
- Shannon-Weiner diversity index and species richness
- Population Dynamics Lab- plants*
- Endangered species research project
- Wanted posters for invasive/exotic species
- Carrying Capacity of a forest activity
- Why is the water green lab *

Unit 6: Geology and Earth Processes

Chapter 10: Geology: Processes, Hazards, and Soil

Origins of the universe, the solar system, Earth's rotation and revolution, Earth's seasonal changes, geologic time, continental drift theory, plate tectonics, soil formation and properties, reading soil profiles and triangles, rock cycle, erosion and weathering Video: Ring of Fire Labs/Activities:

- Internet project: Tectonic plate boundaries
- Virtual earthquake lab
- Physical and chemical properties of soil lab *
- Rocks and minerals lab *

Unit 7: Renewable and Nonrenewable Resources

Chapter 15: Geologic Resources: Nonrenewable Mineral and Energy Resources

Mining and its environmental impacts, extraction of oil, natural gas, and coal, nuclear energy

Labs/Activities:

- Copper mining and extraction lab *
- Cookie mining lab *

-Debate: Drilling in the ANWAR

Chapter 16: Energy Efficiency and Renewable Energy

Energy efficiency and sustainable energy use, solar energy, hydroelectricity, wind power, biomass, solar-hydrogen, geothermal energy, micropower Labs/Activities:

- Measuring energy efficiency lab *
- Personal energy audit
- Estimating fossil fuel used
- Alternative energy student presentations

Unit 8: Populations

Chapter 12: The Human Population Growth, Demography, and Carrying Capacity

Birth/fertility/death rates, age structure histograms, factors affecting population size, demographic transition (industrialized vs. developing growth)

Chapter 13: Food Resources

-Food production and nutrition, increasing crop production, meat production, aquaculture, identifying human health problems related to nutrition

Labs/Activities:

- Power of the Pyramids: Constructing Age-Sex Histograms
- Human Population Dynamics
- Irradiated seed germination lab*
- Population growth in lemna minor lab *

Unit 9: Water and Water Pollution

Chapter 14: Water Resources

Properties of water, freshwater vs. saltwater sources, water conservation issues, water use, flooding and flood plains

Chapter 19: Water Pollution

Types and sources of water pollution, changes in dissolved oxygen levels based on environmental factors, wastewater treatment Video: A Civil Action Labs/Activities:

- Water Use Audit
- Water Case Studies
- Determining Groundwater Contamination*
- 12 mile Creek Water Analysis Lab *

Unit 10: Air and Air Pollution

Chapter 17: Air and Air Pollution

Smog, outdoor vs. indoor air pollution, solutions to air pollution

Chapter 18: Climate Change and Ozone Loss

Natural greenhouse effect, global climate change, ozone depletion, atmospheric composition Labs/Activities:

- Car Emissions Lab *
- Air Pollution and lung damage lab
- Ozone field lab on campus *
- Effects of NOX and SOX on seed germination
- Toxic House: Indoor Air Pollution *

Unit 11: Human Hazards

Chapter 11: Risk, Toxicology, and Human Health

Toxicology, chemical hazards, transmissible diseases

Chapter 20: Pesticides and Pest Control

Types of pesticides, pesticide use, pesticide regulations, alternative methods of controlling pests

Chapter 21: Solid and Hazardous Waste

Municipal solid waste, hazardous waste, reduce, reuse, recycle, detoxifying, burning, burying, and exporting waste Labs/Activities:

- Student research project on viral and bacterial hazards to human health
- Risk perception and risk reality survey
- Toxicology activity (LD50) using Radish seeds*
- Wastewater treatment plant tour
- Home pesticide Inventory Audit
- Gradd Decomposition Lab- A Lab of Rot *

Unit 12: Economy, Legislation, and the Environment

Chapter 26: Economics, Environment, and Sustainability

Chapter 27: Politics, Environment, and Sustainability

Chapter 28: Environmental Worldviews, Ethics, and Sustainability

Labs/Activities:

- Eco-Ethics Activity *
- Environmental Law Posters
- Letters to Congress- Choose your favorite environmental issue!