AP Environmental Science

Semester A Summary:

The goal of AP Environmental Science is to provide the student with the scientific principles, concepts, and methodologies required to understand the interrelationships of the natural world and to identify and analyze environmental problems that are natural and made my humans. The student will evaluate the relative risks associated with these problems and examine alternative solutions for resolving or preventing problems. Laboratory experiments support student content mastery in both hands-on and virtual experiences.

Semester A Outline

1. **Environmental Problems and Sustainability**
    1. Getting Started
    2. Env. Problems and Sustainability Unit Checklist
    3. Environmental Problems
        - define and discuss the implications of sustainability, sustainable society, sustainable yield, and environmental degradation
        - describe modern environmental problems and potential solutions
    4. History of Environmental Problems
        - describe changes that occurred in human population distribution, employment, and relationships between societies as the Agricultural Revolution unfolded
        - discuss the Industrial Revolution, focusing on changes in energy consumption
        - compare and contrast hunter-gatherer societies, agricultural societies, and industrial societies and the impact of their societies on the environment
        - construct a timeline showing the relationship between environmental change and cultural change
    5. Case Study: Tragedy of the Commons
        - distinguish among non-renewable, renewable, and potentially renewable resources; products that can be reduced, reused and recycled; point source of pollution and non-point source of pollution; and degradable, slowly degradable, and non-degradable pollutants
        - analyze interactions among population, resources, technology, and pollution
    6. Public Lands
        - compare and contrast "conservation" and "preservation"
        - define "conservation biology" and "ecological integrity"
        - recognize that conservation is guided in part by application of ethical principles
        - describe the types of public lands in the United States, the challenges that face each type, and how the challenges are currently being managed
    7. Science
        - discuss the difference between science and non-science

- explain the differences between science and technology
- analyze a list and flow chart that represent the Scientific Method
- apply the use of models in environmental science

8. Environmental Economics
    - describe the relationship among natural resources, manufactured capital, and human capital
    - identify negative externalities in a product life cycle
    - compare and contrast economic systems
    - evaluate measurement systems for valuing economies
9. Environmental Politics
    - describe the process through which an environmental concern becomes an environmental law
    - evaluate specific environmental regulations, laws, and treaties related to biodiversity
10. AP Exam and Math Prep
    - describe the structure of the AP Environmental Science Exam
    - identify the different kinds of questions that appear on the AP Environmental Science Exam
    - approximate the percentage of multiple-choice items that will test each topic covered by the AP Environmental Science Exam
11. Env. Problems and Sustainability Unit Exam

2. **The Living World**
    1. The Living World Unit Checklist
    2. Ecosystems
        - describe the levels of organization in ecology
        - identify and describe the characteristics of life
        - differentiate between biotic and abiotic components of an ecosystem
        - explain the difference between food chains and food webs
        - predict changes in ecosystem services resulting from environmental degradation
    3. Energy and Ecosystems
        - define the terms lithosphere, hydrosphere, and atmosphere
        - distinguish between the first and second law of thermodynamics
        - draw and label an energy pyramid
    4. Cycles
        - explain the differences between a closed system and an open system
        - draw, label, and describe the process and importance of the following cycles: water, carbon, nitrogen, phosphorous, and sulfur
    5. Community Ecology
        - describe a biological community
        - explain the difference between primary and secondary succession
        - interpret the competitive exclusion principle
        - compare and contrast the forms of symbiotic relationships
    6. Biodiversity
        - analyze the relationship between natural selection and speciation
        - interpret the effect that humans have had on their environment, including extinction rates
        - evaluate the ethical principles that guide conservation biology
    7. AP Exam and Math Prep
        - describe the process of creating an AP Environmental Science exam
        - describe the process of scoring an AP Environmental Science exam
        - analyze a sample AP score

8. The Living World Unit Exam

3. **The Physical World**
    1. The Physical World Unit Checklist
    2. Climates
        - analyze the properties of layers of the atmosphere
        - distinguish between weather and climate
        - describe global air-circulation patterns
        - explain the relationship between solar intensity, latitude, and seasons
    3. Terrestrial Biomes
        - define the term biome
        - compare and contrast major terrestrial biome types
        - describe adaptations required for organisms to thrive in each biome
    4. Ocean Circulation and Currents
        - describe ocean circulation patterns
        - analyze ocean-atmosphere interactions
        - evaluate current fishing practices and relevant laws
        - identify the location, seasonality, and effects of ENSO
    5. Aquatic Environments and Biodiversity
        - describe the different types of aquatic biomes
        - explain the components of a watershed
        - outline the ecological functions performed by wetlands
        - evaluate the ecological significance of aquatic environments
    6. Structure of the Earth
        - differentiate among the layers of Earth's interior
        - compare and contrast plate boundaries and resulting geologic features
        - describe the rock cycle and the interrelationships among the different rock types
    7. Mineral Resources
        - explain the environmental impacts of extracting, processing, and consuming mineral resources
        - summarize the differences between mineral resources and mineral reserves
    8. Forestry
        - describe the commercial and ecological significance of forests
        - distinguish between the goals of even-aged management and uneven-aged management
        - evaluate the types of tree harvesting in industrial forestry and sustainable forestry
        - summarize the best current strategies for protecting forests from pathogens and insects, fires, air pollution, and climate change
        - summarize the current state of old-growth forests in the United States and Canada
        - evaluate steps for reform of federal forest management
        - describe the current state of tropical forests and the significance of tropical forests in terms of both ecosystems and indigenous cultures
    9. AP Exam and Math Prep
        - describe the process of developing scoring guidelines for an AP free-response essay question
        - describe the process of training AP essay readers and scoring AP essays
        - analyze the scoring guidelines for a free-response essay question and score a sample student response
    10. The Physical World Unit Exam

4. **Population**

1. Population Unit Checklist
2. Population Dynamics
    - develop equations to describe the relationship between birth rate, death rate, emigration, and immigration rates and the rate of population change
    - describe how fertility rate and reproductive strategies affect population growth
    - examine factors that affect birth rate and factors that affect death rate
3. Demographics
    - describe three approaches to slowing human population growth and overpopulation
    - evaluate the controversies that surround controlling human population growth
    - interpret age-structure diagrams
    - summarize social impacts resulting from declining populations
    - describe demographic transitions and how they affect birth rate/death rate
    - evaluate the relationship between age and population growth
    - describe the consequences of unsustainable population growth
4. Urbanization
    - describe resources and environmental problems faced by urban areas
    - examine the process of ecological land-use planning
    - evaluate the costs and benefits of transportation for human society and ecosystem
    - evaluate a sustainable urban environment
    - describe the sources and effects of noise pollution
5. AP Exam and Math Prep
    - identify general and specific approaches to answering multiple-choice items on the AP Environmental Science Exam
6. Population Unit Exam

5. **Energy**
    1. Energy Unit Checklist
    2. Energy Concepts and Consumption
        - distinguish among amps, volts, and watts
        - describe how electricity is generated and flows
        - describe the relationship between the first law of thermodynamics and energy resources
        - describe the relationship between the second law of thermodynamics and the efficiency of energy generation
    3. Fossil Fuels I
        - distinguish among types of oil
        - describe the advantages and disadvantages of using conventional oil, oil from oil shale, and oil from tar sands as an energy source
        - distinguish among types of gas
        - describe the advantages and disadvantages of using natural gas as an energy source
        - distinguish among types of coal
        - describe the advantages and disadvantages of using coal as an energy source
    4. Fossil Fuels II
        - Examine the factors that affect demand for fossil fuels
        - Analyze the ways in which future demand for fossil fuels can be anticipated
        - Describe fossil fuel reserves and resources
    5. Nuclear Energy

- describe the components of a conventional nuclear reactor
- examine advantages and disadvantages of using conventional nuclear fission to produce electricity
- summarize current scientific thinking about disposal radioactive wastes
- describe ways of decommissioning a nuclear power plant
- summarize safety issues with nuclear energy
- predict future issues with nuclear energy sources and methods

6. Renewable Energy Resources I
    - compare and contrast renewable energy sources
    - evaluate using hydrogen gas as an energy source
    - anticipate sources of tension in a sustainable energy revolution
    - evaluate geothermal, hydrogen, solar, and biomass energy as energy sources
7. Renewable Energy Resources II
    - compare and contrast forms of energy generated from water
    - describe how wind energy is generated
    - construct arguments for and against the use of hydroelectric energy
8. Energy Conservation
    - describe the advantages and disadvantages of improving energy efficiency
    - examine cogeneration
    - evaluate potential actions for energy efficiency to decrease your own energy use
    - analyze the interactions of economic policy and energy resources
    - analyze the future of sustainable energy use in the United States
9. AP Exam and Math Prep
    - explain how eliminating distracters is likely to affect your score
    - identify situations in which it makes sense to skip an item and situations in which it makes sense to guess
    - describe a simple system for marking up answer choices
10. Collaboration Project
11. Energy Unit Exam
12. Semester One Exam

Semester B Summary:

The goal of AP Environmental Science is to provide the student with the scientific principles, concepts, and methodologies required to understand the interrelationships of the natural world and to identify and analyze environmental problems that are natural and made by humans. The student will evaluate the relative risks associated with these problems and examine alternative solutions for resolving or preventing problems. Laboratory experiments support student content mastery in both hands-on and virtual experiences.

Semester B Outline

1. **Atmosphere and Climate Change**
    1. Getting Started
    2. Atmosphere and Climate Change Unit Checklist
    3. Air Pollution and Smog
        - distinguish between a primary pollutant and a secondary pollutant
        - outline the process of thermal inversion

- describe the sources, control strategies, and environmental and human health effects of common air pollutants regulated by the Clean Air Act
- describe the formation and types of smog

4. Ozone
    - distinguish between ground-level ozone and upper atmospheric ozone
    - outline the chemistry of ozone loss
    - discuss the scope and effectiveness of the Montreal Protocol
    - describe the effects of ozone depletion
5. Acid Deposition
    - describe how acid deposition occurs.
    - describe the environmental effects of acid deposition.
6. Indoor Air Pollution
    - describe sources of indoor air pollution
    - evaluate the effects of indoor pollutants on human beings
    - evaluate the best ways to remediate and reduce asbestos and radon
7. Climate Change
    - describe how human actions affect the carbon cycle
    - summarize evidence for climate change
    - describe climate change effects on the biosphere
    - differentiate between human-induced and natural climate change
    - describe practical actions to take to mitigate human-induced climate change
8. AP Exam and Math Prep
    - identify the stimulus and the question parts of a synthesis-evaluation essay question
    - analyze a synthesis-evaluation essay question to determine what each question part instructs you to do
    - analyze a synthesis-evaluation essay question to determine the number of points you can earn for an accurate, complete response to each question part
9. Atmosphere and Climate Change Unit Exam

2. **Land and Food**
    1. Land and Food Unit Checklist
    2. Soil
        - describe how soil is formed
        - compare and contrast soil types across the United States and around the world
        - describe the physical and chemical composition of soil
        - describe the characteristics of main soil horizons
    3. Soil Conservation
        - describe the causes, processes, and effects of soil erosion and desertification
        - describe methods to maintain soil fertility and reduce erosion for various areas
        - describe soil conservation methods
        - use a model to draw conclusions about a real-world problem
    4. Agriculture and Food
        - distinguish between various types of agriculture
        - describe the causes and effects of the Green Revolution
        - evaluate the potential of aquaculture for increasing fish production and environmental effects
        - identify the factors that control food distribution and affect starvation
    5. Pests and Pest Management
        - describe types of pesticides
        - discuss the advantages and disadvantages of pesticide use

- summarize threats to wildlife and the human population resulting from use and overuse of pesticides
- examine alternative pest management strategies that control food distribution and affect starvation

6. Land Conservation
    - differentiate among land conservation options
    - recognize land conservation options for specific situations
    - identify primary methods of soil remediation
7. AP Exam and Math Prep
    - explain how document-based essay questions differ from synthesis-evaluation essay questions
    - summarize the document in a document-based essay question
    - analyze a document-based essay question to determine the number of points you can earn for an accurate, complete response to each question part
8. Land and Food Unit Exam

3. **Water**
    1. Water Unit Checklist
    2. Water Supply
        - describe the physical properties that make water unique
        - identify the major sources of freshwater and how freshwater is stored
        - examine causes of water supply issues
        - identify ways to prevent unnecessary water waste
        - evaluate the water supply problems of a specific locality
    3. Water Quality
        - identify water pollution types, sources, health, and environmental effects
        - compare and contrast the indicators of water quality
        - evaluate pollution prevention and control methods and strategies
        - examine and evaluate effectiveness of water quality legislation
    4. Water Treatment
        - describe how drinking water is protected and purified
        - distinguish among primary, secondary, and advanced sewage treatment
        - summarize a natural approach to water purification
    5. AP Exam and Math Prep
        - identify items you should bring and items you cannot bring to the AP Environmental Science Exam
        - explain the rationale for AP security policies and describe the consequences for violating them
        - apply for necessary accommodations to the AP Environmental Science Exam
    6. Water Unit Exam
4. **Toxicology and Risk**
    1. Toxicology and Risk Unit Checklist
    2. Risk
        - identify the precautionary principle and discuss the importance of its application
        - identify the major types of hazards and give examples
        - compare and contrast risk assessment and risk management
    3. Human Health
        - distinguish between transmissible and non-transmissible diseases
        - evaluate a strategy for reducing smoking in the United States
        - examine dietary changes that can help prevent cancer
        - describe the relationship between developments in medicine and population growth

- summarize the ways humans can minimize risk of infectious disease

4. Toxicology
    - describe acute and chronic effects of pollution
    - distinguish between locations of toxic events
    - model, simulate, and evaluate dose-response situations
5. AP Exam and Math Prep
    - determine when an essay question part requires a math-based response
    - follow instructions exactly to produce a correct math-based response to an essay question part
    - solve math problems involving percents, decimals, and unit conversions
6. Toxicology and Risk Unit Exam

5. **Recycling and Sustainability**
    1. Recycling and Sustainability Unit Checklist
    2. Solid Waste
        - identify options for disposal of solid waste
        - describe the structures in a modern sanitary landfill
        - compare and contrast landfills and incinerators
        - analyze the status of export of wastes globally
        - evaluate legal and economic aspects of solid waste
    3. Hazardous Waste
        - explain the characteristics of hazardous waste
        - examine hazardous waste-related legislation and evaluate its effectiveness
        - describe options for disposal of hazardous wastes
        - describe how legislation related to hazardous waste is developed
    4. Recycling
        - apply reduce, reuse, and recycle strategies at a variety of locations
        - describe the process of composting and describe the benefits
        - compare and contrast models for recycling
    5. Global Change and Sustainability
        - Analyze key components of an ecological footprint.
        - Discuss the relationship of biodiversity to sustainability.
        - Evaluate global energy options.
        - Discuss the Green Revolution and its affect on sustainability.
        - Discuss the relationship of population growth to pollution.
        - Evaluate representations of sustainable and unsustainable living.
    6. AP Exam and Math Prep
        - identify scholarships and other opportunities contingent on AP scores
        - follow a study plan to help you prepare for the AP Environmental Science Exam
    7. Collaboration Project
    8. Recycling and Sustainability Unit Exam
    9. Semester Two Exam

