

## APES TOPIC OUTLINE

### I. Earth Science and Resources (10-15%)

- A. Earth Science Concepts  
(Geological time scale; plate tectonics, earthquakes, volcanism; seasons; solar intensity and latitude)
- B. The Atmosphere  
(Composition; structure; weather and climate; atmospheric circulation and the Coriolis Effect; atmosphere-ocean interactions; ENSO)
- C. Global Water Resources and Use  
(Freshwater/saltwater; ocean circulation; agricultural, industrial and domestic use; surface and groundwater issues; global problems; conservation)
- D. Soil and Soil Dynamics  
(Rock cycle; formation; composition; physical and chemical properties; main soil types; erosion and other soil problems; soil conservation)

### II. The Living World (10-15%)

- A. Ecosystem Structure  
(Biological populations and communities; ecological niches; interactions among species; keystone species; species diversity and edge effects; major terrestrial and aquatic biomes)
- B. Energy Flow  
(Photosynthesis and cellular respiration; food webs and trophic levels; ecological pyramids)
- C. Ecosystem Diversity  
(Biodiversity; natural selection; evolution; ecosystem services)
- D. Natural Ecosystem Change  
(Climate shifts; species movement; ecological succession)
- E. Natural Biogeochemical Cycles  
(Carbon, nitrogen, phosphorus, sulfur, water, conservation of matter)

### III. Population (10-15%)

- A. Population Biology Concepts  
(Population ecology; carrying capacity; reproductive strategies, survivorship)
- B. Human Population
  - 1. Human population dynamics  
(Historical population sizes; distribution; fertility rates; growth rates and doubling times; demographic transition; age-structure diagrams)
  - 2. Population size  
(Strategies for sustainability; case studies; national policies)
  - 3. Impacts of population growth  
(Hunger; disease; economic effects; resource use; habitat destruction)

### IV. Land and Water Use (10-15%)

- A. Agriculture
  - 1. Feeding a growing population  
(Human nutritional requirements; types of agriculture; Green Revolution; genetic engineering and crop production; deforestation; irrigation; sustainable agriculture)
  - 2. Controlling pests  
(Types of pesticides; costs and benefits of pesticide use; integrated pest management; relevant laws)

B. Forestry  
(Tree plantations; old growth forests; forest fires; forest management; national forests)

C. Rangelands  
(Overgrazing; deforestation; desertification; rangeland management; federal rangelands)

D. Other land Use

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; national parks; wildlife refuges; forests; wetlands)
4. Land conservation option  
(Preservation; remediation mitigation; restoration)
5. Sustainable land use strategies

E. Mining  
(Mineral formation; extraction; global reserves; relevant laws and treaties)

F. Fishing  
(Fishing techniques; overfishing; aquaculture; relevant laws; and treaties)

G. Global Economics  
(Globalization; World Bank; Tragedy of Commons; relevant laws and treaties)

## V. Energy Resources and Consumption (10-15%)

A. Energy Concepts  
(Energy forms, power; units; conversions; Laws of Thermodynamics)

B. Energy Consumption

1. History  
(Industrial Revolution; exponential growth; energy crisis)
2. Present global energy use
3. Future energy needs

C. Fossil Fuel Resources and Use  
(Formation of coal, oil, and natural gas; extraction/purification methods; world reserves and global demand; synfuels; environmental advantages/disadvantages of sources)

D. Nuclear Energy  
(Nuclear fission process; nuclear fuel; electricity production; nuclear reactor types; environmental advantages/disadvantages; safety issues; radiation and human health; radioactive wastes; nuclear fission)

E. Hydroelectric Power  
(Dams; flood control; salmon; silting other impacts)

F. Energy Conservation  
(Energy efficiency; CAFÉ standards; hybrid electric vehicles; mass transit)

G. Renewable Energy  
(Solar energy; solar electricity; hydrogen fuel cells; biomass; wind energy; small scale hydroelectric; ocean waves and tidal energy; geothermal; environmental advantages/disadvantages )

## VI. Pollution Types (10-15%)

### 1. Air Pollution

(Sources –primary and secondary; major air pollutants; measurement units; smog acid deposition –cause and effects; heat islands and temperature inversions; indoor air pollution; remediation and reduction strategies; Clean Air Act and other relevant laws)

### 2. Noise Pollution

(Sources; effects; control; measures)

### 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)

### 4. Solid Waste

(Types; disposal; reduction)

## B. Impacts on the Environment and Human Health

### 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)

## C. Economic Impacts

(Cost-benefit analysis; externalities; marginal costs; sustainability)

## VII. Global Change (10-15%)

### A. 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)

### B. Global Warming

(Greenhouse gases and the greenhouse effect; impacts and consequences of global warming; reducing climate change; relevant laws and treaties)

### C. Loss of Biodiversity

1. Habitat Loss; overuse; pollution; introduced species; endangered and extinct species

2. Maintenance through conservation

3. Relevant laws and treaties