APES Topic Outline for Advanced Placement Exam

I. Earth Systems and Resources (10-15%)

A. Earth Science Concepts
(Geologic 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, Ecosystems Impacts)
3. Public and Federal Lands
(Management; Wilderness Areas; National Parks; Wildlife Refuges; Forests; Wetlands)
4. Land Conservation Options
(Preservation; Remediation; Mitigation; Restoration; Adaptation)
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 the 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 Fusion)

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 (25-30%)

A. Pollution Types

1. Air Pollution
(Sources - Primary and Secondary; Major air pollutants; Measurement Units; Smog; Acid Deposition - Causes, 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; Clean-up 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