AP Environmental Science Exam Prep Session: Energy Resources and Consumption

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AP Environmental Science Topic Outline

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 Conser vation
  - (Energy efficiency; CAFE 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)

Important Legislation

Low-Level Radioactive Policy Act: all states must have facilities to handle low-level radioactive wastes.
Nuclear Waste Policy Act: US government must develop a high level nuclear waste site by 2015 (see Yucca Mountain).

Important Terms

First Law of Thermodynamics: energy is neither created nor destroyed, but may be converted from one form to another.
Second Law of Thermodynamics: when energy is changed from one form to another, some useful energy is always degraded into lower quality energy (usually heat).
Ionizing radiation: radiation w/enough energy to free electrons from atoms forming ions, may cause cancer (ex. gamma, X-rays, UV).
High Quality Energy: organized & concentrated, can perform useful work (ex. fossil fuels & nuclear).
Low Quality Energy: disorganized, dispersed (ex. heat in ocean or air/wind, solar).
Natural radioactive decay: unstable radioisotopes decay releasing gamma rays, alpha & beta particles (ex. Radon).
Half-life: the time it takes for 1⁄2 of the mass of a radioisotope to decay. A radioactive isotope must be stored for approximately 10 half-lives until it decays to a safe level.
Nuclear Fission: nuclei of isotopes split apart when struck by neutrons.
Nuclear Fusion: 2 isotopes of light elements (H) forced together at high temperatures until they fuse to form a heavier nucleus; happens in the Sun; very difficult to accomplish on Earth; prohibitively expensive.
Electricity Generation: steam, from water boiled by fossils fuels or nuclear energy, or falling water is used to turn a generator.
Petroleum (Crude Oil) Formation: microscopic aquatic organisms in sediments converted by heat & pressure into a mixture of hydrocarbons.
Petroleum Pros: cheap, easily transported, high-quality energy.
Petroleum Cons: reserves depleted soon, pollution during drilling, transport and refining, land subsidence, burning oil produces CO2.
Coal Formation: prehistoric plants buried un-decomposed in oxygen-depleted water of swamps/bogs converted by heat and pressure.
Ranks of Coal: peat, lignite, bituminous coal, anthracite coal *(from least to best)*
Nuclear Reactor: consists of a core, control rods, moderator, steam generator, turbine, containment building.
Alternative Energy Sources: wind, solar, waves, biomass, geothermal, fuel cells