Physical Science Chapter 8 (Energy Sources and the Environment)
Notes

Section 1: Fossil Fuels

1) **Fossil fuels**—coal, natural gas and petroleum were formed from ancient plants and animals that were buried and altered over millions of years.
   a) **Petroleum**—is a flammable liquid formed from the decay of ancient organisms such as plankton and algae.
      i) A refinery is a large industrial plant that separates crude oil into various products using a fractionation tower.
      ii) Products such as gasoline, diesel fuel, heating fuel, petroleum jelly, and asphalt are separated.
   b) **Natural gas**--is a colorless gas consisting mostly of methane (chemical formula: CH_4).
      i) Is relatively easy to collect and when compared to other fossil fuels it produces little pollution.
      ii) Is most often used for heating, cooking and generating hot water.
   c) **Coal**--is a dark brown or black rock that is mined. These mines were once the sites of ancient swamps.
      i) Coal—is the most abundant fossil fuel in the world & is estimated to last 200-250 years.

Fossil fuels are considered **nonrenewable resources** because they took so long to form. They cannot be replaced after they are used. Since fossil fuels are nonrenewable they are decreasing in supply and increasing in cost. Fossil fuels release carbon dioxide CO_2 which is a green house gas.

Section 2: Nuclear Energy

1) **Fusion**—occurs atomic nuclei combine at very high temperatures.
2) **Fission**—the energy is released when the nucleus of an atom splits apart.
   a) **Nuclear reactors** – convert nuclear energy into heat. The heat from the nuclear reaction is used to boil water, turning it into steam. The steam is used to spin a generator turbine.
   b) The isotope uranium U-235 is used as fuel in the fuel rods and the fission chain reaction is controlled by control rods made of boron or cadmium that absorb excess neutrons.
   c) Advantages—do not release the pollution that fossil fuels do.
   d) Disadvantages—expensive and time consuming to build, risk of releasing radio activity. (not sure Chernobyl is the worst nuclear disaster anymore. Japan tsunami may now be the worst)
      i) **Nuclear waste**—is any radioactive material that results when radioactive materials are used. Both low and high level waste can be produced.

Section 3: Renewable Energy Resources

1) **Renewable resource**—is an energy source that is replaced by natural processes faster than humans can consume the resource.
   a) **Photovoltaic cell**—(solar cell) converts radiant energy directly into electrical energy.
      i) Solar cell is made from a sandwich of semiconductor material.
   b) **Hydroelectricity**—Electric current produced from the energy of moving water
   c) **Wind Energy**—uses windmills to convert rotary energy to electrical energy.
   d) **Geothermal energy**—using thermal energy that is contained in and around magma.
   e) **Hydrogen fuel cells**—(alternative fuel)—combines hydrogen with oxygen in air to generate electrical energy, water and heat.
   f) **Biomass**—(alternative fuel)—renewable organic matter such as wood, soy, corn, switch grass, sugarcane fiber, rice hulls or animal manure.

Section 4: Environmental Impacts

1) **Population**—includes all the individuals of one species living in a particular area.
2) **Carrying capacity**—is the largest number of individuals of a particular species that the environment can support.
3) **Pollutants**—include any substance that contaminates the environment.
4) **Hazardous wastes**—wastes that are poisonous, that cause cancer, or that can catch fire.
5) **Photochemical smog**—pollution that results from the reaction between sunlight and vehicle for factory exhaust.
6) **Acid precipation**—sulfur, nitrogen, and carbon react with moisture creating various concentrations of sulfuric acid, nitric acid and carbonic acid. This can corrode metals and cause harm to plants and animal.
7) **Greenhouse effect** – the increase in the temperature of Earth due to the increase of carbon dioxide in the atmosphere. Carbon dioxide in the earth's atmosphere acts like a glass globe.
   a) The carbon dioxide allows the sunlight to pass inward to the earth but reduces the flow of heat energy outward into space.
8) **Global warming** – (Now known as climate change) the increase in the average temperature of Earth's atmosphere as a result of the greenhouse effect.
9) **Ozone layer** – protects the Earth from the sun's ultraviolet radiation by absorbing it.
   a) Too much ultraviolet radiation can cause skin cancer, impairment of vision, and even death.
   b) In the polar regions the ozone layer is being depleted.

c) The ozone layer is depleted by the effects of nitrogen oxides produced by highflying aircraft, and by compounds called chlorofluorocarbons (CFCs).
d) The rate of ozone depletion is greater than the rate of natural formation of ozone. Known as the leaky bucket theory.

10) **Conservation** – the careful and efficient use of resources.
a) By conserving nonrenewable resources they will last longer.
b) Using less energy will produce less pollution.