Review Exercises - 2:

Why are fossil fuels not being created in nature fast enough to keep up with our use of them?
It took hundreds of millions of years for plant and animal matter to be converted into the hydrocarbon compounds (fossil fuel) under conditions of high temperature and pressure under the earth's surface.

What is the definition of Q_∞ for a certain fossil fuel?

Q_∞ is the total resource of a fossil fuel that is *available* (economically recoverable) over all time from the beginning of its industrial production to the exhaustion of the resource.

What are the major environmental problems of coal production?

1. Environmental impact of surface mining
2. The effect of CO_2 emissions on global climate
3. Health effects of SO_2 and particulate emissions

Gasoline costs nearly twice as much per Btu as does natural gas. Why then, do we power our cars and trucks predominantly with gasoline rather than natural gas?

Natural gas must be compressed to liquid form for practical use. There is a potential for explosions.

Why is 2/3 of the petroleum left in the ground after the primary extraction process comes to and end? Can this problem be overcome?

There are two effects that lock the oil in: interfacial tension and viscosity. Enhanced recovery methods include pumping either water or gas into the surrounding area to force more oil toward the well, injecting CO_2 or steam to decrease viscosity, injecting detergents to decrease surface tension.

What is oil shale and how can it be converted into useful fuels for transportation and heating?

Oil shale, an organic-rich fine-grained sedimentary rock, contains significant amounts of kerogen from which technology can extract liquid hydrocarbons – shale oil. The shale oil can be further refined to produce gasoline, fuel oil.

It has been estimated that a person can perform continuous manual labor at a power of 50 watts for an 8 hour working day. How many pounds of coal contain the energy equivalent of the useful physical labor a person can perform in this time period? (There are about 13,000 Btu in a pound of coal.)

$50W \times (8 \times 3600S) = 1440000J$

$1440000J \div (13000 \times 1055)J/pound = 0.1$ pound

What is the oldest form of coal?
a. bituminous b. anthracite c. lignite   d. peat

In the United States the total energy consumed per year per person is the equivalent of about how many barrels of oil?
a. 5.8 b. 58 c. 580   d. 5800

The declining order of importance for the various energy sources in the world is:
natural gas, oil, coal, nuclear, hydro
oil, coal, natural gas, nuclear, hydro
oil, natural gas, coal, hydro, nuclear
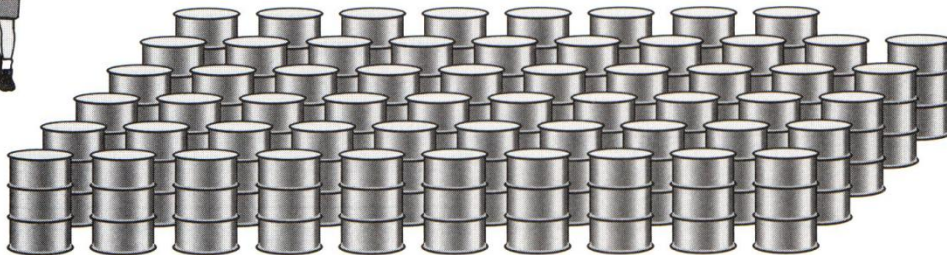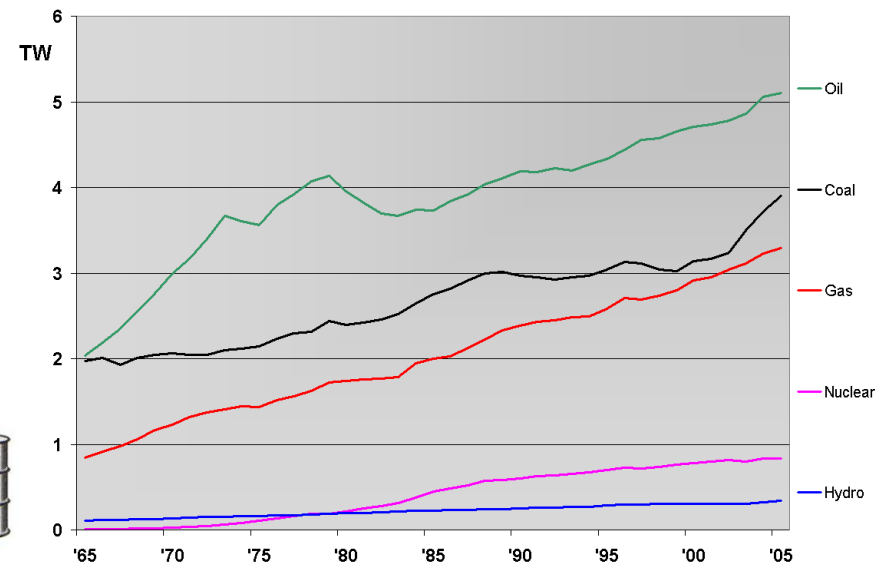coal, oil, natural gas, hydro, nuclear

Figure 1.7 Each person in the United States consumes an energy equivalent of 58 barrels of oil burned as fuel each year.

Natural gas consists mostly of___, and to some extent___.
propane, ethane
propane, methane
butane, ethane
(methane, ethane)

The coal that we burn in our power plant today represents solar energy trapped in organic molecules about___years ago.
a. 300,000   b. 3,000,000   (c. 300,000,000)   d. 3,000,000,000

The oil that we burn in our car today represents solar energy trapped in organic molecules about___years ago.
a. 200,000   b. 2,000,000   (c. 200,000,000)   d. 2,000,000,000

In tar sands, the organic material that contains the oil and that surrounds the grains of sand is:
a. kerogen,   b. kerosene,   c. marlstone,   (d. bitumen,)   e. paraffin