

ESC 111

Human use of energy resources

BRIEF ANSWERS

1. Define the following terms as they relate to natural resources, energy, and materials.
 - a. Renewable: can be replenished in a relevant time period and/or use does not appreciably diminish supply (e.g., solar energy)
 - b. Non-renewable: the opposite of renewable (e.g., fossil fuels)

2. List six sources of energy used by humans to power technology and classify each as renewable or nonrenewable. Then, answer the following question. Why don't we use renewable resources more than we do (why do non-renewables continue to dominate)?
 1. Coal—NR
 2. Oil—NR
 3. Natural gas—NR
 4. Nuclear—NR
 5. Hydro power –R (for the most part....)
 6. Solar—R
 7. Wind—R

Why don't we use them more? It's complicated, but the answer has to do with existing infrastructure and start-up costs.

3. Define the following terms. HINT: check out my web link to 'Additional Readings on topics discussed in class' → 'Resources vs. reserves'. You could also do some additional research.
 - a. Oil reserves: known to exist AND can be recovered with existing technology
 - b. Oil resources: includes reserves PLUS oil that is thought to exist (but may not) and/or oil that cannot be easily recovered with existing technology

4. Explain the processes by which oil and natural gas wells are formed. Be sure to include: a description of the environmental conditions necessary to form these fuels and how the formation of these fuels fits into the global carbon cycle.

Ancient marine microorganisms died and sank to the sea floor. Due to anaerobic conditions, they escaped decomposition and persisted. Burial with sediments increased temperature and pressure. After millions of years (or so) they were changed to petroleum and migrated toward earth's surface (through permeable rocks). If they hit an impermeable barrier, they collected (see pp. 330–331). If found, they can be pumped out. C cycle: remains of dead organisms can escape decomposition and persist in the lithosphere. Human combustion converts them to CO₂.

5. Describe how a generator is used to produce electricity.

In short: find a way to spin a wheel. As fig. 15.4 describes, coal might be used to generate steam and spin a wheel....but many other power sources exist. Read the figure caption for more details.

6. What are some of the problems associated with the use of biomass (e.g., ethanol) as an energy source? Is biomass a renewable or nonrenewable source of energy? Table 15.1 in your textbook classifies it as 'Renewable.' Is that reasonable? Be sure to consider all of the resources necessary to use biomass as an energy source in your answer.

Ethanol is made from crops like corn or sugar. So, all the problems associated with agriculture should come to mind. Is it renewable? The answer depends on how well soil loss is managed (as well as all the other things we talked about relative to agriculture). If the only limiting factors were CO₂ and sunlight, then we might be able to say it's renewable. Unfortunately, more is needed to grow plants (as you know).