Begin your reading with the overview to Part 3 of the text, beginning on page 117.

1.a. What are the two major sources of energy flow to the earth’s surface?

   b. How do these energy sources manifest themselves to us, i.e., what are the obviously energy-related products of these two energy-flows?

2. What proportion of the world’s energy use currently is supplied by fossil fuels?

3. What proportion of its petroleum consumption does the U.S. now import?

4. How much faster is the rate of the world’s consumption of petroleum than is the rate of the earth’s natural formation of petroleum?

   a. Does petroleum renew itself?
   b. Is petroleum a renewable resource?

5. What are some of the (positive?) results of the recent skyrocketing of oil prices?

6.a. Why is it that natural gas (methane) finally is becoming a more economic fuel?

   b. What are some of the environmentally desirable properties of natural gas compared to other fossil fuels?

7. What property of nuclear reactions do we take advantage of in nuclear power plants?

8. What are two important problems with the use of nuclear power plants in the U.S., particularly as perceived by the general populace?

9. What are the major types of “alternative/renewable energy sources”?

10.a. Which types of alternative energy have the “tappable power-abundance” to be major suppliers in the U.S.?

Read through the very useful FOCAL POINTS (pp. 122-123)

11.a. What is the energy output of a human--converted into watts? Are you impressed?

   b. How many “energy slaves” (human-energy equivalents) does each American have?

12.a. Why is the concept of rate important with respect to (energy) resources?

   b. What are the definitions of the energy units joule, calorie, BTU (British thermal unit), watt?

13. What was the United States’ and Europe’s major source of energy in 1850?
    In 1900?    Since 1950?
14. What will the ultimate efficiency be for generating electricity?

15.a. What are the ways and forms (list the types of fossil fuels) in which organic matter occurs in sediments and sedimentary rocks?
   b. About what % of the original organic matter in sediments is preserved (i.e., to become some type of fossil fuel)?

16.a. What events led up to the Persian Gulf War in 1990-91?
   b. What acts of ecological terrorism did Iraq commit during this conflict? What were the results?

17.a. What factors determine whether organic matter is converted to coal, petroleum, natural gas, peat, or oil shale?
   b. What processes of alteration/maturation are shared by the different types of organic matter as they naturally convert to fossil fuels?

18.a. What is the major use for coal today in the U.S.?
   b. What are the major complaints against use of coal?
   c. Which chemical components of coal are crucial to its combustion and its heat output?

19.a. Why were the urban areas of the eastern U.S. not deforested (like Britain) during the Industrial Revolution?
   b. How does the total area of the eastern U.S. forests today compare to the area in the 1880s?

20.a. Why is so much of the coal worldwide confined to the geologic time period called the Carboniferous?
   b. What factors encourage efficient formation of coal?
   c. What is the rate (mm/year) of peat accumulation in conducive areas today?

21.a. What present environments are conducive to coal/peat formation?
   b. Explain the reasons for the cyclical deposition of coal that are recorded in coal beds.
   c. What rock types typically are found in the layers between coal seams?

22. What processes occur during coalification?

21. Where are the major coal reserves of the U.S. and the world located?

22.a. What factors control whether a coal seam is economical to mine and whether mining will occur through underground mining or surface/strip mining?
   b. What are the modern techniques for mining coal?

23. Why has there been a marked increase in the proportion of U.S. coal production that comes from the western states?

24.a. What are the environmental problems of coal mining and coal use?
   b. Which of the above problems can be mitigated and how?
Questions for Ch.5: Energy from Fossil Fuels

25.a. What are the relative CO₂ releases from coal, petroleum, and natural gas per BTU?  
    b. Why is this consideration important?

26.a. What is peat? Is it a renewable resource?  
    b. What are the limitations to its use as a fuel?

27. What is the difference between the organic materials that give rise to coal and those that 
    give rise to petroleum deposits?

28.a. What innovative, but -- by today’s standards – low-tech, mechanism did Edwin Drake use 
    to recover oil from the first modern U.S. oil well (in Pennsylvania) in 1859?  
    b. What transport infrastructure soon grew to handle the oil?

29.a. How does coal-bed methane form?  
    b. How can it be recovered and used as a fuel?

30. The Middle East holds more than ___% of the world’s known oil reserves.

31. What two huge petroleum deposits have been discovered far to the north in the past 50 
    years?

32.a. What is the distinction between aerobic and anaerobic environments, and why is this 
    important in the development of coal and oil?  
    b. What processes/stages does marine organic matter undergo to form petroleum?

33. Define the following petroleum-related terms: 
    a. Methane  f. Refining  k. directional drilling 
    b. Biogenic gas  g. Strategic Petroleum Reserve  
    c. Thermogenic gas  h. Oil shale 
    d. Source rocks  i. In situ retorting  
    e. Reservoir rocks  j. Traps

34.a. What % of the total petroleum in a deposit typically is removed by primary recovery?  
    b. What is the typical ultimate recover % even by means of secondary recovery?

35. Place the following fluids in order by density (most dense to least dense): water, natural 
    gas, petroleum. If all 3 shared the same aquifer, how would they be “layered” in the aquifer?

36. What properties of porous-permeable rocks, petroleum, and selected chemicals are 
    employed during “secondary recovery” processes?

37. What is oil mining?  

OVER  ➔
Questions for Ch.5: Energy from Fossil Fuels

38.a. What is the process of distillation as applied to raw petroleum?
   b. Where does gasoline fit into the distillation scheme? Why was gasoline discarded during the early years of petroleum refining and use?

39.a. What happens to the (inherent) sulfur in the petroleum during the refining process?
   b. Why don’t we use the same kind of process for removal of sulfur from coal?

40.a. Geologically, what controls the occurrence of major oil fields? Think about time, surface topography, and ecosystems.
   b. What disappointments have we experienced in recent years in our search for more petroleum deposits worldwide and in the U.S.?

41.a. What is OPEC?
   b. What gives OPEC its strength (and economic clout)? Give at least 2 reasons.

42. To answer the questions, below, refer to figure 5.44. Divide by 1000 the values on the Y-axis of the upper graph; they should read “5, 10, 15, 20” million barrels per day.
   a. What percent of the oil used by the U.S. is imported?
   b. What percent of the world’s total oil production is consumed by the U.S.?

43.a. What % of the world’s oil reserves are found in the U.S.?
   b. What are the important factors in determining how long the world’s oil reserves will last?

44.a. What percent of the U.S. and Europe’s energy needs are met by the use of natural gas?
   b. Is most of the recovered gas of thermogenic or biogenic origin? From what depths is it recovered?

45.a. From what raw materials are plastics made?
   b. What are polymers? How are they important in the plastics industry?

46. What technologic advancements have made it possible to ship natural gas far from its source?

47. What are the properties of natural gas that make it so desirable as a fuel – even above coal and petroleum (discussions both here in ch. 5 and in the overview section)?

48.a. What are clathrates?
   b. What are the energy “advantages” and environmental “disadvantages” of clathrates?

49.a. What are oil shales? How and from what do they form?
   b. How can usable fuel be derived from oil shales and tar sands? What problems are associated with this processing?

Focus on: Boxes 5.1, 5.2, 5.3, 5.4; Figures 5.1, 5.2, 5.4, 5.5, 5.6, 5.11, 5.14, 5.15, 5.16, 5.25, 5.31, 5.32, 5.33, 5.35, 5.37, 5.38, 5.39, 5.40, 5.41, 5.44, 5.45, 5.46, 5.49, 5.51, 5.52, 5.53; see Fig. 2.13 back in chapter 2.