

APES

Reading

Assignments

- Based on Miller's **Living in the Environment**
- Complete these assignments neatly on loose-leaf, by hand, with chapter titles clearly indicated.
- Complete your own assignments – do not copy other people's work or offer your work for copying.
- Keep assignments in a separate part of your binder
- Assignments done with a word processor will NOT be accepted
- Establish a habit of completing ***approximately 8 - 10 reading questions per day*** ... do not fall behind!
- Reading assignments will comprise 25% of your mark in this course – based on completion, thoroughness, neatness and punctuality.

Environmental History: An Overview

Chapter 2, Miller's Living in the Environment, 13th Ed

2-1 Cultural Changes and the Environment

1. Briefly describe (3 or 4 sentences) the lifestyle of hunter-gatherers. List 3 reasons why they had limited impact on their environment.
2. Describe the four stages of "sustainable cultivation" that was practiced with the agricultural revolution.
3. List 3 reasons why early farmers have limited impact on their environment?
4. Based on the "Connections: Consequences of the Agricultural Revolution", make a table that lists 3 benefits and 3 harmful effects to the agricultural revolution.
5. Briefly describe the industrial revolution in terms of energy sources, pollution, urbanization, agriculture and health care.

2-2 Environmental History of the U.S.: The Tribal and Frontier Eras

2-3 Environmental History of the U.S.: The Early Conservation Era

2-4 Environmental History of the U.S.: The Environmental Era

6. Describe 3 characteristics of the "frontier environmental worldview".
7. Contrast the "conservationist" views of Theodore Roosevelt and the "preservationist" views of John Muir. The spotlight section "How should Public Land Resources be Used" may help answer this.
8. The publication of Rachel Carson's book "Silent Spring" is often pointed to as the beginning of the modern environmental era. Read the section "Individuals Matter: Rachel Carson" and answer the following questions:
 - a) What was Rachel Carson's field of expertise?
 - b) What was DDT used for?
 - c) Why did Carson title her book, "Silent Spring"?
9. In one or two sentences describe the following U.S. government entities, regulations or environmental events listed in the timeline since 1960:
 - a) Clean Air Act
 - b) Environmental Defense Fund
 - c) EPA
 - d) OSHA
 - e) Clean Water Act
 - f) Three Mile Island accident
 - g) Superfund Law
 - h) Chernobyl accident
 - i) Montreal Protocol
 - j) Exxon Valdez accident

Science, Systems, Matter, and Energy

Chapter 3, Miller's Living in the Environment, 13th Ed

3-1 Science and Critical Thinking

1. Sketch the simplified outline of "what scientists do" in figure 3-2.
2. Distinguish between a "scientific hypothesis" and a "scientific theory".
3. Non-scientists often criticize scientific theories for being just "theories". Explain how this criticism illustrates a misunderstanding of the term.
4. What is a "controlled experiment"? How is single-variable analysis done?
5. Contrast "inductive reasoning" with "deductive reasoning".
6. Contrast "frontier science" with "consensus science".

3-2 Models and Behaviour of Systems

7. Define the term "system" and the key components of systems (inputs, flows, stores, and outputs).
8. What is a "feedback loop"? Describe the two types – positive and negative feedback loops.
9. Explain how an increasing city population can lead to both positive and negative feedback loops. (i.e. the increase in population may lead to further increases or to a stabilization of the population)
10. Describe the connection of a "time delay" with the "threshold level" in complex systems.
11. What is "synergy"?
12. Explain Eric Davidson's "Law of Conservation of Problems" in the implementation of technology to solve environmental problems.

3-3 Matter: Forms, Structure and Quality

13. What is a compound? What is a molecule?
14. Briefly describe the structure of the atom in terms of nucleus, protons, neutrons and electrons. What do the "atomic number" and "mass number" refer to?
15. What are ions? What are isotopes?
16. Describe the pH scale for acids and bases (acidity and alkalinity).
17. What are "organic compounds"? Briefly describe the major types listed by Miller (hydrocarbons, chlorinated hydrocarbons, chlorofluorocarbons, and simple carbohydrates).
18. Distinguish between "genes" and "chromosomes". What is DNA?

3-4 Energy: Forms and Quality

19. How is energy defined? Distinguish between "kinetic energy" and "potential energy".
20. List the different types of "electromagnetic radiation" in figure 3-9.
21. What is meant by "ionizing radiation"? Which forms of electromagnetic radiation are ionizing?
22. Define "convection", "conduction" and "radiation". Refer to figure 3-11.

3-5 Physical and Chemical Changes & the Law of Conservation of Matter

23. What is the difference between a physical change and a chemical change?
24. State the “Law of Conservation of Matter”.
25. Explain what Miller means when he says there is no “away” in “to throw away”.
26. What are the three factors that determine how harmful a pollutant is?
27. Give two examples each for degradable, slowly degradable and nondegradable pollutants.
28. What is a “biodegradable” pollutant?

3-6 Nuclear Changes

29. What is a radioisotope?
30. How is “gamma radiation” different from “alpha particles and beta particles”?
31. What is the definition of “half-life”?
32. What is the largest natural source of radiation exposure to humans? What is the largest human-generated source? (see figure 3-15)
33. What are the two ways that ionization radiation harms cells? Briefly describe each.
34. Contrast nuclear “fission” and nuclear “fusion”.

3-7 Two Laws Governing Energy Changes

35. State the first law of thermodynamics. What does it mean?
36. State the second law of thermodynamics. How does figure 3-19 explain the law?

3-8 Connections: Matter and Energy Change Laws

37. Describe the three types of economies Miller lists here (High throughput, Matter Recycling and Low throughput).

Ecosystems: Components, Energy Flow, and Matter Cycling

Chapter 4, Miller's Living in the Environment, 13th Ed

4-1 The Nature of Ecology

1. In the introduction to the chapter, Miller discusses the role of insects in ecosystems. Describe two "services" that insects provide for us.
2. What is ecology?
3. How are organisms that reproduce sexually classified as members of the same "species"?
4. What is a good estimate of the number of species that exist on the earth?
5. Define each of the following terms:
 - a) Population
 - b) Genetic Diversity
 - c) Community
 - d) Ecosystem

4-2 The Earth's Life Support Systems

6. Define each of the following terms:
 - a) Atmosphere (troposphere and stratosphere)
 - b) Hydrosphere
 - c) Lithosphere
 - d) Biosphere
7. What is the source of the sun's energy?
8. What are the three forms of the sun's energy that reaches the troposphere?
9. What percent of the sun's energy is reflected by the atmosphere back into space?
10. List 5 "greenhouse gases" ... gases in the atmosphere that absorb infrared radiation reflected from the earth's surface, warming the troposphere in the "natural greenhouse effect".

4-3 Ecosystem Concepts and Components

11. What are biomes and "aquatic life zones"?
12. What is an ecotone? Why are there more species present in an ecotone?
13. Use table 4-13 to list 5 abiotic factors that affect terrestrial and aquatic ecosystems.
14. What is the "law of tolerance"? In your answer, define the "range of tolerance".
15. What is the "limiting factor principle"? What are some examples of limiting factors in aquatic ecosystems?
16. Define each of the following terms:
 - a) Producers (autotrophs)
 - b) Consumers (heterotrophs)
 - c) Herbivores (primary consumers)
 - d) Carnivores (secondary, tertiary consumers)
 - e) Omnivores
 - f) Scavengers
 - g) Detritivores – distinguish between detritus feeders and decomposers.

17. Explain how detritivores “complete the cycle of matter” in nature.
18. Write and label the chemical reactions for photosynthesis and aerobic respiration.
19. Miller defines four types of biodiversity. Explain each type: genetic diversity, species diversity, ecological diversity, and functional diversity.

4-4 Connections: Food Webs and Energy Flows in Ecosystems

20. Define “food chain”, including an explanation of the term “trophic levels”.
21. What is a “food web”?
22. Describe the “pyramid of energy flow” in an ecosystem.
23. Miller claims that earth can support more people if we eat at lower trophic levels. Explain what he means by this.
24. Describe the structure of “pyramids of biomass” for most land ecosystems. How are pyramids of biomass for oceans often different? What is the explanation?
25. Why does the “pyramid of numbers” in a temperate rainforest have a small base of producers and a larger base of primary consumers?

4-5 Primary Productivity of Ecosystems

26. Give definitions for the following terms:
 - a) Gross Primary Productivity (GPP)
 - b) Net Primary Productivity (NPP)
27. What are “estuaries”?
28. List the top 4 ecosystems and the bottom 4 ecosystems in terms of net primary productivity.
29. According to Miller, why is it a bad idea to clear tropical rainforests and plant food crops?
30. According to Peter Vitousek, what is the impact of humans on the NPP of the earth?

4-6 Connections: Matter Cycling in Ecosystems

31. What are the five major “biogeochemical cycles”?
32. Define the following terms from the hydrologic cycle:
 - a) Evaporation
 - b) Transpiration
 - c) Condensation
 - d) Precipitation
 - e) Infiltration
 - f) Percolation
 - g) Runoff
33. Explain the difference between “absolute humidity” and “relative humidity”.
34. What is the “dew point”?
35. Describe 3 ways that humans influence the water cycle.
36. Why are fossil fuels considered non-renewable resources?
37. Describe 2 ways that humans influence the carbon cycle.
38. Despite the fact that nitrogen makes up 78% of the atmosphere, it cannot be absorbed directly as a nutrient by plants or animals. What are two ways that the atmospheric nitrogen is made available?

39. Define the following terms from the nitrogen cycle:
- a) Nitrogen fixation
 - b) Nitrification
 - c) Assimilation
 - d) Ammonification
 - e) Denitrification
40. Describe 3 ways that humans are altering the nitrogen cycle.
41. Why is phosphorus (phosphates) in soils and freshwater ecosystems often the limiting factor for plant growth?
42. What is the definition of “guano”? How is it important in the phosphorus cycle?
43. Describe 3 ways humans are altering the phosphorus cycle.
44. What are three forms of sulfur in the sulfur cycle?
45. What is “acid deposition”? How does it form from sulfur compounds in the air?

4-8 Ecosystem Services and Sustainability

46. What are three examples of “ecosystem services” that benefit humans?
47. According to Miller, what are two ways that natural ecosystems achieve sustainability?