

**Botkin & Keller: Environmental Science: *Earth as a Living Planet 8th Edition***  
**Guided Reading Assignment: Energy Unit- Chapters 14-15**

Name: \_\_\_\_\_

**Chapter #14- Energy: Some Basics**

1: How does the energy crisis in **Ancient Greece and Rome** compare to the oil crisis today?  
**Explain.**

**Energy Basics**

2: What is “*work*”? **Definition and mathematical equation.**

*Define the following:*

\* **Chemical Energy:**

\* **Kinetic Energy:**

\* **Heat Energy:**

\* **Potential Energy:**

3: What is the “*first law of thermodynamics*”?

4: What does it mean to have a “*higher quality of energy*”?

5: What is the “*second law of thermodynamics*”?

## **Energy Efficiency**

6: Define: **First-Law Efficiency**

7: Define: **Second-Law Efficiency**

## **Energy Units**

8: What is the *fundamental energy unit* in the Metric System? *How is it defined?*

9: What is **POWER**? *How is it expressed?*

10: What is **thermal efficiency**?

11: What is **electrical resistivity**? What does it cause?

## **Energy Sources and Consumption**

12: *What percentage of the energy* in the United States is derived from fossil fuels?

13: What percentage of the energy use in the United States is used efficiently?

Energy Conservation, Increased Efficiency and Cogeneration

Define the following:

14: **Conservation:**

15: **Cogeneration** (*define and give an example*):

16: In the United States, space heating and cooling of homes and offices, water heating, industrial processes and automobiles account for nearly \_\_\_\_\_% of the total energy use

## **Building Design**

17: What is a passive solar energy system? *Give examples.*

18: What are some ways that *older homes* can be modified to be more energy efficient?

### **Industrial Energy**

19: U.S. Industry consumes about \_\_\_\_\_ of the energy produced.

Values, Choices and Energy Conservation

20: **Name 3 ways** that people could modify their behavior to help save energy

21: What is the concept of **Integrated, Sustainable Energy Management?**

### **Micropower**

22: What is the concept of *micropower*?

### **Critical Thinking Issue: Use of Energy Today and in 2030**

23: How much energy in exajoules, did the world use in 2010 and what would you project global energy use to be in 2030?

24: The average person emits as heat 100 watts of power. If we assume that 25% of it is emitted by the brain, how much energy does your brain emit as heat in a year?

25: Can the world supply one-third more energy by 2030 without unacceptable environmental damage? How?

26: In what specific ways could energy be used more efficiently in the United States?

## Chapter #15: Fossil Fuels and the Environment

1: What is **Peak Oil**? What is predicted to happen when we reach peak oil?

### Fossil Fuels

2: How were *fossil fuels created*?

3: The major fossil fuels- crude oil, natural gas and coal- are our primary energy sources; they provide approximately \_\_\_\_\_ of the energy consumed worldwide.

### Crude Oil and Natural Gas

4: **Where** were crude oil and natural gas deposits created?

5: Why do we not find oil and gas in *geologically old rocks*?

6: What the *favorable rock structure* to trap oil and gas deposits?

### Petroleum Production

7: How much oil can be recovered from wells by **primary production**?

8: What are *enhanced recovery techniques* of oil and gas deposits?

9: *Where* are 60% of the total known reserves found?

10: When will world oil production likely to peak?

### Natural Gas

11: How is natural gas primarily *transported*?

12: Why is natural gas considered to be a *clean fuel*?

### **Coal-Bed Methane**

13: What is **coal-bed methane** and *how much* is estimated to exist? (*How many years does this represent?*)

14: What are the **PROS and CONS** of drilling for and using coal-bed methane?

### **Black Shale Natural Gas**

15: What are some of the concerns of **hydrologic fracturing** for black shale natural gas?

### **Methane Hydrates**

16: What are **methane hydrates** composed of? *How were they formed?*

17: *Where* do methane hydrates form?

### **The Environmental Effects of Oil and Natural Gas**

18: What are some of the environmental effects of *recovery* of oil and gas?

19: What are some of the environmental effects of *refining* of oil and gas?

20: What are some of the environmental effects of *delivery and use* of oil and gas?

21: What are some arguments **FOR and AGAINST** drilling in the **ANWR (Alaskan National Wildlife Refuge)**?

### **Coal**

22: What is **COAL**? *How is it created?*

23: **Which type** of coal has the *greatest energy content*? Which type has the *lowest*?

### **Coal Mining and the Environment**

24: What is **strip mining**?

25: What are some of the *environmental impacts* of strip mining?

### **Mountaintop Removal**

26: What are some of the *environmental impacts* of mountaintop removal?

27: What does the “*Surface Mining Control and Reclamation Act of 1977*” require?

### **Underground Mining**

28: Underground Mining accounts for approximately \_\_\_\_\_% of the coal mined in the United States

29: What are the **dangers to miners** in underground mining?

30: What are the *environmental impacts* of underground mining?

### **Transporting Coal**

31: How is most of the coal transported in the United States?

### **The Future of Coal**

32: The burning of coal produces nearly \_\_\_\_\_% of the electricity used and about \_\_\_\_\_% of the total energy consumed in the United States today

33: How much air emissions are created using coal to create electricity in the U.S.?

34: What did the **Clean Air Amendment of 1990** mandate?

35: What is **allowance trading**?

### **Oil Shale and Tar Sands**

36: What is **oil shale**? *How is it created and where is it found?*

37: What are the *environmental impacts* of developing oil shale?

### **Tar Sands**

38: Why can't petroleum be recovered from tar sands from conventional methods?

39: How are *tar sands processed*?