

**Botkin & Keller: Environmental Science: Earth as a Living Planet- 8th Ed.**  
***Guided Reading: Chapter 16: Alternative Energy and The Environment***

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

**Read: “Using Wind Power in New Ways for an Old Application”**

1: How was the voyage of the *Beluga SkySails* different than traditional industrial ship voyages?

**Introduction to Alternative Energy Sources**

2: Fossil fuels supply approximately \_\_\_\_\_% of the energy consumed by people

3: What are the two types of **non-renewable alternative energy** sources? *Why are they considered to be non-renewable?*

4: What is *low-density, near-surface geothermal energy*?

5: What are **biofuels** made from?

6: What is the definition of “*renewable*” energy?

**Solar Energy**

7: How much solar energy is equal to the energy stored in all known reserves of coal, oil and natural gas on Earth?

8: What are *passive solar energy systems*? Give an example.

9: What are *active solar energy systems*? Give an example.

10: What are **solar collectors**? What are they used for? *How do they work?*

11: What are **photovoltaics**? What are they made out of? Explain how they work.

12: What are **solar thermal generators**? *How do they work?*

13: What are some of the environmental concerns of solar energy?

14: What are **fuel cells**? *How are they created?*

### **Water Power**

15: Water power has been around *since when?*

16: **How much power** in the United States is currently powered by *hydroelectricity*?

17: What is **microhydropower**? *Where is this helpful?*

18: What are the **environmental benefits** of hydroelectricity?

19: What are the **environmental consequences** of hydroelectricity?

### **Ocean Energy**

20: Explain how we can harness **tidal power**.

21: What are some of the *environmental impacts* of tidal power?

## **Wind Power**

22: What is the *major problem* with using wind power?

23: How are winds *produced*?

24: How does topography influence winds? Explain.

25: Which **regions in the United States** have the *greatest potential* for wind power development?

26: Which country has the **largest wind energy capacity installed**?

27: **Modern wind turbines are big- as much as \_\_\_\_\_ m high, as tall as a \_\_\_\_\_ story building, and have a generating capacity of more than \_\_\_\_\_ watts. This is enough electricity for \_\_\_\_\_ modern U.S. homes.**

28: What are the *disadvantages to wind power* for the environment?

29: What is the future outlook for wind energy generation?

## **Biofuels**

30: What are the 3 *categories of biofuels*?

31: How many people worldwide still use *wood* as their primary source for energy?

32: What are some of the *benefits of using biofuels*?

33: What are the *environmental concerns* with the using of biofuels?

### **Geothermal Energy**

34: *What* are the **two types of geothermal energy** and *how do they differ?*

35: How many people worldwide depend on geothermal as their energy source?

36: *What type of location* is ideal for high-density geothermal energy? *Give an example.*

37: Where is *low-density geothermal energy* mostly found? *Why?*

38: What are the **PROS and CONS** of using geothermal energy?

39: What types of *government incentives* might encourage use of alternative energy sources? Would their widespread use affect our economic and social environment?

## ***Chapter #17- Nuclear Energy and the Environment***

1: How much of the *world's electricity* do nuclear power plant provide?

2: **In the United States, nuclear power plants produce about \_\_\_\_% of the country's electricity and about \_\_\_\_% of the total energy used.**

3: The nuclear power plants in **France** provide \_\_\_\_% of the country's total energy.

### **What is Nuclear Energy?**

4: What is *nuclear energy*?

5: What is the difference between *fission and fusion*?

6: Nuclear reactors use \_\_\_\_\_ (**fusion or fission?**) and **which product** as a source of radioactivity? \_\_\_\_\_

7: *Which type of Uranium* is used for nuclear power plants?

8: What does it mean that the Uranium is "*enriched*"?

9: What is a nuclear "*meltdown*"?

10: Reactors that use ordinary water as the coolant are called: \_\_\_\_\_

11: Draw and label a diagram below to explain the nuclear power plant set-up:

### **A Closer Look: Radioactive Decay**

12: What is a *radioisotope*?

13: What is *radioactive decay*?

14: What is a half-life? What is the half-life of Uranium 235?

15: Define the following types of nuclear radiation: (*Explain the safety measures needed when using each*)

\* Alpha Particle:

\* Beta Particle:

\* Gamma Rays:

16: Uranium goes through a radioactive decay chain to *finally become which element*?

### **Nuclear Energy and the Environment**

17: What are the major problems associated with the nuclear fuel cycle?

## **Nuclear Radiation in the Environment, and it's Effects on Human Health**

18: How does nuclear radiation *affect ecosystems*? *Explain and give an example.*

19: Radiation is found naturally in what **kind of materials**? *Give 2 examples.*

20: Where in the United States are *background radiation levels higher*?

21: In what ways are people exposed to radiation in their *every day lives*?

### **A Closer Look: Radiation Units and Doses**

22: What is the *commonly used unit* for radioactive decay? *Who is it named after?*

23: What is the *SI unit for radioactive decay*?

24: **When dealing with the environmental effects of radiation, we are most interested in the actual dose of radiation delivered by radioactivity. This dose is commonly measured in terms of \_\_\_\_\_ and \_\_\_\_\_. In the international system (SI), the units are \_\_\_\_\_ and \_\_\_\_\_.**

25: For gamma rays, the unit commonly used is the \_\_\_\_\_ or in SI units, \_\_\_\_\_

26: What is the **LD50 dose** of radiation in humans?

27: *What happened* to the women who worked in the **watch factories** in the early 1900's?

28: What are the *health effects* for workers in uranium mines?

## **Nuclear Power Plant Accidents**

29: What is the *current risk of a nuclear meltdown* in the U.S. according to the U.S. Nuclear Regulatory Commission?

## **Three-Mile Island**

30: *When* did the event on Three-Mile Island occur?

31: *Where* is Three-Mile Island located?

32: What were some of the *societal issues* associated with the incident at Three-Mile Island?

## **Chernobyl**

33: *Summarize* the events at Chernobyl, Soviet Union

34: How many **people died** and how many people were diagnosed with **acute radiation sickness**?

35: How many people were *exposed to radiation* in the days following the accident?

36: What was the most common type of illness that resulted from the Japanese A-bomb survivors?

37: What was the most common type of illness that resulted from the Chernobyl accident?

38: What happened to the *ecosystem around the affected area* following the meltdown?



## **Radioactive-Waste Management**

39: What is *low-level radioactive waste*? *Where it is stored*?

40: What is **transuranic waste**? *How is it created*?

41: What is *high-level radioactive waste*? *Where is it stored*?

42: What and where is **Yucca Mountain**? *What was the plan with it*?

43: What are the **safety hazards** associated with using Yucca Mountain to store nuclear waste?

## **The Future of Nuclear Energy**

44: How much Uranium stores do we have left?

45: What are the **PROS and CONS** of using Nuclear Power?

46: What are *breeder reactors*?

