

## **APES Unit 6: Energy Sources and Consumption Review Packet:**

*This review packet is meant to help prepare you for your exam, but it should not be the only thing that you use to study. This packet provides you with the opportunity to practice the skills necessary for your exam.*

### **Part 1: Review Questions – Surface Layer**

1. What are the four main types of nonrenewable resources?
2. Of these, which ones are leading the world in terms of energy consumption?
3. Explain the process of coal creation
  - a. In your explanation, identify which material undergoes anaerobic decomposition
4. Which type of coal is the most energy efficient? Least energy efficient?
5. **In comparison to other nonrenewable resources, what are some disadvantages of burning coal**
  - a. Specifically, how much carbon dioxide is produced in comparison to other fossil fuels?
  - b. Describe the environmental impacts associated with burning coal
6. Explain the process of generating electricity using coal.
7. What are the three types of methods used in coal mining extraction?
8. Describe acid mine drainage
  - a. What policy went into place to combat acid mine drainage? Describe that policy.
9. Which locations export the majority of the world's oil?
10. What is the relationship between oil and natural gas?
11. What is the primary chemical component in natural gas?
12. **Explain the process of hydraulic fracturing.**
13. Identify and describe TWO environmental disadvantages in the process of fracking. Identify and describe TWO economic benefits.
14. What is nuclear fission? What radioactive material is used in this process?
  - a. Be able to determine half lives given a radioactive element
15. Describe how steam is created at a nuclear reactor. In your description, be sure to include the terms fuel rod and control rods, and what they do.
16. What is considered to be new renewables vs conventional renewables?
17. What is the difference between passive and solar energy? Which direction is key in terms of passive solar energy?
18. Explain how photovoltaic cells operate.
19. What are the disadvantages of photovoltaic cells?
20. Describe how wind turbines operate, and what maximizes their efficiency.
21. Describe geothermal energy. What country is considered a leader in producing geothermal energy?
22. What is a hydrogen fuel cell, and explain how they work.
23. **Be familiar with the advantages and disadvantages of each type of resource (both renewable and nonrenewable)**

**Part 2: Practice Test - Application**

1. Compared to a coal-fired power plant that produces the same amount of energy, a nuclear power plant generates more:
  - a. CO<sub>2</sub>
  - b. SO<sub>2</sub>
  - c. fly ash
  - d. particulates
  - e. thermal pollution
  
2. Which of the following is a significant problem associated with the use of nuclear power to generate electricity?
  - a. Radon leaking into buildings
  - b. Production of greenhouse gases such as carbon dioxide
  - c. Disposal of radioactive waste
  - d. Depletion of the ozone layer
  - e. Production of acid rain
  
3. Which statement best describes the approximate global distribution of coal supplies?
  - a. Brazil and South Africa together contain 33% of proven reserves
  - b. The United States contains 40% of proven reserves.
  - c. Australia, Japan, and France together contain 45% of proven reserves
  - d. The United States, the former Soviet Union, and China together contain 50% of proven reserves
  - e. Germany, Brazil, and India together contain 75% of proven reserves.
  
4. Which three sources supply the majority of commercial energy in the world today?
  - a. Coal, oil, and natural gas
  - b. Solar, wind, and biomass
  - c. Nuclear, hydropower, and photovoltaics
  - d. Wood, dung, and charcoal
  - e. Fuel cells, geothermal, and tidal power
  
5. Which of the following is a way for the government to encourage efficient energy use?
  - a. Requiring higher fuel economy standards for new cars
  - b. Implementing government subsidies to keep gasoline prices low
  - c. Raising the speed limit from 55 to 70 miles per hour
  - d. Limiting the development of public transportation systems
  - e. Removing all taxes from gasoline at the fuel pump

6. In 1997 the World Resources Institute estimates the world's proven oil reserves to be 1,000 billion barrels and the ultimately recoverable reserves to be 2,000 billion barrels. The table below shows the world consumption of oil from 1986 to 1997.

Year	Consumption (million barrels per day)
1986	62
1987	63
1988	65
1989	66
1990	66
1991	67
1992	67
1993	67
1994	68
1995	70
1996	72
1997	74

What was the approximate percent increase in consumption from 1986 to 1997 (refer to the table)?

- a. 10%
- b. 20%
- c. 30%
- d. 50%
- e. 80%

7. In the majority of less developed countries, the major source of energy for domestic use is which of the following?

- a. Oil
- b. Coal
- c. Nuclear
- d. Geothermal
- e. Biomass

8. The half-life of radon gas is approximately four days. Four weeks after the introduction of radon into a sealed room, the fraction of the original amount remaining is closest to

- a.  $\frac{1}{2}$
- b.  $\frac{1}{8}$
- c.  $\frac{1}{32}$
- d.  $\frac{1}{64}$
- e.  $\frac{1}{128}$

9. Which of the following is a true statement concerning the production of electricity in conventional nuclear power plants using fission reactors?

- a. New nuclear power plants will be built without containment structures, due to the increased insulation in the reactor core.
- b. Thermal energy is converted into mechanical energy and then to electrical energy, as in coal-burning power plants
- c. Regularly scheduled releases of radioactive gases during production are well below the maximum contamination levels set by the EPA.
- d. Nuclear production of electricity is much less expensive per kilowatt-hour than production of electricity at a coal-burning or natural-gas-fueled power plant.
- e. Storage of nuclear waste is no longer an issue, because power plants are now storing all wastes on-site in specialized containment units.

**Questions 10 - 12 refer to the following list of pollutants**

- (A) Radon
- (B) Mercury
- (C) Lead
- (D) Copper
- (E) Iron

10. A gaseous decay product of uranium that is found in rocks

11. A leading cause of lung cancer in the United States

12. Poses a health risk to humans who eat large quantities of marine fish such as tuna and swordfish

13. Which of the following is considered an advantage of using nuclear power to generate electricity?

- a. No waste is generated
- b. There is a limitless supply of the raw material needed for the process of generating energy
- c. Nuclear power plants are inexpensive to build and maintain
- d. There is no potential for thermal pollution
- e. There is no CO<sub>2</sub> emitted from the nuclear reaction

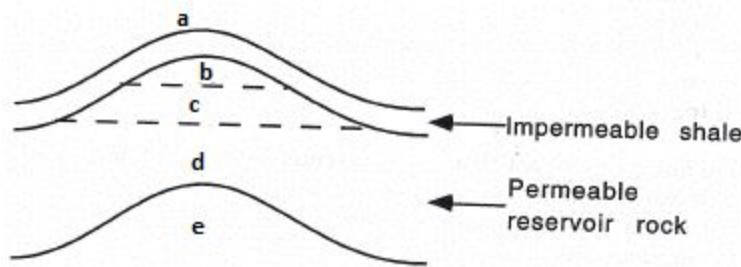
14. Coal was surface mined from five sites, labeled 1 through 5, that had originally been covered by forest. Each site was planned with a mix of tree seedlings to reclaim the area to forest. Grass was also seeded over each site to prevent initial erosion and to provide forage. Ten years after planting, the information was collected at the five sites and is given back in the table below. Select the letter of the row that indicates the site with the most successful forest reclamation.

Site Number	Percent Grass Cover	Number of Tree Species Surviving	Percent Tree Cover	Average Height Increase of Seedlings (cm/yr)
(A) 1	90	4	5	4
(B) 2	80	4	10	5
(C) 3	70	4	25	8
(D) 4	50	3	40	10
(E) 5	35	3	65	20

15. Consumers who get their electricity from coal-fired power plants are not paying the true cost of energy production in their monthly utility bills. Which of the following is true about utility bills for these consumers?

- a. The bills do not include public health costs, such as those associated with air pollution
- b. The bills do not include the cost of power distribution
- c. The bills do not include the cost of marketing electricity
- d. The bills do not include the cost of environmental damage associated with transporting coal
- e. The bills include the cost of cleaning up acid mine drainage

Questions 16 – 17 refer to the diagram below



16. The area where natural gas can be found.

17. The area where oil would be found

18. Nuclear power plants produce electricity using energy from the radioactive decay of
- a. uranium-235.
  - b. uranium-238.
  - c. uranium-239.
  - d. plutonium-235.
  - e. plutonium-238.

19. Currently, most high-level radioactive waste from nuclear reactors in the United States is
- a. stored in deep ocean trenches
  - b. buried in Yucca Mountain
  - c. reprocessed into new fuel pellets
  - d. chemically modified into safe materials
  - e. stored at the power plant that produced it.
20. Which of the following nonrenewable energy sources produces less  $\text{SO}_2$  and  $\text{NO}_x$  than other fossil fuels when burned, leading to less of an impact on acid rain and photochemical smog?
- a. coal
  - b. oil
  - c. natural gas
  - d. nuclear power
  - e. methane
21. A major limitation of using photovoltaic cells to generate electricity is that they
- a. do not produce as much  $\text{CO}_2$  as other energy sources do
  - b. do not produce as much electricity on cloudy days
  - c. have no moving parts
  - d. present a danger to birds and bats
  - e. cannot be connected to the electrical grid
22. Which of the following energy sources is not derived directly or indirectly from solar energy?
- a. geothermal
  - b. photovoltaic
  - c. hydroelectric
  - d. biomass
  - e. wind
23. One benefit of offshore wind farms is that \_\_\_\_\_.
- A) they are more aesthetically pleasing than wind farms on land
  - B) unlike land-based wind farms, they do not interfere with bird migration routes
  - C) wind speeds are higher and turbulence is lower over water than over land
  - D) development of land for human use is pushing wind farms to open water
  - E) maintenance costs are less than they are on land