



Raven, Berg, Hassenzahl: Environment, 7th Edition

Chapter 12 Fossil Fuels

1. What factors have led to the recent “nuclear renaissance?”
- 1) uncertainty and increased expense of building conventional coal
 - 2) technological advances in methods for disposing of nuclear waste
 - 3) creating additional nuclear capacity is a political priority in the United States
- a) 1
 - b) 2
 - c) 3
 - d) Both 1 and 3
 - e) All of these

Ans: d

Difficulty: Easy

Response:

Chapter Opener; 12.0

2. Nuclear energy:
- a) is released when the chemical bonds that hold atoms together are changed
 - b) involves changes within the nuclei of atoms
 - c) involves converting a large amount of matter from the nucleus into a small amount of energy
 - d) results in the production of greater mass at the end of the energy process
 - e) all of these

Ans: b

Difficulty: Easy

Response:

Nuclear Processes; 12.1.1

3. Nuclear fusion:
- a) produces a product with a larger mass than the starting material
 - b) is a form of combustion
 - c) involves splitting a large atom into two smaller atoms of different elements
 - d) is the rearrangement of electrons that occurs during a chemical reaction
 - e) is the process that powers the sun and other stars

Ans: e

Difficulty: Easy

Response:

Nuclear Processes; 12.1.1



4. Nuclear fission:
- a) is a form of combustion
 - b) is the blending or "melting together" of two small atoms to form a large atom
 - c) is the splitting of a large atom into two smaller atoms of different elements
 - d) is the rearrangement of electrons that occurs during a chemical reaction
 - e) is the process that powers the sun and other stars

Ans: c

Difficulty: Easy

Response:

Nuclear Processes; 12.1.1

5. Joining two lightweight atomic nuclei into a single heavier nucleus is called:
- a) enrichment
 - b) fusion
 - c) fission
 - d) atom exchange
 - e) the nuclear fuel cycle

Ans: b

Difficulty: Easy

Response:

Nuclear Processes; 12.1.1

6. Forms of a single element that differ in atomic mass are called:
- a) atoms
 - b) radioactive
 - c) compounds
 - d) isotopes
 - e) molecules

Ans: d

Difficulty: Easy

Response:

Atoms and Radioactivity; 12.1.2

7. The atomic mass of an element is equal to the:
- a) number of neutrons
 - b) number of protons
 - c) number of electrons
 - d) number of neutrons + number of protons
 - e) number of protons + number of electrons

Ans: d

Difficulty: Easy

Response:

Atoms and Radioactivity; 12.1.2

8. The half-life of a radioactive element is the period of time required:
- a) to convert half of a given mass into radioisotopes
 - b) to extract one-half of the energy from the Earth's uranium supply
 - c) for one half of the total amount of a radioactive substance to change into a different material
 - d) for the sun to use up one-half of its available atomic resources
 - e) none of these

Ans: c

Difficulty: Easy

Response:

Introduction to Nuclear Processes; Atoms and Radioactivity; 12.1.2

9. The most abundant isotope of uranium in ore is:
- a) C-12
 - b) U-234
 - c) U-235
 - d) U-238
 - e) PU-239

Ans: d

Difficulty: Easy

Response:

Nuclear Fission; 12.2

10. The process of refining uranium ore and insuring the proper amounts of various types of uranium is called:
- a) breeding
 - b) fabrication
 - c) enrichment
 - d) fission
 - e) integration

Ans: c

Difficulty: Easy

Response:

Nuclear Fission; 12.2

11. Which of the following countries has the largest deposits of the element uranium?

- a) South Africa
- b) United States
- c) Australia
- d) Afghanistan
- e) Canada

Ans: c

Difficulty: Easy

Response:

Nuclear Fission; 12.2

12. Which of the following is *not* a component of a regular nuclear power plant?

- a) combustion engine
- b) fuel rods
- c) reactor core
- d) steam generator
- e) control rods

Ans: a

Difficulty: Easy

Response:

Nuclear Fission; 12.2

13. Above each fuel assembly is a control rod that regulates the nuclear reaction by absorbing:

- a) energy
- b) heat
- c) neutrons
- d) radioactive wastes
- e) uranium

Ans: c

Difficulty: Easy

Response:

How Energy is Produced from Conventional Nuclear Fission; 12.2.1

14. A reactor vessel in a nuclear power plant is:
- a) the protective structure surrounding the reactor core
 - b) the container used to store spent fuel rods
 - c) used to control the fission process in the reactor core
 - d) the site of steam and electricity production
 - e) the standard location for on-site waste storage

Ans: a

Difficulty: Easy

Response:

Nuclear Fission; 12.2

15. When high temperatures begin to melt the metal encasing of the uranium fuel pellets, this is called a:
- a) breeder reaction
 - b) fission reaction
 - c) fusion reaction
 - d) meltdown
 - e) flame out

Ans: d

Difficulty: Easy

Response:

Safety Issues in Nuclear Power Plants; 12.4

16. The worst nuclear accident ever to happen at a nuclear power plant occurred at:
- a) Bristol, England
 - b) Chernobyl, Ukraine
 - c) Normandy, France
 - d) Savanna River, GA
 - e) Three Mile Island, PA

Ans: b

Difficulty: Easy

Response:

Chernobyl; 12.4.2



17. High level radioactive wastes:
- a) are produced by nuclear power plants and nuclear weapons facilities
 - b) can be safely and permanently disposed of
 - c) do not include spent fuel rods and tailings from uranium mining
 - d) have very short half-lives
 - e) all of these

Ans: a

Difficulty: Easy

Response:

Radioactive Wastes; Entire Section; 12.5

18. The greatest problem with the use of nuclear power to generate electricity is its production of:
- a) air pollutants
 - b) water pollution
 - c) carbon dioxide
 - d) radiation that is released into the surrounding region
 - e) radioactive waste that requires waste storage

Ans: e

Difficulty: Easy

Response:

Radioactive Wastes; Entire Section; 12.5

19. A storage site for a high-level radioactive waste would have all of the following features *except*:
- a) isolated from major population centers
 - b) geological stability
 - c) no contact with groundwater
 - d) near volcanic activity where waste can be destroyed by high temperatures
 - e) no contact with flowing water or air movement

Ans: d

Difficulty: Easy

Response:

Radioactive Wastes; 12.5

20. All of the following are related to NIMBY response *except*:
- a) not in my back yard
 - b) it commonly is a response to the proposal for a nuclear power plant
 - c) politicians and their term of office
 - d) is the “sister” response to NIMTOO
 - e) all of these are related

Ans: c

Difficulty: Easy

Response:

Public and Expert Attitudes Toward Nuclear Energy; 12.6.1

21. The production of "glass logs" to store high-level liquid radioactive wastes in the United States is called:
- a) vitrification
 - b) "wet cask storage"
 - c) spent fuel pools
 - d) fuel assemblies
 - e) logification

Ans: a

Difficulty: Easy

Response:

High Level Radioactive Waste; 12.5.2

22. Spent fuel is:
- a) exhausted energy
 - b) the depleted environmental reserves of radioactive elements
 - c) the entombed storage of dismantled nuclear reactors
 - d) the used neutrons in the nucleus of an atom
 - e) radioactive waste generated by nuclear energy

Ans: e

Difficulty: Easy

Response:

Breeder Reactors and Mixed Oxide Fuel (MOX) for Nuclear Fission; 12.2.2



23. U-235 and U-238 are different:
- a) isotopes of uranium
 - b) elements that are radioactive
 - c) ionic forms of the same element
 - d) types of radioactive decay
 - e) types of fuel for fusion reactors

Ans: a

Difficulty: Easy

Response:

Nuclear Fission; 12.2

24. All of the following are effects of the Megatons to Megawatts™ program *except*:
- a) generation of energy that has been used by one in ten US consumers
 - b) elimination of almost 14,000 nuclear warheads have been eliminated from former Soviet stockpiles
 - c) conversion of over 350 metric tons of highly enriched uranium from dismantled Russian nuclear weapons to low enriched uranium
 - d) elimination of over 10 tons of high level radioactive waste

Ans: d

Difficulty: Easy

Response:

The Link Between Nuclear Energy and Nuclear Weapons; 12.4.3

25. Which of the following vocabulary is mis-matched with its definition?
- a) fission – splitting atoms into smaller fragments
 - b) fusion - combining atomic nuclei into larger nuclei
 - c) high-level nuclear waste – spent fuel elements from commercial reactors
 - d) low-level nuclear waste – any slightly contaminated material
 - e) meltdown – process by which uranium ore is refined after mining to increase the concentration of fissionable U-235

Ans: e

Difficulty: Medium

Response:

Safety Issues in Nuclear Power Plants; 12.4

26. The real problem with energy from nuclear fusion power is:
- a) it is dependent upon hydrogen, a limited fuel resource
 - b) fusion only occurs in the sun, and we don't know how the sun's energy is produced
 - c) fusion technology requires vast quantities of uranium
 - d) fusion power still remains to be proven practical to control
 - e) none of these

Ans: d

Difficulty: Medium

Response:

Fusion: Nuclear Energy for the Future?; 12.6.2

27. Which of the following statements is *not* true? The splitting of a uranium atom in a nuclear reactor:
- a) may trigger the splitting of additional atoms of uranium
 - b) produces dangerous waste material
 - c) results in the production of high-energy neutrons
 - d) results in the production of large amounts of heat energy
 - e) results in no loss of mass

Ans: e

Difficulty: Medium

Response:

Nuclear Fission; 12.2

28. How many countries are currently using nuclear energy to generate electricity?
- a) 21
 - b) 19
 - c) 101
 - d) 13
 - e) 31

Ans: e

Difficulty: Medium

Response:

The Link Between Nuclear Energy and Nuclear Weapons; 12.4.3

29. Fission of U-235:

- a) results in the release of electrons, which collide with other U-235 atoms creating a chain reaction
- b) releases a great amount of heat, which is used to transform steam into water
- c) must be controlled in order to be used for the production of electricity
- d) in power plants may get out of control generating a bomb-like nuclear explosion
- e) is controlled by the careful placement of the reactor core within the turbine

Ans: c

Difficulty: Medium

Response:

Nuclear Fission; 12.2

30. Fission products with short half-lives that are products of U-235 fission:

- a) mimic nutrients essential for good health
- b) can be incorporated into bones, teeth, muscle and the thyroid gland
- c) continue to decay even after being ingested
- d) can cause cancer
- e) all of these

Ans: e

Difficulty: Medium

Response:

Radioactive Wastes; 12.5

31. An unstable isotope of hydrogen is:

- a) tritium
- b) deuterium
- c) sodium
- d) lead
- e) uranium

Ans: a

Difficulty: Medium

Response:

Atoms and Radioactivity; 12.1.2

32. Which of the following statements is *false*?
- a) The primary water circuit heats water, using the energy produced by the fission reaction.
 - b) The secondary water circuit converts the water to steam.
 - c) The tertiary water circuit provides cool water to the condenser.
 - d) The primary water circuit is open, often drawing water from a nearby lake.
 - e) The water circuits interact with the reactor core, steam generator, turbine, and condenser.

Ans: d

Difficulty: Medium

Response:

How Electricity Is Produced from Conventional Nuclear Fission; 12.2.1

33. In breeder nuclear fission reactors:
- a) uranium U-235 is converted into plutonium Pu-239
 - b) U-238 fission produces heat that is used to generate electricity
 - c) protons produced from the fission of Pu-239 produce additional Pu-239 from U-238
 - d) Pu-239 fission produces heat that is used to produce electricity
 - e) uranium U-238 is converted to U-235

Ans: d

Difficulty: Medium

Response:

Breeder Reactors and Mixed Oxide Fuel (MOX) for Nuclear Fission; 12.2.2

34. Which of the following is a major advantage of breeder nuclear fission?
- a) breeder nuclear fission is responsible for 30% of the electricity needed worldwide
 - b) nonfissionable U-238 is converted to fissionable Pu-239
 - c) it uses sodium as a coolant, which is safer than using water
 - d) it uses uranium-235 as a main energy source
 - e) it neither uses nor produces weapons-grade materials

Ans: b

Difficulty: Medium

Response:

Breeder Reactors and Mixed Oxide Fuel (MOX) for Nuclear Fission; 12.2.2



35. One advantage of conventional nuclear power, when compared to coal, is:
- a) no connection to water pollution
 - b) limited risk from catastrophic accidents
 - c) emission of few pollutants to the atmosphere
 - d) no related occupational death
 - e) unlimited supply

Ans: c

Difficulty: Medium

Response:

Pros and Cons of Nuclear Energy; 12.3

36. Which of the following has not been linked to exposure to high levels of radiation?
- a) mutations
 - b) increased incidence of influenza
 - c) cancer
 - d) leukemia

Ans: b

Difficulty: Medium

Response:

Chornobyl; 12.4.2

37. The partial destruction of the reactor core at Three Mile Island:
- a) was controlled by the containment building
 - b) caused no safety issues for workers or nearby residents
 - c) resulted in extensive radioactivity being released into the surrounding environment
 - d) caused the power plant to be closed indefinitely
 - e) caused cancer in many children who lived near the power plant

Ans: a

Difficulty: Medium

Response:

Three Mile Island; 12.4.1

38. The two fuels commonly used in atomic fission weapons are:
- a) plutonium-239 and uranium-235
 - b) plutonium-239 and uranium-238
 - c) radium-226 and uranium-235
 - d) plutonium-239 and krypton-85
 - e) uranium-235 and plutonium-240

Ans: a

Difficulty: Medium

Response:

The Link Between Nuclear Energy and Nuclear Weapons; 12.4.3

39. The formation of a mixed oxide (MOX) containing plutonium:
- a) produces an essential component of nuclear weapons
 - b) is a means of disposing of weapons-grade plutonium
 - c) allows for the safe transport of radioactive liquid
 - d) occurs during a meltdown
 - e) can only be applied to low-level radioactive waste

Ans: b

Difficulty: Medium

Response:

Breeder Reactors and Mixed Oxide Fuel (MOX) for Nuclear Fission; 12.2.2

40. Low levels of radioactive wastes:
- a) give off small amounts of ionizing radiation
 - b) are produced only by nuclear power plants
 - c) are safely stored in local landfills
 - d) are in solid form only
 - e) are not a serious problem for disposal

Ans: a

Difficulty: Medium

Response:

Radioactive Wastes; 12.5

41. Which of the following is incorrectly matched?
- a) primary water circuit: closed system superheating water using the energy produced by the fission reaction
 - b) secondary water circuit: water used to create pressurized steam to spin a generator to produce electricity
 - c) tertiary water circuit: provides cool water to the condenser
 - d) cooling tower: command center used to monitor activities of the nuclear power plant
 - e) reactor vessel: huge steel container surrounding the reactor core where fission occurs

Ans: d

Difficulty: Medium

Response:

How Electricity Is Produced from Conventional Nuclear Fission; 12.2.1

42. Hazardous radioactive materials produced by fission reactors include all of the following *except*:

- a) plutonium - 239
- b) cesium - 137
- c) carbon - 12
- d) krypton - 85
- e) strontium - 90

Ans: c

Difficulty: Medium

Response:

Nuclear Fission; 12.2

43. What is the role of the reactor core in a nuclear power plant?

- a) it provides heat to superheat water into steam under pressure, which is used to generate electricity
- b) it restricts atomic fallout to reduce contamination
- c) it breaks large radioisotopes into smaller radioisotopes
- d) it reacts chemically with high-energy particles rendering them inert
- e) it maintains one radioactive decay per second

Ans: a

Difficulty: Medium

Response:

How Electricity Is Produced from Conventional Nuclear Fission; 12.2.1

44. Which of the following does not have a short half life?

- a) Uranium- 235
- b) Carbon – 12
- c) Krypton – 85
- d) Cesium – 137
- e) Strontium – 90

Ans: b

Difficulty: Medium

Response:

Radioactive Wastes; 12.5