Critical Thinking Items

22.1 The Structure of the Atom 4.

How would the gold foil experiment have changed if electrons were used in place of alpha particles, assuming that the electrons hit the gold foil with the same force as the alpha particles?

a. Being less massive, the electrons might have been scattered to a greater degree than the alpha particles.
b. Being less massive, the electrons might have been scattered to a lesser degree than the alpha particles.
c. Being more massive, the electrons would have been scattered to a greater degree than the alpha particles.
d. Being more massive, the electrons would have been scattered to a lesser degree than the alpha particles.

5.

Why does the emission spectrum of an isolated gas differ from the emission spectrum created by a white light?

a. White light and an emission spectrum are different varieties of continuous distribution of frequencies.
b. White light and an emission spectrum are different series of discrete frequencies.
c. White light is a continuous distribution of frequencies, and an emission spectrum is a series of discrete frequencies.
d. White light is a series of discrete frequencies, and an emission spectrum is a continuous distribution of frequencies.

6.

Why would it most likely be difficult to observe quantized orbital states for satellites orbiting the earth?

a. On a macroscopic level, the orbital states do exist for satellites orbiting Earth but are too closely spaced for us to see.
b. On a macroscopic level, the orbital states do not exist for satellites orbiting Earth.
c. On a macroscopic level, we cannot control the amount of energy that we give to an artificial satellite and thus control its orbital altitude.
d. On a macroscopic level, we cannot control the amount of energy that we give to an artificial satellite but we can control its orbital altitude.

7.

Do standing waves explain why electron orbitals are quantized?

a. no
b. yes

8.

Some terms referring to the observation of light include *emission spectrum* and *absorption spectrum*. Based on these definitions, what would a *reflection spectrum* describe?

a. The reflection spectrum would describe when incident waves are selectively reflected by a substance.
b. The reflection spectrum would describe when incident waves are completely reflected by a substance.
c. The reflection spectrum would describe when incident waves are not absorbed by a substance.
d. The reflection spectrum would describe when incident waves are completely absorbed by a substance.

22.2 Nuclear Forces and Radioactivity 9.

Explain why an alpha particle can have a greater range in air than a beta particle in lead.

a. While the alpha particle has a lesser charge than a beta particle, the electron density in lead is much less than that in air.
b. While the alpha particle has a greater charge than a beta particle, the electron density in lead is much lower than that in air.
c. While the alpha particle has a lesser charge than a beta particle, the electron density in lead is much greater than that in air.
d. While the alpha particle has a greater charge than a beta particle, the electron density in lead is much higher than that in air.

10.

What influence does the strong nuclear force have on the electrons in an atom?

a. It attracts them toward the nucleus.
b. It repels them away from the nucleus.
c. The strong force makes electrons revolve around the nucleus.
d. It does not have any influence.

22.3 Half Life and Radiometric Dating 11.

Provide an example of something that decreases in a manner similar to radioactive decay.

a. The potential energy of an object falling under the influence of gravity
b. The kinetic energy of a ball that is dropped from a building to the ground
c. Theh charge transfer from an ebonite rod to fur
d. The heat transfer from a hot to a cold object

12.

A sample of radioactive material has a decay constant of 0.05 s^{-1}. Why is it wrong to presume that the sample will take just 20 seconds to fully decay?

a. The decay constant varies with the mass of the sample.
b. The decay constant results vary with the amount of the sample.
c. The decay constant represents a percentage of the sample that cannot decay.
d. The decay constant represents only the fraction of a sample that decays in a unit of time, not the decay of the entire sample.

22.4 Nuclear Fission and Fusion 13.

What is the atomic number of the most strongly bound nuclide?

a. 25
b. 26
c. 27
d. 28

14.

Why are large electromagnets necessary in nuclear fusion reactors?

a. Electromagnets are used to slow down the movement of charge hydrogen plasma.
b. Electromagnets are used to decrease the temperature of hydrogen plasma.
c. Electromagnets are used to confine the hydrogen plasma.
d. Electromagnets are used to stabilize the temperature of the hydrogen plasma.

22.5 Medical Applications of Radioactivity: Diagnostic Imaging and Radiation 15.

Why are different radiopharmaceuticals used to image different parts of the body?

a. The different radiopharmaceuticals travel through different blood vessels.
b. The different radiopharmaceuticals travel to different parts of the body.
c. The different radiopharmaceuticals are used to treat different diseases of the body.
d. The different radiopharmaceuticals produce different amounts of ionizing radiation.

16.

Why do people think carefully about whether to receive a diagnostic test such as a CT scan?

a. The radiation from a CT scan is capable of creating cancerous cells.
b. The radiation from a CT scan is capable of destroying cancerous cells.
c. The radiation from a CT scan is capable of creating diabetic cells.

d. The radiation from a CT scan is capable of destroying diabetic cells.

17.

Sometimes it is necessary to take a PET scan very soon after ingesting a radiopharmaceutical. Why is that the case?

a. The radiopharmaceutical may have a short half-life.
b. The radiopharmaceutical may have a long half-life.
c. The radiopharmaceutical quickly passes through the digestive system.
d. The radiopharmaceutical can become lodged in the digestive system.