

Unit 6 - Nuclear Radiation & Decay**Multiple Choice**

Identify the choice that best completes the statement or answers the question.

C

1. This type of radioactive decay involves energy and has no mass.

- a. alpha
- b. fission
- c. gamma
- d. beta

D

2. What are the components of natural radiation, in order from least to most penetrating?

- a. alpha, gamma, beta
- b. gamma, beta, alpha
- c. beta, gamma, alpha
- d. alpha, beta, gamma

C

3. An amount of sodium-25 decreases to $1/4$ its original amount in 2 minutes. What is the half-life of this radioisotope?

- a. 4 minutes
- b. 2 minutes
- c. 1 minute
- d. 30 seconds

B

4. Atoms with the same atomic number but different atomic masses are called

- a. ions
- b. isotopes
- c. isomers
- d. prototypes

D

5. A fission reaction is initiated by a(n)

- a. proton
- b. beta particle
- c. alpha particle
- d. neutron

B

6. Half-life is best described as the time it takes for

- a. an atom to rotate halfway around the world
- b. 50% of a radioactive element to decay into a particle and another element
- c. each atom of a radioactive element to decay halfway
- d. a nuclear fission reaction to split a nucleus in half

B

7. Another term for radioactive decay into another element is

- a. transportation
- b. transmutation
- c. mutation
- d. emission

C

8. What is nuclear fission?

- a. Random explosion of nuclei into many different parts
- b. Combining of two smaller nuclei into one larger nucleus
- c. Splitting of one larger nucleus into two smaller nuclei
- d. None of the above

B

9. A nuclear chain reaction can occur when

- a. fusion reactions produce helium.
- b. a fission reaction releases enough neutrons to trigger more fission reactions.
- c. an isotope gives off alpha decay.
- d. one atom of uranium hits another atom of uranium and cause it to split.

- B 10. The force that tries to pull the nucleus apart is known as
a. gravity. c. strong nuclear force.
b. weak (electric) nuclear force. d. electromagnetic force.
- A 11. The atomic number for the radioisotope carbon-13 is
a. 6 c. 12
b. 7 d. 13
- A 12. Which kind of reaction do nuclear power plants currently use to generate electricity?
a. fission c. fusion
b. hydro-power d. chemical
- A 13. What is nuclear fusion?
a. Combination of two smaller nuclei into one larger nucleus c. Splitting of one larger nucleus into two smaller nuclei
b. Random explosion of nuclei into many different parts d. None of the above
- B 14. When an unstable isotope undergoes alpha decay, it gives off
a. a hydrogen atom. c. high energy electromagnetic radiation.
b. two protons and two neutrons. d. an electron.
- B 15. The nucleus of an atom is made up of which of the following combinations of particles?
a. protons, electrons, & neutrons c. electrons & protons
b. protons & neutrons d. electrons & neutrons
- A 16. To which of the following is the atomic number of a given element equivalent?
a. The number of protons in the nucleus c. The number of electrons in the outer energy level
b. The number of neutrons in the nucleus d. The sum of protons and neutrons in the nucleus
- C 17. During fission, some of the nuclear mass is converted into
a. a heavier nuclei. c. energy.
b. protons. d. critical mass.
- C 18. The force that holds neutrons and protons together in the nucleus is known as
a. electromagnetic force. c. strong force.
b. gravity. d. weak (electric) force.
- A 19. What happens to the mass of an atom when it undergoes alpha decay?
a. The mass increases by 4 c. The mass decreases by 1
b. The mass decreases by 4 d. There is no change in mass
- B 20. The type of radiation that has the greatest penetrating ability is
a. alpha radiation c. beta radiation
b. gamma radiation d. delta radiation

- D 21. What are isotopes of atoms with unstable nuclei called?
- Radioactive
 - Radiation
 - Radioactive Decay
 - Radioisotopes

- D 22. The energy produced by the sun is a result of
- alpha emission
 - nuclear fission
 - beta emission
 - nuclear fusion



- C 23. What type of equation is:
- Gamma Decay
 - Beta Decay
 - Alpha Decay
 - Fusion

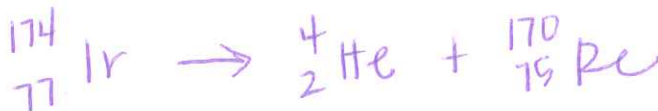
- B 24. What type of equation is: ${}_{19}^{42}\text{K} \rightarrow {}_{-1}^0\text{e} + {}_{20}^{42}\text{Ca}$
- Alpha Decay
 - Beta Decay
 - Gamma Decay
 - Nuclear Fission

- C 25. What type of equation is: ${}_{94}^{240}\text{Pu} \rightarrow {}_{94}^{240}\text{Pu} + {}_0^0\gamma$
- Nuclear Fission
 - Alpha Decay
 - Gamma Decay
 - Beta Decay

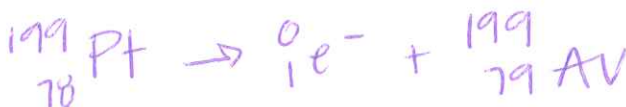
Short Answer

Write the nuclear equation for:

26. The alpha decay of iridium-174 [Hint: Iridium = Ir]



27. The beta decay of platinum-199 [Hint: Platinum = Pt]



28. Write the **symbols** for an alpha particle, beta particle, & gamma ray (not the particle they break down into).

α Alpha β Beta γ gamma

29. If the half-life of zirconium-84 is 26 minutes and you start with a 175g sample, how much will remain after 104 minutes?

$$104/26 = 4HL$$

$$175/2 = 87.5 / 43.75 / 21.875 / 10.9375$$

$$\boxed{10.94g}$$

30. Bromine-82 is used as a tracer for organic materials in environmental studies. The half-life of Br-82 is 36 hours. If you start with 10g of Br-82, how long (in hours) will it take for there to be 12.5% remaining?

$$100/50/25/12.5 = 3HL$$

$$3HL \times 36h = \boxed{108hr}$$

31. The half-life of lead-212 is 11 hours. If you start with a 100g sample, how much will remain after 22 hours?

$$22/11 = 2HL$$

$$100/50/25 = \boxed{25g}$$

32. After 5 half-lives 2.5g of Nickel-61 remains, how much did you start with?

$$2.5/5/10/20/40/80$$

$$\boxed{80g}$$

Fill in the blank(s) below for the following nuclear reactions:

