

25.1 NUCLEAR RADIATION

Section Review

Objectives

- Explain how an unstable nucleus releases energy
- Describe the three main types of nuclear radiation

Vocabulary

- radioisotopes
- radioactivity
- radiation
- alpha particle
- beta particle
- gamma ray

Part A Completion

Use this completion exercise to check your understanding of the concepts and terms that are introduced in this section. Each blank can be completed with a term, short phrase, or number.

- Isotopes with unstable nuclei are 1. radioactive and are called 2. radioisotopes. The 3. number of radioisotopes decay to 4. stable nuclei plus emission of large amounts of 5. energy, radiation. The radiation may be alpha, 6. beta, or gamma 7. radiation consists of alpha particles (positively charged 8. helium nuclei) that are easily stopped by a sheet of paper. Beta radiation is composed of fast-moving particles, which are 9. electrons, negative. Beta radiation is more penetrating than alpha radiation; it is stopped by 10. metal or foil. Gamma radiation is electromagnetic radiation. Gamma radiation has no 11. mass or electrical charge. It is extremely penetrating. 12. glass bricks and 13. concrete reduce the intensity of gamma radiation but do not completely 14. stop it. 15. stop block

Part B True-False

Classify each of these statements as always true, AT; sometimes true, ST; or never true, NT.

- ST 16. Beta radiation is emitted when a radioisotope decays.
NT 17. Gamma radiation has a negative charge.
AT 18. Gamma radiation is high-energy electromagnetic radiation.
NT 19. ${}_{92}^{238}\text{U} + {}_0^1\text{p} \rightarrow {}_{92}^{239}\text{U}$
AT 20. When a beta particle is emitted, the atomic number increases by 1, and the mass number stays the same.

Part C Matching

Match each description in Column B to the correct term in Column A.

Column A <u>B</u> 21. radioisotopes <u>A</u> 22. radioactive decay <u>C</u> 23. gamma ray <u>E</u> 24. alpha particles <u>D</u> 25. beta particles	Column B a. the process in which an unstable nucleus releases energy by emitting radiation b. isotopes that have unstable nuclei and undergo radioactive decay c. high-energy photon with no mass or electrical charge d. electrons resulting from the breaking apart of a neutron in an atom e. helium nuclei emitted from a radioactive source
--------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------

Part D Problems

Answer the following in the space provided.

26. Write nuclear equations for these processes.
- a. The alpha decay of ${}_{84}^{210}\text{Po}$ - Polonium
 ${}_{84}^{210}\text{Po} \rightarrow {}_{82}^{206}\text{Pb} + {}_2^4\text{He}$
- b. The beta decay of ${}_{83}^{210}\text{Bi}$
 ${}_{83}^{210}\text{Bi} \rightarrow {}_{84}^{210}\text{Po} + {}_0^0\beta$