Name _____ Date _____ Class _____

24–1 Practice Problems

1. The half-life of cesium-137 is 30.2 years. If the initial mass of a sample of cesium-137 is 1.00 kg, how much will remain after 151 years?

2. Given that the half-life of carbon-14 is 5730 years, consider a sample of fossilized wood that, when alive, would have contained 24 g of carbon-14. It now contains 1.5 g of carbon-14. How old is the sample?

3. A 64-g sample of germanium-66 is left undisturbed for 12.5 hours. At the end of that period, only 2.0 g remain. What is the half-life of this material?

4. With a half-life of 28.8 years, how long will it take for 1 g of strontium-90 to decay to 125 mg?

5. Cobalt-60 has a half-life of 5.3 years. If a pellet that has been in storage for 26.5 years contains 14.5 g of cobalt-60, how much of this radioisotope was present when the pellet was put into storage?

6. A 1.000-kg block of phosphorus-32, which has a half-life of 14.3 days, is stored for 100.1 days. At the end of this period, how much phosphorus-32 remains?

7. A sample of air from a basement is collected to test for the presence of radon-222, which has a half-life of 3.8 days. However, delays prevent the sample from being tested until 7.6 days have passed. Measurements indicate the presence of 6.5 μg of radon-222. How much radon-222 was present in the sample when it was initially collected?

8. A 0.500 *M* solution of icdine-131, which has a half-life of 8.0 days, is prepared. After 40. days, how much iodine will remain in 1.0 L of solution? Express the result in moles.

9. The half-life of sodium-25 is 1.0 minute. Starting with 1 kg of this isotope, how much will remain after half an hour?

10. What is the half-life of polonium-214 if, after 820. seconds, a 1.0-g sample decays to 31.25 mg?

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24–1 *Practice Problems (continued)*

11. Bombardment of aluminum-27 by alpha particles produces phosphorus-30 and one other particle. Write the nuclear equation for this reaction and identify the other particle.

12. Plutonium-239 can be produced by bombarding uranium-238 with alpha particles. How many neutrons will be produced as a by product of each reaction? Write the nuclear equation for this reaction.

13. When bombarded with neutrons, cobalt-59 is converted to cobalt-60. What is the nuclear equation for this reaction?

14. One method for producing plutonium-239 is by bombarding uranium-238 with deuterium (hydrogen-2), which produces neptunium-238 and 2 neutrons. The unstable neptunium then decays to form plutonium-238. Write the nuclear equations for this two-step reaction. What other particle is produced in the second reaction?

15. Neutron bombardment of plutonium-239 yields americium-240 and another particle. Write the nuclear equation and identify the other particle produced.

16. Alpha-particle bombardment of plutonium-239 produces a neutron and another isotope. Write the nuclear equation for this reaction and identify the isotope.

17. One possible result of the impact of a neutron on a uranium-235 nucleus is the splitting of the uranium into tellurium-137, zirconium-97, and two other particles. Write the nuclear equation for this reaction and identify the two other particles.

18. When bombarded with neutrons, lithium-6 produces an alpha particle and an isotope of hydrogen. Write the nuclear equation for this reaction. What isotope of hydrogen is produced?

19. With what particle would you bombard sulfur-32 to produce hydrogen-1 and phosphorus-32? Write the appropriate nuclear equation.

20. With what particle would you bombard bismuth-209 to produce astatine-211 and 2 neutrons? Express this reaction in the form of a nuclear equation.

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