Name: _____ Date: _____

Complete the following nuclear reactions by filling in the missing particle:

1. $^{137}_{55}\text{Cs} \rightarrow {}^{0}_{-1}e + {}^{0}_{0}\gamma + \_\_\_$

2. $^{210}_{84}\text{Po} \rightarrow \_\_\_ + {}^{206}_{82}\text{Pb}$

3. $^{144}_{60}\text{Nd} \rightarrow {}^{4}_{2}\alpha + \_\_\_$

4. $^{87}_{36}\text{Kr} \rightarrow \_\_\_ + {}^{1}_{0}n$

5. $^{1}_{1}\text{H} + {}^{7}_{3}\text{Li} \rightarrow {}^{8}_{4}\text{Be} + 2\ \_\_\_$

6. $\_\_\_ + {}^{25}_{12}\text{Mg} \rightarrow {}^{27}_{13}\text{Al}$

Fill in the missing atomic numbers, mass numbers, and/or symbols below:

7. $^{14}\text{N} + {}_{2}\alpha \rightarrow \quad \text{F}$

8. $^{236}\text{U} \rightarrow {}_{36}\text{Kr} + {}^{130}\text{Ba} + 3\ \text{n}$

9. $10 \quad \rightarrow {}_{1}e + {}^{19}$

Write the nuclear reaction based on the descriptions below:

10. The alpha emission of polonium-210

11. The beta emission of protactinium-234

12. The collision of a positron and an electron produced two gamma rays.

13. Oxygen-16 captures an alpha particle to produce neon-20 and a gamma ray.

14. The electron capture of einsteinium-247

15. The positron decay of strontium-83

16. $^{125}_{53}\mathrm{I}$ captures an electron

17. Lead-206 is a daughter nuclide from alpha decay

18. The alpha decay of strontium-90

19. The beta emission of technetium-99

20. The electron capture of radium-221

21. Cadmium-110 releases a gamma ray to stabilize itself

22. Astatine-208 is the daughter nuclide from alpha emission

23. Uranium-235 emits three neutrons and a beta particle during a fission process

24. The positron emission of silver-109

Complete the following problems related to half-lives of radioactive nuclides.

25. If a 100. g sample of thorium-230 is analyzed, how much is left after 3.2×10^5 years?

26. How much oxygen-15 is left after 1650 seconds if the original sample was 0.25 g?

27. After 6.00×10^{19} years, how much of a 0.500 g sample of $^{123}_{52}\text{Te}$ has decayed?

28. Determine the amount of material remaining from a 75.66 g sample of xenon-133 after exactly 1 week.

29. How much iron-55 will decay if a 112.4 g sample is left to decay for 225.3 days?

30. Bismuth-207 is prepared in the lab and allowed to decay for a period of 6.00 years. What is the probable amount of material remaining from a 100.0 g block of this isotope?

How much has decayed over this time?

31. Determine the amount of energy that will be released from the fission of 25.00 g of uranium-235. A single uranium-235 particle is 235.04 amu.

32. Find the energy released from the fusion of hydrogen-3 (3.0150 amu) and hydrogen-1 (1.0079 amu). An alpha particle (4.0026 amu) is produced.

The unit of power, the watt, measures energy usage per second. Thus a 60 watt light bulb consumes 60 joules of energy per second. How long could a light bulb remain lit from the energy produced in the fusion reaction that produces 4.00 g of alpha particles?