Chapter 9
You must show your entire work on a separate sheet(s) of paper to get full credit.

1. How many protons and neutrons are in each of the following nuclides?
   a. Po-218     b. $^{234}_{91}$Th    c. Bi-212     d. $^{214}_{82}$Pb

2. Write each of the following nuclides in the subscripted-superscripted form. For example, H-2 would be written as $^2_1$H.
   a. C-14      b. Cs-141    c. Li-6      d. Bi-209

3. What does it mean to be radioactive?

4. Which of the following statements are true of chemical reactions?
   a. The number and types of atoms are the same in the products and the reactants?
   b. Different isotopes of the same element behave similarly.
   c. Only the valence electrons are involved.
   d. New elements are often formed.

5. Which of the statements in Question 4 are true of nuclear reactions?

6. Fill in the missing product in the following nuclear reactions.
   a. $^{208}_{81}$Tl $\rightarrow$ $^{208}_{82}$Pb + ?
   b. $^{263}_{106}$Sg $\rightarrow$ $^4_2$He + ?
   c. ? $\rightarrow$ $^0_{-1}$β + $^{214}_{83}$Bi
   d. $^{87}_{38}$Sr$^m$ $\rightarrow$ $^0_0$γ + ?

7. A portion of the radioactive decay series that starts with Th-232 is as follows. For each step, write the product.
   Th-232 (goes through α decay) $\rightarrow$ ? (goes through β decay) $\rightarrow$ ? (goes through β decay) $\rightarrow$ ? (goes through α decay) $\rightarrow$ ? (goes through α decay) $\rightarrow$ ?

8. Two common units for measuring radioactivity are the Becquerel and the curie. Why are these names appropriate?

9. When 4.00 g of hydrogen nuclei fuse to form helium in the sun, 0.0265 g of matter is converted into energy. Given that the speed of light = $3.00 \times 10^8$ m/s and that a joule = kg·m²/s², calculate how much energy is given off.