

SAMPLE PROBLEM B

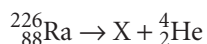
Nuclear Decay

PROBLEM

The element radium was discovered by Marie and Pierre Curie in 1898. One of the isotopes of radium, $^{226}_{88}\text{Ra}$, decays by alpha emission. What is the resulting daughter element?

SOLUTION

Given: The decay can be written symbolically as follows:

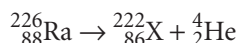


Unknown: the daughter element (X)

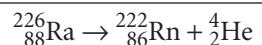
The mass numbers and atomic numbers on the two sides of the expression must be the same so that both charge and nucleon number are conserved during the course of this particular decay.

$$\text{Mass number of X} = 226 - 4 = 222$$

$$\text{Atomic number of X} = 88 - 2 = 86$$



The periodic table (Appendix G) shows that the nucleus with an atomic number of 86 is radon, Rn. Thus, the decay process is as follows:



PRACTICE B

Nuclear Decay

1. Complete this radioactive-decay formula: $^{12}_5\text{B} \rightarrow ? + {}^0_{-1}e + \bar{\nu}$
(Refer to Appendix G for this problem and the following problems.)
2. Complete this radioactive-decay formula: $^{212}_{83}\text{Bi} \rightarrow ? + {}^4_2\text{He}$
3. Complete this radioactive-decay formula: $? \rightarrow {}^{14}_7\text{N} + {}^0_{-1}e + \bar{\nu}$
4. Complete this radioactive-decay formula: $^{225}_{89}\text{Ac} \rightarrow ^{221}_{87}\text{Fr} + ?$
5. Nickel-63 decays by β^- emission to copper-63. Write the complete decay formula for this process.
6. The isotope $^{56}_{26}\text{Fe}$ decays into the isotope $^{56}_{27}\text{Co}$.
 - a. By what process will this decay occur?
 - b. Write the decay formula for this process.