

# Nuclear Chemistry

Write a complete nuclear equation for each of the following.

- The decay of  $^{53}_{26}\text{Fe}$  by beta emission.
- The decay of  $^{230}_{90}\text{Th}$  by alpha emission.
- The decay of  $^{37}_{18}\text{Ar}$  by electron capture.
- The decay of  $^{38}_{19}\text{K}$  by positron emission.
- The decay of  $^{93}_{43}\text{Tc}$  by gamma emission.

Provide the missing term in each of the following equations.

- $^{11}_5\text{B} + ^4_2\text{He} \rightarrow ^{14}_7\text{N} + \text{_____}$
- $^{45}_{20}\text{Ca} + ^1_1\text{p} \rightarrow ^{45}_{21}\text{Sc} + \text{_____}$
- $^{15}_7\text{N} + \text{_____} \rightarrow ^{18}_8\text{O} + ^1_1\text{p}$
- $^{233}_{92}\text{U} + ^1_0\text{n} \rightarrow ^{99}_{42}\text{Mo} + 3^1_0\text{n} + \text{_____}$
- $\text{_____} \rightarrow ^{206}_{82}\text{Pb} + ^4_2\text{He}$
- $^{142}_{58}\text{Ce} + \text{_____} \rightarrow ^{142}_{59}\text{Pr} + ^1_0\text{n}$
- $^{102}_{44}\text{Ru} + ^4_2\text{He} \rightarrow ^1_0\text{n} + \text{_____}$

Answer the following questions about half-life.

- The half-life of  $^{115}_{51}\text{Sb}$  is 32 minutes. How much of a 16.0-g sample of this isotope will remain at the end of 3.0 hours?
- The half-life of  $^{182}_{72}\text{Hf}$  is  $9.0 \times 10^6$  years. How much of a 1.0-g sample of this isotope will remain at the end of 40.0 million years?
- The isotope strontium-90 is produced during the testing of nuclear weapons. If 100.0 mg of strontium-90 was released in the atmosphere in 1960, how much of the radioisotope remains 85 years later? The half life of strontium-90 is 29 years.
- The radioisotope technetium-99 is often used as a radiotracer to detect disorders of the body. It has a half-life of 6.01 hours. If a patient received a 25.0-mg dose of this isotope during a medical procedure, how much would remain 48.0 hours after the dose was given?