• Balance the following nuclear reactions by identifying the missing nuclide.

\[
\begin{align*}
^{55}_{26}\text{Fe} + {}^0_0\text{e} & \rightarrow \quad \square \\
^{232}_{90}\text{Th} & \rightarrow {}^4_2\alpha + \quad \square \\
^{218}_{84}\text{Po} & \rightarrow {}^0_{-1}\text{e} + \quad \square 
\end{align*}
\]

• Over 50 years, the activity of a sample of strontium-90 decreases from 1000 Bq to 303 Bq. Calculate the half-life of strontium-90 (in years) to the nearest year.

\[
\text{Answer: }
\]

• Identify three desirable properties of an unstable isotope to be used in medical imaging.
• Balance the following nuclear reactions by identifying the missing nuclear particle or nuclide.

\[ ^{36}_{17}\text{Cl} + {}_{-1}^0\text{e} \rightarrow \] 

\[ ^{236}_{92}\text{U} \rightarrow ^{92}_{36}\text{Kr} + ^{141}_{56}\text{Ba} + 3 \] 

\[ ^{99}_{42}\text{Mo} \rightarrow {}_{-1}^0\text{e} + \] 

• The half-life of plutonium-239 is 24110 years. How many years (to the nearest year) must pass after \(^{239}_{94}\text{Pu}\) is produced for the number of \(^{239}_{94}\text{Pu}\) atoms to decay to 0.01000 of the original number?

\[
\text{Answer:} 
\]

• Provide a brief explanation of the process by which nuclear radiation causes biological damage.
• Tritium, $^3$H, in nuclear warheads decays with a half life of 12.26 years and must be replaced. What fraction of the tritium is lost in 5.0 years?

ANSWER: