

## Radioisotope Properties

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The nuclei of radioactive isotopes are unstable and undergo random disintegration to produce atoms of different elements. In the course of this breakdown, energetic subatomic particles are emitted. These particles include  $\alpha$ -particles (2 protons and 2 neutrons) and  $\beta$ -particles (electrons). High-energy radiation ( $\gamma$ -rays or X-rays) may also be emitted. Each radioisotope is characterized by its half-life, which is the time in which 50% of the atoms in a radioactive sample will decay.

### Physical Properties of $\beta$ -Emitting Radionuclides.

Radionuclide	Half-Life	Specific Activity: Common Values for Compounds (mCi/mmol)	Daughter Nuclide (stable)
tritium [ $^3\text{H}$ ]	12.43 years	$10^2$ – $10^5$	helium-3
carbon-14 [ $^{14}\text{C}$ ]	5,730 years	$1$ – $10^2$	nitrogen-14
sulphur-35 [ $^{35}\text{S}$ ]	87.4 days	$1$ – $10^6$	chlorine-35
phosphorus-33 [ $^{33}\text{P}$ ]	25.5 days	$10$ – $10^4$	sulphur-33
phosphorus-32 [ $^{32}\text{P}$ ]	14.3 days	$10$ – $10^6$	sulphur-32

### Physical Properties of $\gamma$ -Ray- and X-Ray-Emitting Radionuclides.

Radionuclide	Half-Life	Specific Activity: Common Values for Compounds (mCi/mmol)	Daughter Nuclide (stable)
iodine-131 [ $^{131}\text{I}$ ]	8.06 days	$10^2$ – $10^4$	xenon-131
iodine-125 [ $^{125}\text{I}$ ]	60 days	$10^2$ – $10^6$	tellurium-125