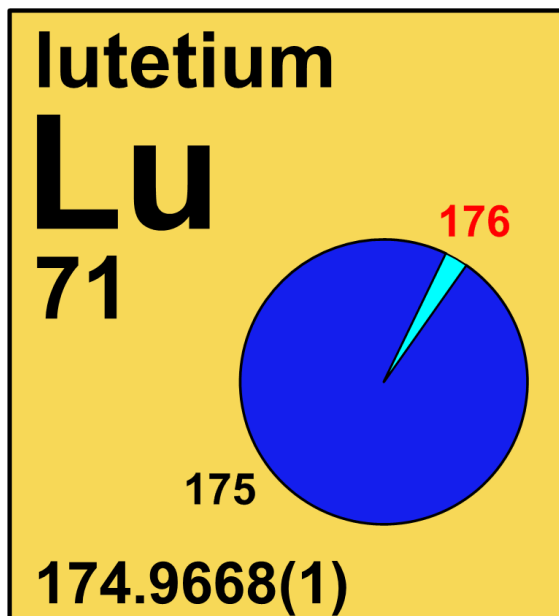





4.71 lutetium

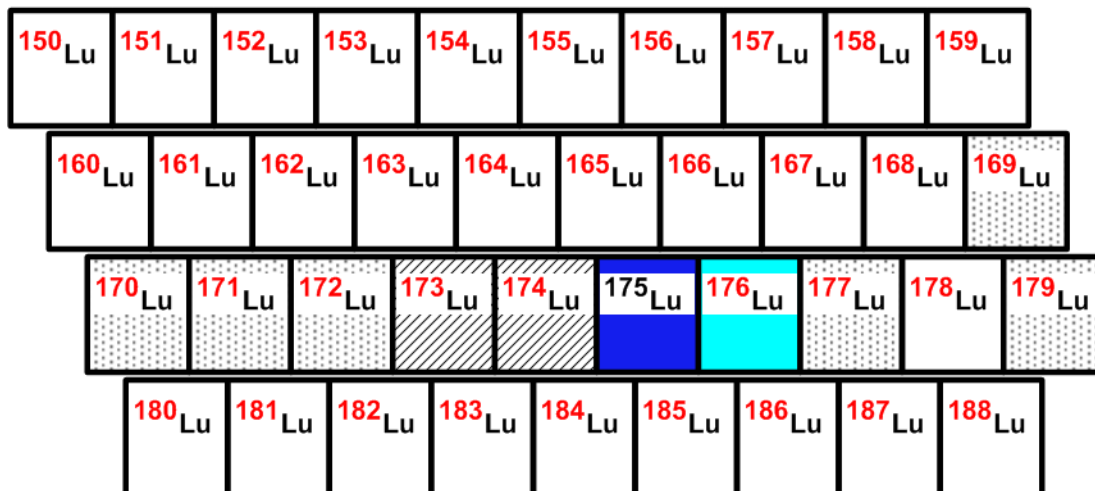


Stable isotope	Relative atomic mass	Mole fraction
^{175}Lu	174.940 78	0.974 01
$^{176}\text{Lu}^\dagger$	175.942 69	0.025 99

† **Radioactive isotope** having a relatively long **half-life** (3.73×10^{10} years) and a characteristic terrestrial **isotopic composition** that contributes significantly and reproducibly to the determination of the **standard atomic weight** of the element in **normal materials**.

Half-life of radioactive isotope

Less than 1 hour 
Between 1 hour and 1 year 
Greater than 1 year 



4.71.1 Lutetium isotopes in biology

^{176}Lu is used in labeling experiments to quantify absolute protein abundance (absolute quantities of proteins in a cell) and examine the extent of synthesis of proteins under specific biological conditions [497]. ^{175}Lu has been used as a yield **tracer** in **inductively coupled plasma mass spectrometry** (ICP-MS) determination of plutonium in urine [497].

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4.71.2 Lutetium isotopes in medicine

^{177}Lu (with a **half-life** of 160 hours) has potential for use as an **isotope** for **radioimmunotherapy** for the treatment of small, soft tumors and for imaging purposes (Figure 4.71.1) [498].

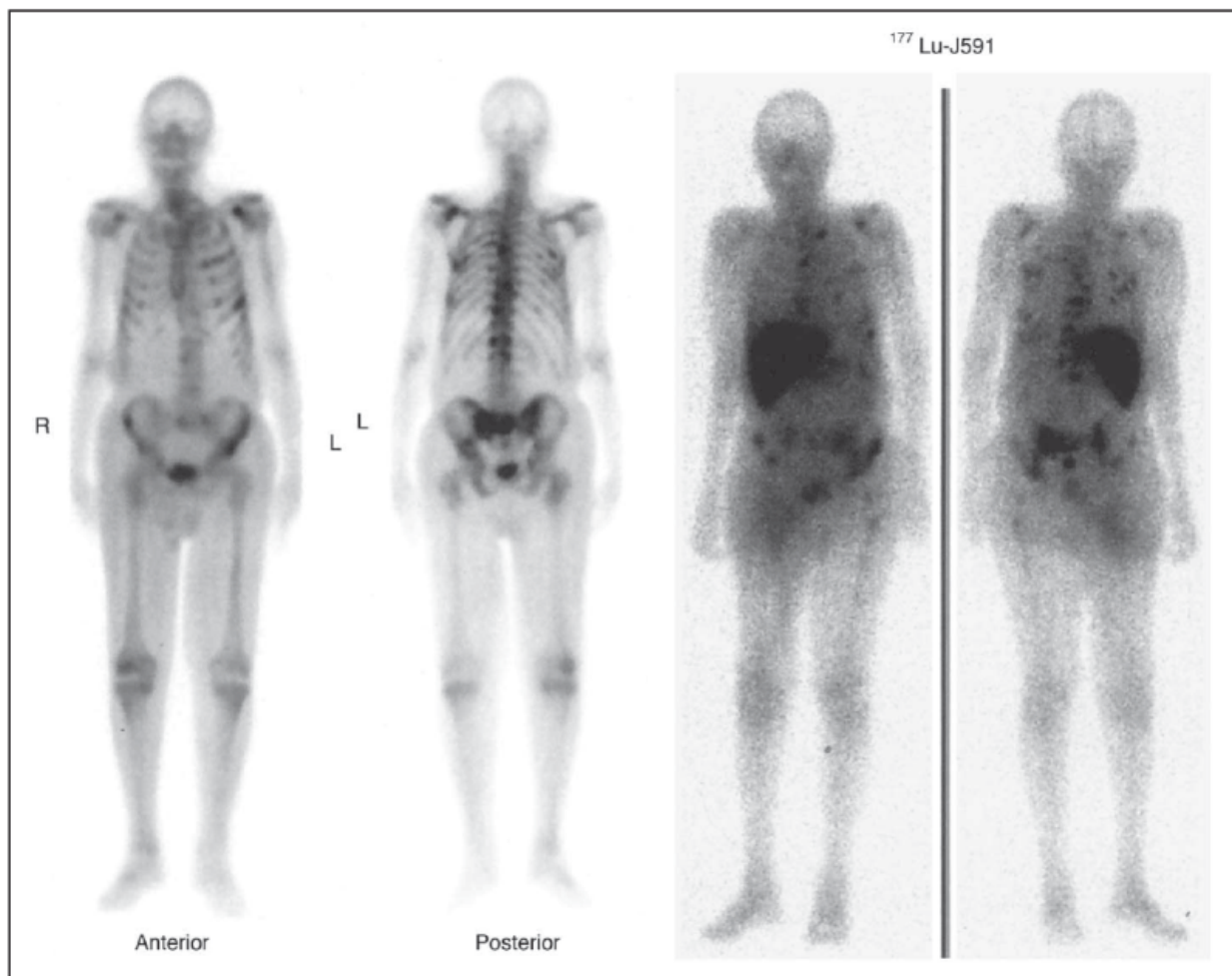


Fig. 4.71.1: Bone scan (on left) and ^{177}Lu scan (on right) done 10 days apart on a patient with prostate cancer (PC), which metastasized to his bones, and who is being treated with the experimental drug ^{177}Lu -labeled J591 (^{177}Lu -J591). The primary areas of uptake of this drug in the body are in PC metastases, which appear as small dark spots in both sets of scans, and in the liver (the large dark spot in the ^{177}Lu scans). The location and number of metastases is clearer in the ^{177}Lu scan than in the bone scan. (Image Source: Bander, Milowsky, Nanus, Kostakoglu, Vallabhajosula and Goldsmith, 2005, © American Society of Clinical Oncology) [498]. (Copyright permission will be purchased through Copyright Clearance Center once publication is approved.)