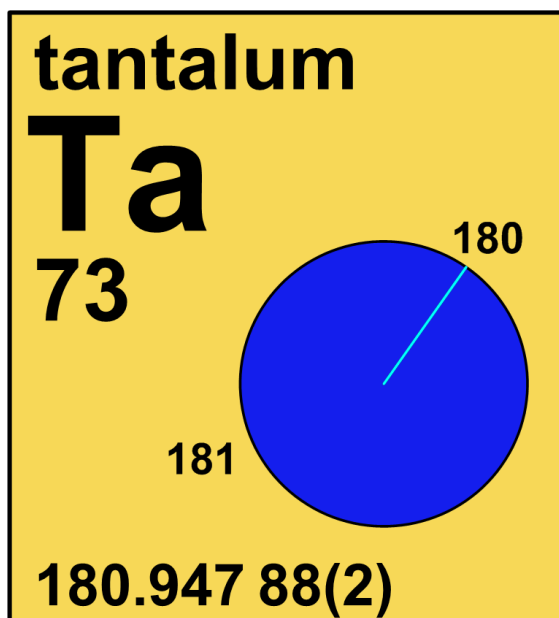


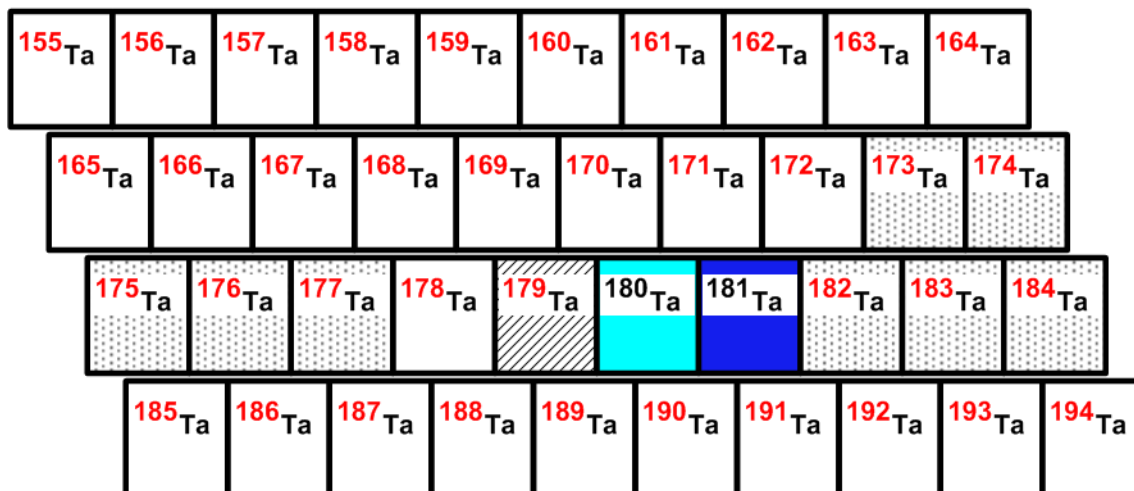
## 4.73 tantalum



Stable isotope	Relative atomic mass	Mole fraction
$^{180}\text{Ta}$	179.947 46	0.000 1201
$^{181}\text{Ta}$	180.948 00	0.999 8799

## Half-life of radioactive isotope

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



## 4.73.1 Tantalum isotopes in medicine

$^{178}\text{Ta}$  (with a **half-life** of 9.2 minutes) is used in medical studies, such as **first-pass radionuclide angiography** of mice, to better understand cardiovascular disease. **Radionuclide** angiography uses a pinhole lens fitted to a high-speed multiwire proportional camera and a  $n(^{178}\text{W})/n(^{178}\text{Ta})$  mole-ratio generator for minimally invasive quantification of murine ventricular (heart) functions (Figure 4.73.1) [503, 504]. The multiwire **gamma camera** has a  $^{178}\text{Ta}$  generator incorporated in its housing, and it provides portable and laboratory ventricular function assessments for cardiovascular patients [504, 505]. **Intravenous** injections of  $^{178}\text{Ta}$  are used in **gated**

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**equilibrium blood pool imaging** [506].  $^{183}\text{Ta}$  (with a half-life of 5.1 days) has potential for use in **radionuclide** pharmaceuticals and as a **tracer** for toxicity studies of ecosystems [507].



**Fig. 4.73.1:** Multiwire **gamma camera** containing a  $^{178}\text{Ta}$  generator. (Photographer: Ami Iskandrian, M.D. Used with permission from: Proportional Technologies, Inc.) [508].

### 4.73.2 Tantalum isotopes used as a source of radioactive isotope(s)

$^{181}\text{Ta}$  is used to produce  $^{178}\text{W}$ , which decays to  $^{178}\text{Ta}$  via the reaction  $^{181}\text{Ta} (p, 4n) ^{178}\text{W} \rightarrow ^{178}\text{Ta}$ , which is important for medical studies as noted in section 4.73.1.