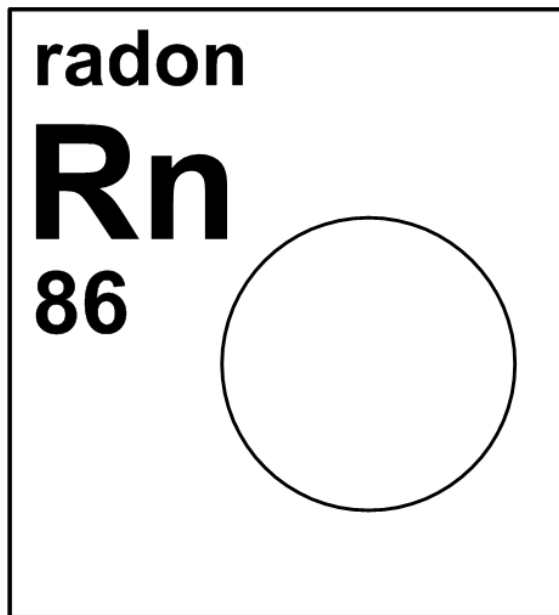




4.86 radon

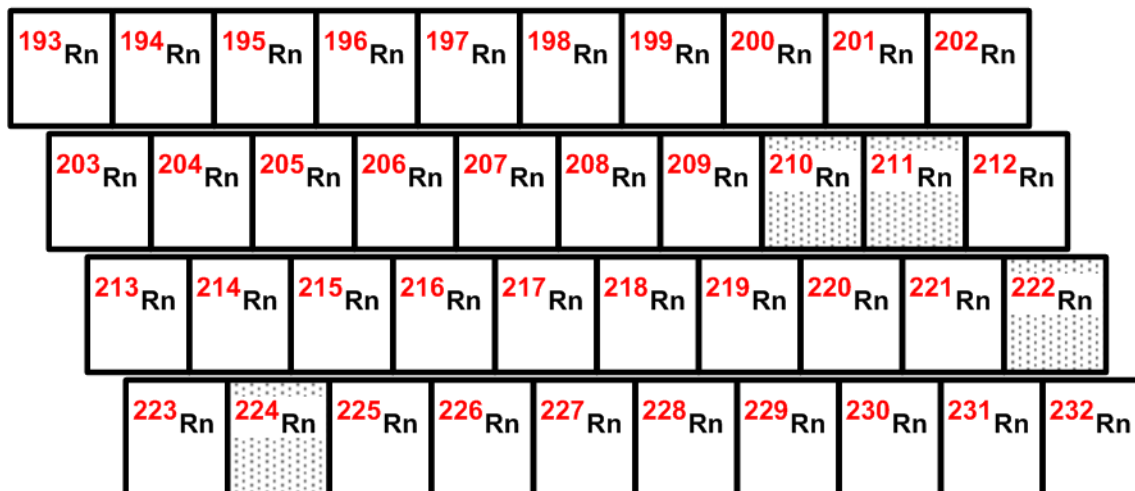


Stable isotope	Relative atomic mass	Mole fraction
(none)		

Half-life of radioactive isotope

Less than 1 hour 

Between 1 hour and 1 year 



4.86.1 Radon isotopes in Earth/planetary science

Both ^{220}Rn and ^{222}Rn (with **half-lives** of 56 seconds and 3.8 days, respectively) are used to study underground environmental as well as atmospheric gaseous-transport processes [565-567]. The interaction of radon with streams and rivers enables it to be used commonly as a **tracer** in groundwater studies (Figure 4.86.1). ^{222}Rn has a short **residence time** in streams and river

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channels, which leads to radon loss. As a result, if an area of a stream or river has a high concentration of radon, it suggests that there are local groundwater inputs [565-567]. In a deep (100 m) contaminated aquifer at a refinery site in Mexico, where the contaminated source was too deep to be directly accessible for sampling, Schubert et al. [568] collected groundwater samples from a few wells available at the site. They used the partitioning of the natural tracer ^{222}Rn between uncontaminated groundwater and the NAPL (non-aqueous phase-liquid like oil, gasoline, and petroleum) source zone, and they were able to approximately identify the location of the NAPL source zone. As noted in Section 4.88.1, ^{222}Rn has been used to quantify submarine groundwater discharge [569].



Fig. 4.86.1: Air-water equilibrator, which strips radon out of water and into the gas phase so it can be used as a groundwater **tracer**. (Photo Source: John Crusius, U.S. Geological Survey) [570].

4.86.2 Radon isotopes in geochronology

^{222}Rn has been used as a tool to date groundwater when used in combination with other **isotopes** or elemental ratios (i.e., helium/radon and xenon/radon **mole ratios** have been used to date groundwater) [565, 571].