

Problems of Nuclear disintegration

1) The isotope ^{41}Ca has a half-life of 1.030×10^5 years. Determine:

- Its decay-constant.
- Its mean-life.
- If we start with 155 g of ^{41}Ca , how many grams will remain after 1.362×10^5 years?

Answer: a) $6.730 \times 10^{-6} \text{ years}^{-1}$ b) $1.486 \times 10^5 \text{ years}$ c) 62 g

2) Assume we started with 91 g of thorium-229. After 14260 years there are 23.66 g of isotope remaining. Calculate:

- Its decay-constant.
- Mean-life.
- Its half-life.

Answer: a) $9.443 \times 10^{-5} \text{ years}^{-1}$ b) 10590 years c) 7340 years

3) The isotope cobalt-60 has a half-life of 5.271 years. Calculate:

- Its decay-constant.
- Its mean-life.
- If we start with 213 g of cobalt-60, how many grams will remain after 5.906 years?

Answer: a) $0.1315 \text{ years}^{-1}$ b) 7.605 years c) 97.98 g

4) The isotope ^{222}Rn has a half-life of 3.824 days. Find out:

- Its decay-constant.
- The mean-life.
- If we start with 262 g of ^{222}Rn , how many grams will remain after 1.587 days?

Answer: a) 0.1813 days^{-1} b) 5.517 days c) 196.5 g

5) The isotope potassium-40 has a half-life of 1.277×10^9 years. Calculate:

- The decay-constant.
- The mean-life.
- How long will it take 150 g of the isotope to disintegrate to 114 g?

Answer: a) $5.428 \times 10^{-10} \text{ years}^{-1}$ b) $1.842 \times 10^9 \text{ years}$ c) $5.056 \times 10^8 \text{ years}$