

Problems

Complete the following nuclear equations and state the type of nuclear decay.

- ${}_{84}^{210}\text{Po} \rightarrow \underline{\hspace{2cm}} + {}_2^4\text{He}$ _____
- ${}_5^8\text{B} \rightarrow {}_4^8\text{Be} + \underline{\hspace{2cm}}$ _____
- $\underline{\hspace{2cm}} \rightarrow {}_{91}^{234}\text{Pa} + {}_{-1}^0\text{e} + \gamma$ _____
- ${}_6^{14}\text{C} \rightarrow \underline{\hspace{2cm}} + {}_{-1}^0\text{e}$ _____
- $\underline{\hspace{2cm}} + {}_{37}^{81}\text{Rb} \rightarrow {}_{36}^{81}\text{Kr} + \text{X-ray photon}$ _____
- ${}_8^{15}\text{O} \rightarrow {}_7^{15}\text{N} + \underline{\hspace{2cm}}$ _____
- ${}_{28}^{58}\text{Ni} + {}_{-1}^0\text{e} \rightarrow \underline{\hspace{2cm}}$ _____
- ${}_{88}^{226}\text{Ra} \rightarrow {}_{86}^{222}\text{Rn} + \underline{\hspace{2cm}} + \gamma$ _____
- ${}_0^1\text{n} \rightarrow \underline{\hspace{2cm}} + {}_{-1}^0\text{e}$ _____
- ${}_{92}^{238}\text{U} \rightarrow \underline{\hspace{2cm}} + {}_2^4\text{He}$ _____

Complete the following nuclear equations.

- ${}_4^9\text{Be} + {}_2^4\text{He} \rightarrow \underline{\hspace{2cm}} + {}_0^1\text{n}$
- $\underline{\hspace{2cm}} \rightarrow {}_{94}^{239}\text{Pu} + {}_{-1}^0\text{e}$
- ${}_{29}^{66}\text{Cu} \rightarrow {}_{30}^{66}\text{Zn} + \underline{\hspace{2cm}}$
- ${}_{13}^{27}\text{Al} + \underline{\hspace{2cm}} \rightarrow {}_{14}^{30}\text{Si} + {}_1^1\text{H}$
- ${}_{56}^{141}\text{Ba} \rightarrow \underline{\hspace{2cm}} + {}_{-1}^0\text{e}$
- $\underline{\hspace{2cm}} + {}_2^4\text{He} \rightarrow {}_{17}^8\text{O} + {}_1^1\text{p}$
- $\underline{\hspace{2cm}} \rightarrow {}_{77}^{181}\text{Ir} + {}_2^4\text{He}$
- ${}_{95}^{241}\text{Am} \rightarrow \underline{\hspace{2cm}} + {}_{93}^{237}\text{Np}$
- $\underline{\hspace{2cm}} + {}_6^{12}\text{C} \rightarrow {}_{98}^{246}\text{Cf} + 4{}_0^1\text{n}$
- ${}_{9}^{18}\text{F} \rightarrow {}_8^{17}\text{O} + \underline{\hspace{2cm}}$
- ${}_1^2\text{H} + \underline{\hspace{2cm}} \rightarrow {}_2^4\text{He} + {}_0^1\text{n} + \text{energy}$
- ${}_{14}^{27}\text{Si} \rightarrow {}_{-1}^0\text{e} + \underline{\hspace{2cm}}$
- $\underline{\hspace{2cm}} \rightarrow {}_2^4\text{He} + {}_{81}^{210}\text{Tl}$
- ${}_{15}^{32}\text{P} \rightarrow \underline{\hspace{2cm}} + {}_{-1}^0\text{e}$
- ${}_{61}^{142}\text{Pm} + \underline{\hspace{2cm}} \rightarrow {}_{60}^{142}\text{Nd}$
- ${}_{7}^{14}\text{N} + \underline{\hspace{2cm}} \rightarrow {}_6^{14}\text{C} + {}_1^1\text{p}$
- ${}_{6}^{13}\text{C} + {}_0^1\text{n} \rightarrow \underline{\hspace{2cm}}$
- ${}_{94}^{239}\text{Pu} + {}_2^4\text{He} \rightarrow {}_1^1\text{H} + 2{}_0^1\text{n} + \underline{\hspace{2cm}}$

Half-Lives

- If gallium-68 has a half-life of 68.3 minutes, how much of a 10mg sample is left after two half-lives?
- If the passing of five half-lives leaves 25.0mg of a strontium-90 sample, how much was present in the beginning?
- The radioisotope cesium-137 has a half-life of 30 years. A sample decays at the rate of 544counts/min (544cpm) in 1985. In what year will the decay be 17cpm?
- Manganese-56 is a beta emitter with a half-life of 2.6hr. What is the mass of manganese-56 in a 1mg sample of the isotope after 10.4hr?
- Nitrogen-13 emits beta radiation and decays to C-13 with $t_{1/2} = 10\text{min}$. Assume a starting mass of 2.0g of N-13. How many grams of that isotope will remain after 40min?
- The radioisotope Mo-91 has a $t_{1/2}$ of 15.5min. A sample decays at the rate of 954counts/min (954cpm). After how many minutes will the decay be 7.45cpm?