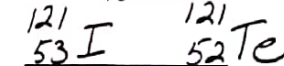
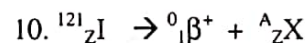
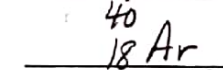
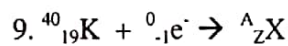
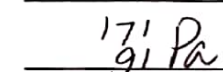
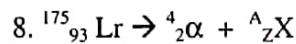
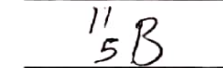
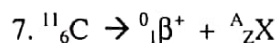
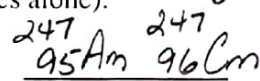
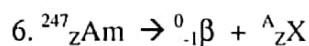
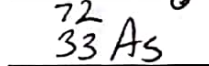
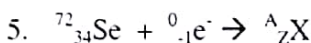
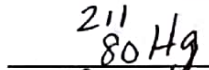
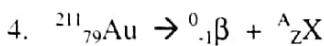
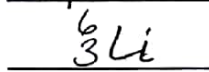
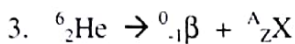
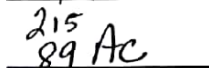
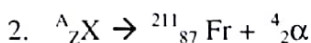
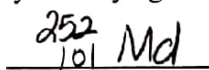
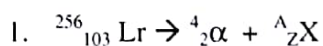
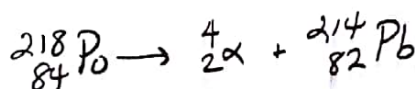


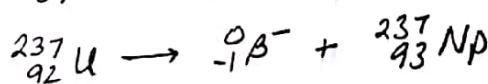
A. Complete the nuclear decay reaction by identifying the missing component (${}^Z_A\text{X}$ or Z/A values alone).

B. Writing nuclear decay reactions:

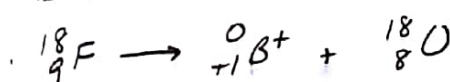
11. Decay of Po-218 by alpha emission:



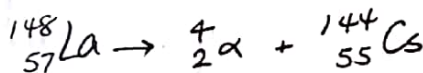
12. Decay of U-237 by beta emission:



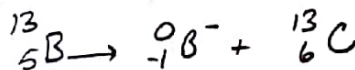
13. Positron emission of F-18:



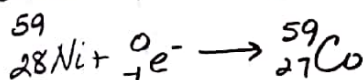
14. Formation of Cs-144 from alpha decay:



15. Formation of C-13 from beta decay:



16. Formation of Co-59 from electron capture:



C. Half-life processes:

17. Thallium-208 has a half-life of 3.053 min. How long will it take for 120.0 g to decay to 7.50 g?

$$t = \frac{1}{\left(\frac{0.693}{3.053}\right)} \ln\left(\frac{120.0\text{g}}{7.50\text{g}}\right) = 12.2\text{ min}$$

$$k = \frac{0.693}{t_{1/2}}$$

$$t = -\frac{1}{k} \ln\left(\frac{N_t}{N_0}\right)$$

18. Actinium-226 has a half-life of 29 hours. If 100 mg of actinium-226 disintegrates over a period of 58 hours, how many mg of actinium-226 will remain?

$$N_t = e^{-kt} \cdot N_0 \Rightarrow e^{-\left(\frac{0.693}{29}\right)(58)} \cdot 100\text{mg} = 25.00\text{mg}$$

or 58 hrs is 2 · 29 hrs (2 half-lives)

$$100 \times \frac{1}{2} = 50 \times \frac{1}{2} = 25$$

19. A space rock contains 3.20g of ${}^{147}_{62}\text{Sm}$ and 0.110g of ${}^{143}_{60}\text{Nd}$. If ${}^{147}_{62}\text{Sm}$ decays through alpha emission to ${}^{143}_{60}\text{Nd}$ with a half-life of 1.06×10^{11} yrs. What is the maximum age of the rock, assuming there was no ${}^{143}_{60}\text{Nd}$ present at the "birth" of the rock?

$$t = \left(-\frac{1}{\frac{0.693}{1.06 \times 10^{11}}}\right) \ln\left(\frac{3.20\text{g}}{(3.20\text{g} + 0.110\text{g})}\right) = 4.71 \times 10^9\text{ yrs}$$

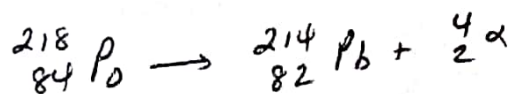
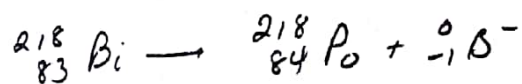
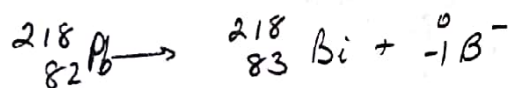
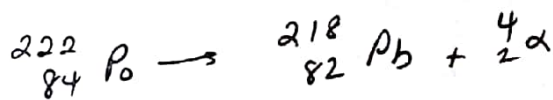
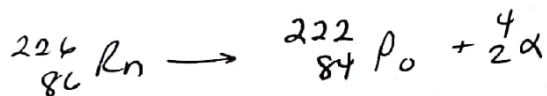
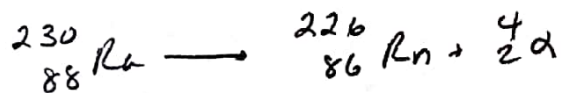
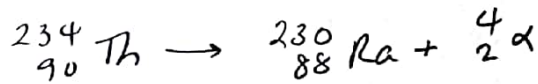
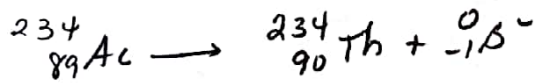
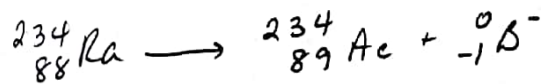
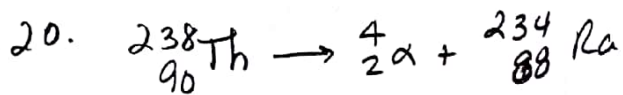
D. Series:

20. Write the reactions for the decay of Th-238. There are ten steps:

(Alpha → Beta → Beta → Alpha → Alpha → Alpha → Alpha → Beta → Beta → Alpha).

What is the stable isotope formed from this series?

See 2nd page



The final isotope of this series is ${}_{82}^{214}\text{Pb}$ - Do you think it is stable?

probably not - follow $\beta^- \rightarrow \beta^- \rightarrow \alpha \rightarrow \beta^- \rightarrow \beta^- \rightarrow \alpha$

and you get ${}_{82}^{206}\text{Pb}$