NUCLEAR CHEMISTRY WORKSHEET

Part A: Completing the Nuclear Decay Reaction

For each of the atoms listed below, complete the decay reaction by solving for $^{A}_{Z}X$ or other missing information. Remember that the mass and protons on each side of the arrow need to equal each other.

1. $^{256}_{103}\text{Lr} \rightarrow {}^{4}_{2}\text{He} + {}^{A}_{Z}\text{X}$
2. $^{247}_{X}\text{Am} \rightarrow {}^{0}_{-1}\text{e} + {}^{A}_{Z}\text{X}$
3. $^{A}_{Z}\text{X} \rightarrow {}^{211}_{87}\text{Fr} + {}^{4}_{2}\text{He}$
4. $^{175}_{93}\text{Np} \rightarrow {}^{4}_{2}\text{He} + {}^{A}_{Z}\text{X}$
5. $^{211}_{79}\text{Au} \rightarrow {}^{0}_{-1}\text{e} + {}^{A}_{Z}\text{X}$
6. $^{A}_{Z}\text{X} \rightarrow {}^{0}_{-1}\text{e} + {}^{203}_{Z}\text{Po}$
7. $^{148}_{57}\text{La} \rightarrow {}^{4}_{2}\text{He} + {}^{A}_{Z}\text{X}$
8. $^{151}_{67}\text{Ho} \rightarrow {}^{4}_{2}\text{He} + {}^{A}_{Z}\text{X}$
9. $^{239}_{92}\text{U} \rightarrow {}^{4}_{2}\text{He} + {}^{A}_{Z}\text{X}$
10. $^{13}_{5}\text{B} \rightarrow {}^{0}_{-1}\text{e} + {}^{A}_{Z}\text{X}$

Part b: Writing Nuclear Decay Reactions

Write equations for the following nuclear decay reactions. Make sure that both mass numbers and atomic numbers are balanced on each side

11. Decay of polonium-218 by alpha (α) emission
12. Decay of carbon-14 by beta (β emission)
13. The alpha decay of radon-198
14. The beta (β) decay of uranium-237
15. The alpha decay of plutonium- 243
16. Potassium-40 can decay to form calcium-40. Write the balanced equation for this nuclear reaction.
17. Write a balanced equation for the nuclear reaction in which neon-23 decays to form sodium-23.
18. Write a balanced nuclear equation for the radioactive decay of iron-60 to give cobalt-60.
19. Write a nuclear equation for the following radioactive process; beta emission by argon-37
20. When uranium-234 decays by emitting an alpha particle, it becomes?

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20. When uranium-234 decays by emitting an alpha particle, it becomes?

Part C: Half-Life:

1. If 100.0 g of carbon-14 decays until only 25.0 g of carbon is left after 11 460 years, what is the half-life of carbon-14?
2. Thallium-208 has a half-life of 3.053 min. How long will it take for 120.0g to decay to 7.50 g?
3. Gold-198 has a half-life of 2.7 days. How much of a 96g sample of gold-198 will be left after 8.1 days?
4. A patient is administered 20 mg of iodine-131. How much of this isotope will remain in the body after 40 days if the half-life for iodine-131 is 8 days?
5. Polonium-214 has a relatively short half-life of 164 s. How many seconds would it take for 8.0 g of this isotope to decay to 0.25 g?
6. The half life of argon is 6.32 days, how much of argon- 35 would be left after 50.56 days when there was initially 126.35 grams.
7. The radioisotope radon-222 has a half-life of 3.8 days. How much of an initial 20.0-g sample of radon-222 would remain after 15.2 days?
8. The mass of cobalt-60 in a sample is found to have decreased to 0.200 g in a period of 1015.5 years. The half life of cobalt is 425.26 years, what was the initial amount of the sample of cobalt-60?
9. A sample initially contains 60.0 grams of thorium-234. After 48 days, only 7.5 grams of thorium-234 remains. Determine the half-life.
10. Technetium-104 has a half life of 18 minutes. Starting with an initial mass of 100.0 grams, how much would remain after 90.0 minutes?
11. Manganese-56 is a beta emitter with a half life of 2.6 hours. Starting with a 10.0 gram sample, how much would remain after 15.6 hours?
12. If 20.0 gram sample of element Xenaium remains after 72 days, determine the mass of the original sample. The half life of Xenaium-234 is 12 days.

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