Nuclear Equations Practice

Complete each nuclear equation by filling in the blank. Identify the type of nuclear reaction.

Type (alpha, beta, gamma)

1) $^{214}_{84}Po \rightarrow {}^{210}_{82}Pb +$ _____   _____

2) $^{222}_{86}Rn \rightarrow$ _____ $+ {}^{4}_{2}He$ _____

3) $^{230}_{90}Th \rightarrow {}^{226}_{88}Ra +$ _____   _____

4) $^{214}_{82}Pb \rightarrow$ _____ $+ {}^{0}_{-1}e$ _____

5) $^{226}_{88}Ra \rightarrow$ _____ $+ {}^{4}_{2}He$ _____

6) $^{237}_{93}Np \rightarrow$ _____ $+ {}^{0}_{-1}e$ _____

7) _____ $\rightarrow {}^{234}_{90}Th + {}^{4}_{2}He$ _____

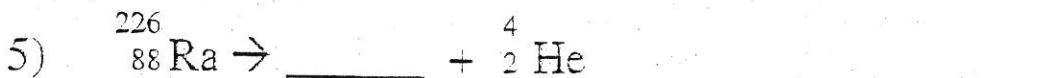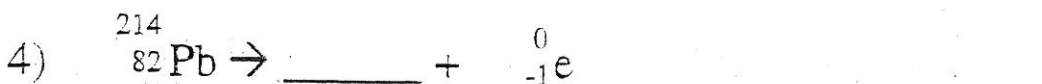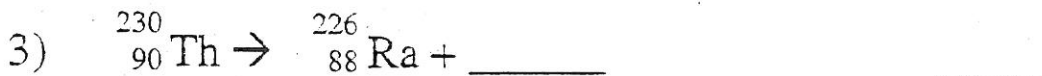8) $^{234}_{92}U \rightarrow {}^{234}_{93}Np +$ _____   _____

9) $^{206}_{82}Pb \rightarrow {}^{4}_{2}He +$ _____   _____

10) $^{254}_{91}Pa \rightarrow$ _____ $+ {}^{0}_{-1}e$ _____

11) $^{228}_{88}Ra \rightarrow$ _____ $+ {}^{4}_{2}He +$ gamma rays   _____

12) $^{212}_{82}Pb \rightarrow$ _____ $+ {}^{0}_{-1}e +$ gamma rays   _____
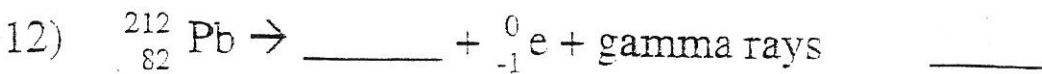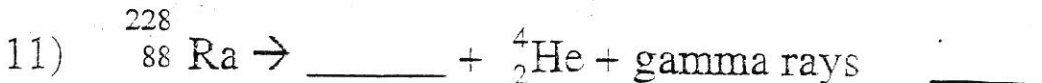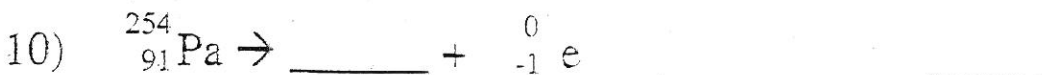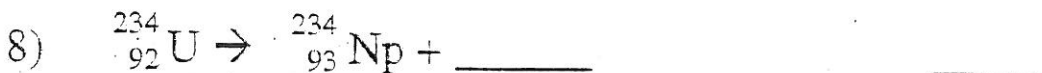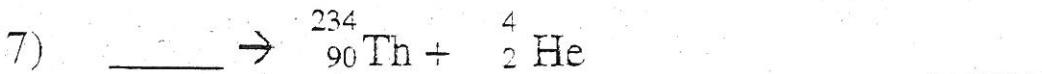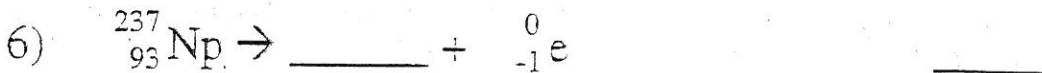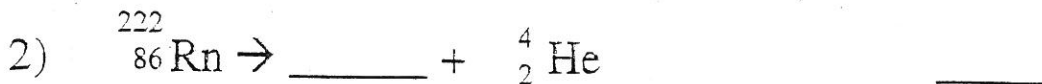
13) Write the nuclear decay equation for the alpha decay of Pa-231:

Half-life Problems

1) A 208 g sample of sodium-24 decays to 13 g within 60 hours. What is the half-life? (Ans. 15 hrs)

2) What is the half-life of a 100g sample of nitrogen-16 that decays to 12.5 g in 21.6 seconds? (Ans. 7.2 sec.)

3) Cobalt-60 has a half-life of 5.3 years. If a pellet that has been in storage for 26.5 years contains 14.5 g of cobalt-60, how much of this radioactive isotope was present when the pellet was originally put into storage? (Ans. 464 g)

4) A radioactive sample is allowed to decay. What fraction will be left after:
   a) 1 half-life?   c) 3 half-lives?
   b) 2 half-lives?   d) 4 half-lives?

5) Nitrogen-16 has a half-life of approximately 7.13 minutes. How much of a 25g sample is left after 21.39 minutes? (Ans. 3.1 g)

6) Cobalt-60 is used in various medical procedures and has a half-life of about 5 years. How much should a hospital order if they want 20 grams to remain after 15 years? (Ans. 160 g)

7) Potassium has a half-life of 12.4 hours. How much of an 848 g sample of potassium-42 will be left after 62 hours? (Ans. 26.5 g)

8) A sample of iodine-131 was originally ordered as 100g. When the shipment arrived 24 days later, only 12.5 g remained. How long is the half-life of iodine 131? (Ans. 8 days)