Big Chem Problem Set

NUCLEAR CHEMISTRY

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1. Explain why some atoms decay while others do not.
2. Write a complete nuclear equation showing the transmutation that occurs. Use Table N for reference.
3. What forms when carbon–14 decays?
4. What forms when radium–226 decays?
5. What forms when iron–53 decays?
6. What kind of decay causes neptunium–238 to form from uranium–238?
7. From what radioactive element does fluorine–19 form by positron emission?
8. What forms from the decay of francium–220?
9. What forms from the decay of potassium–42?
10. What forms from the decay of potassium–37?
11. Describe the process of transmutation. What is the difference between artificial and natural transmutation.

Answer the questions below using data from Table N, the table of Selected Radioisotopes.

12. How long will it take for 30 g of Rn-222 to decay to 7.5 g?
13. How many grams of N-16 will be left from a 16 g sample after 21.6 s?
14. How many half-lives will it take for 50 g of Tc-99 to decay to 6.25 g?
15. What fraction of a sample of P-32 will be left after 42.9 d?
16. How long will it take for a 28 g sample of Ra-226 to decay to 3.5 g?
17. How long will it take for 50% of a sample of I-131 to decay?
18. After 9.8 E10 years, how many grams will be left from a 256 g sample of Th-232?
19. How long will it take for 500 g of Sr-90 to decay to 125 g?
20. Which type of reaction takes place in a nuclear power plant and in lesser powerful atomic bombs?
21. Which type of reaction takes place in stars?
22. Which are more powerful, chemical or nuclear reactions? Justify your answer with a brief explanation.
23. Where does the energy released in a fusion reaction come from? It converts what into what?
24. Identify and list the specific uses of the following isotopes. One ore more may require research: C-14 and geology, U-238 (not bombs or power plants), Co-60, Tc-99
25. In a nuclear fusion reaction, how does the mass of the product compare to the mass of the reactant?
26. When a uranium nucleus breaks up into fragments, which tpe of nuclear reaction occurs?
27. In a fusion reaction, the particles fusing together must collide with huge amounts of energy for the reaction to take place. Why is this?
28. What equation describes what happens to matter lost in a fusion reaction?
29. What are the associated risks, if any, associated with fission and fusion reactions?