

Unit 11 Practice Problems (with answers at end)

He who boasts of his ancestry
praises the deeds of another.
--Seneca

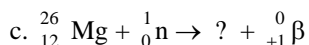
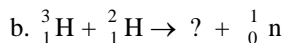
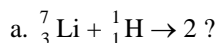
Nuclear Reactions

1. Write nuclear symbols for the following isotopes:

a. lead-208 b. helium-5 c. lead-210 d. potassium-40

2. What is the nuclear symbol for an isotope of rubidium with 50 neutrons?

3. Complete the following nuclear equations:



4. Write nuclear equations for the following processes:

a. Ra-226 decays by α -emission.

b. The result of the β -decay of an isotope is Mg-22.

Rates of nuclear decay

5. For the following, calculate the value of the rate constant, k , given the half-life of the isotope:

a. Th-227, 18.2 day

b. Pa-234, 6.75 hr

c. Rn-222, 3.823 day

6. The half-life of Pa-234 is 6.75 hr. How much (what fraction) of a sample of this isotope remains after 20.25 hr?

7. The half-life of Rn-222 is 3.823 day. What was the original mass of a sample of this isotope if 0.0500 g remains after 7.646 day?

8. The half-life of Th-227 is 18.2 day. How many days are required for 0.70 of a given sample to decay?

9. An object taken from a cave has a carbon-14 fraction which is 0.89 of the amount in a living organism. How old is the object? (half-life for C-14 is 5730 yr)

Every man desires to live
long, but no man would be
old. --Jonathan Swift

Nuclear reactions of fission and fusion

Write and/or complete the following transmutations, fission and fusion reactions.

10. Neutron initiated fission of U-235 results in the release of 2 neutrons, the formation of Cs-144 and another nucleus.

11. Bombardment of Cl-35 with a neutron produces a sulfur-34 nucleus and another particle.

12. Neutron initiated fission of U-235 results in the release of 4 beta particles, the formation of Sr-90 and the release of another nucleus.

13. Neutron initiated fission of U-235 results in the release of 3 neutrons, one beta particle, the formation of Br-87 and another nucleus.

14. Neutron initiated fission of Pu-239 gives three neutrons, La-145 and another nucleus.

15. Two tritium nuclei are fused to produce 2 neutrons and another nucleus.

16. An H-1 nucleus (protium) and a Li-7 nucleus are fused to produce He-4.

17. Tritium and deuterium are fused to produce a neutron and a new nucleus.

18. Bombardment of U-238 with C-12 produces an isotope of element 98 and 4 identical particles.

Answers:

