

Chemistry 101
In-Class Assignment 12 (Due by Nov. 26th)
Nuclear Equations and Radioactive Decay

1. Identify the nuclear symbols associated with the following particles (these should include mass number and atomic number in the form y_zX):

(a) alpha (α)

(c) a neutron

(b) beta (β)

(d) a proton

2. For each of the following, find the number of protons and the number of neutrons. Also write the full nuclear symbol for each.

(a) Na-23

(c) Cu-65

(b) Cl-37

(d) Hg-200

3. The following nuclei undergo alpha decay. Write the nuclear equation for each.

(a) U-234

(b) Ra-226

(c) Po-218

(d) Bi-210

4. The following nuclei undergo beta decay. Write the nuclear equation for each.

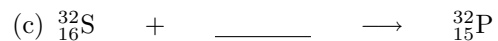
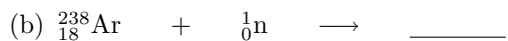
(a) Pb-214

(b) Tl-210

(c) Tl-206

(d) Pa-234

5. Complete the following nuclear reactions:



6. Write nuclear equations for the following nuclear reactions:

(a) Mo-98 is bombarded with a neutron to produce Tc-99 (used in medical imaging) and another particle.

(b) Two H-2 nuclei are joined to form another nucleus and a neutron.

(c) A neutron induces the fission of U-235 to form two neutrons, one nucleus with 56 protons, and a second nucleus with a mass number of 94.

(d) U-235 and a neutron react to form Br-87, La-146 and more neutrons.

(e) U-238 is bombarded with a nucleus to produce Fm-249 and 5 neutrons.

(f) U-235 is bombarded with N-14 to produce another nucleus and 5 neutrons.

7. What percent of a radioactive isotope would remain after (a) two half-lives (b) 4 half lives and (c) 6 half-lives?
8. Fluorine-18 has a half-life of 110 minutes, is used in PET scans. If 100 mg of fluorine-18 is shipped at 8:00 A.M., how many milligrams of the radioisotope are still active is the sample arrives at the radiology laboratory at 1:30 P.M.?
9. ^{131}I has a radioactive half-life of 7.80 days, but iodine is also removed from the body by excretion characterized by a “biological half-life” of 26 days. These two processes lead to an **effective half-life** of 6.0 days. A laboratory animal injected with ^{131}I should not be re-injected with that isotope for 2 months. How much ^{131}I is left at that time?