

Writing Alpha and Beta Decay Equations

First off, you need to know how to write and understand nuclear symbols:

Remember that the lower number is the atomic number and the upper number is the mass number.

Alpha Decay

In 1899, Ernest Rutherford wrote the following words:

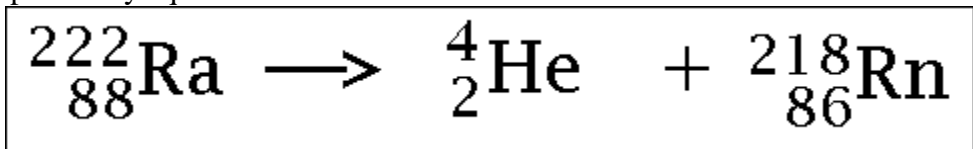
"These experiments show that the uranium radiation is complex and that there are present at least two distinct types of radiation - one that is very readily absorbed, which will be termed for convenience the alpha-radiation, and the other of more penetrative character which will be termed the beta-radiation." The image to the right is of a twenty-eight year old Ernest Rutherford while at McGill University in 1899.



Alpha decay can most simply be described like this:

- 1) The nucleus of an atom splits into two parts.
- 2) One of these parts (the alpha particle) goes zooming off into space.
- 3) The nucleus left behind has its atomic number reduced by 2 and its mass number reduced by 4 (that is, by 2 protons and 2 neutrons).

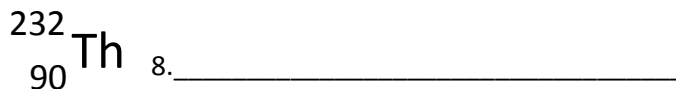
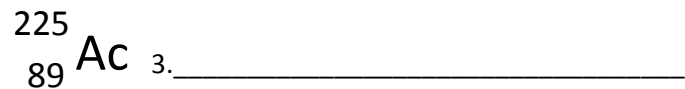
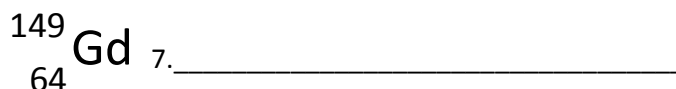
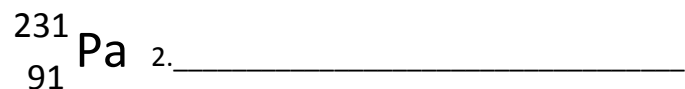
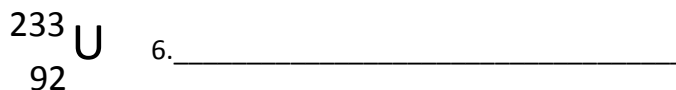
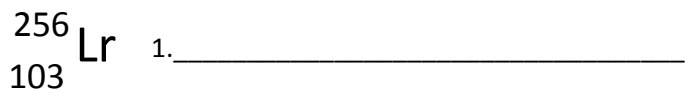
Here is a typical alpha decay equation:



Notice several things about it:

- 1) The atom on the left side is the one that splits into two pieces.
- 2) One of the two atoms on the right is ALWAYS an alpha particle.
- 3) The other atom on the right ALWAYS goes down by two in the atomic number and four in the mass number.

Try these. Write the alpha decay equations for the following.

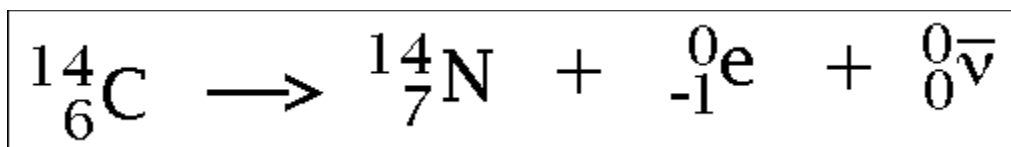


Beta Decay

Beta decay is somewhat more complex than alpha decay is. These points present a simplified view of what beta decay actually is:

- 1) A neutron inside the nucleus of an atom breaks down, changing into a proton.
- 2) It emits an electron and an anti-neutrino (more on this later) which go zooming off into space.
- 3) The atomic number goes UP by one and mass number remains unchanged.

Here is an example of a beta decay equation:



Some points to be made about the equation:

- 1) The nuclide that decays is the one on the left-hand side of the equation.
- 2) The order of the nuclides on the right-hand side can be in any order.
- 3) The way it is written above is the usual way.
- 4) The mass number and atomic number of the antineutrino are zero and the bar above the symbol indicates it is an anti-particle.

Try these. Write out the full beta decay equations for the following.

