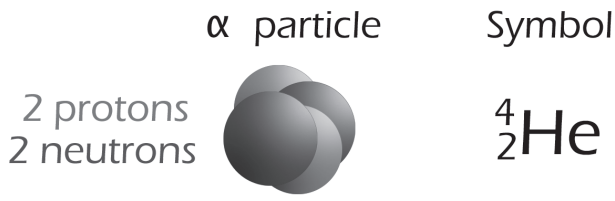
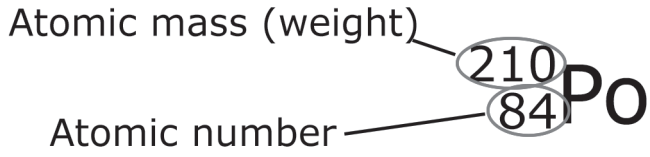
32. Draw and alpha particle, write the symbol used in nuclear chemistry to denote the alpha particle and indicate why the He—denoting helium—is used as its symbol.



33. Indicate what the circled numbers mean in the notation below.



34. How many protons, neutrons and electrons does this isotope have? Is it radioactive? **It has 86 protons, 86 electrons and 136 neutrons. It is radioactive (because its N:P is 1.581 and all elements with a N:P >1.537 are radioactive).**

35. Write the nuclear decay equation for the alpha decay of ^{232}Th into ^{228}Ra.

$$^{232}_{90}Th \rightarrow {}^{228}_{88}Ra + {}^{4}_{2}He$$

36. What is the symbol for a beta particle and from where does it come? **The symbol for the beta particle is $^{0}_{-1}e$ and it is generated during the beta decay cycle when a neutron loses energy, turns into a proton and releases an electron, ejecting it out of the nucleus. The electron is the beta particle.**

37. Write the beta decay cycle for ^{237}U.

$$^{237}_{92}U \rightarrow {}^{237}_{93}Np + {}^{0}_{-1}e$$

New Graphic

38. True or False? Gamma decay (radiation) usually occurs at the same time alpha or beta decay occurs and is a way for the nucleus to release "extra energy." **True.**

39. The half life of ^{50}Ca is about 14 seconds. If we have a pile of $1x10^7$ atoms of ^{50}Ca, how many do we have left after 84 seconds? **6 half-lives have passed in 84 seconds, so we have 156,250 atoms of ^{50}Ca left at that point: 10,000,000 to 5,000,000 (1st half-life), 5,000,000 to 2,500,000 (2nd), 2,500,000 to 1,250,000 (3rd), 1,250,000 to 625,000 (4th), 625,000 to 312,500 (5th), 312,500 to 156,250 (6th).**