CHEM-630 Assignment 1

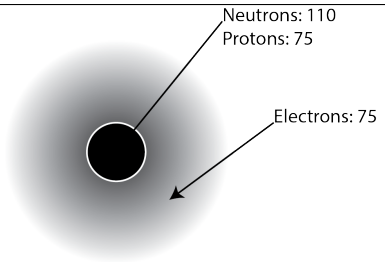
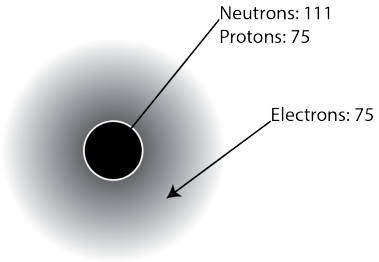
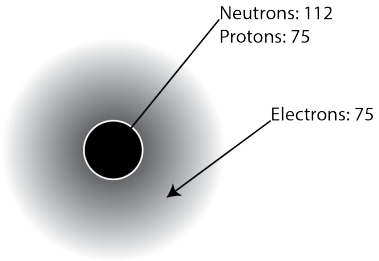
Matthew J. Urffer
murffer@utk.edu
January 15, 2013

1.03: Atoms

(a) Look up the atomic numbers (Z) of Si, V, Re and Am

Symbol	Z
Si	14
V	23
Re	75
Am	95

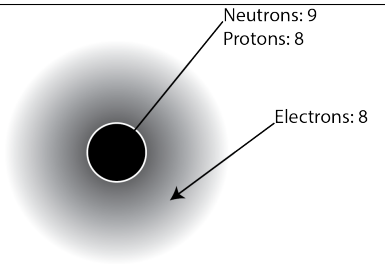
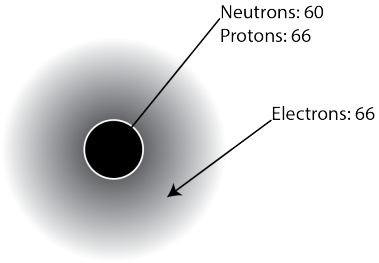
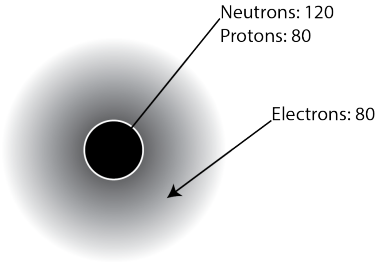
(b) Draw the structures for the three isotopes: ^{185}Re, ^{186}Re and ^{187}Re

Isotope	Structure
^{185}Re	
^{186}Re	
^{187}Re	

(c) Write designations for the three isotopes in Part b in the form ${}^{A}_{Z}$El

Isotope	Full Symbol
^{185}Re	${}^{185}_{75}$Re
^{186}Re	${}^{186}_{75}$Re
^{187}Re	${}^{187}_{75}$Re

(d) Draw complete structures and give full symbols for ^{17}O, ^{126}Dy and ^{200}Hg

Isotope	Full Symbol	Structure
^{17}O	$^{17}_{8}$O	
^{126}Dy	$^{126}_{66}$Dy	
^{200}Hg	$^{200}_{80}$Hg	

Advanced Topic: Extended Periodic Table

The periodic table (a method of organizing elements while predicting properties and existence) was proposed by Dimitri Mendeleev in 1869. Since then, elements have been continuously added to the table. Livermorium and Flerovium (^{116}Lv & ^{114}Fl) have become the most recent additions to the periodic table (May 31, 2012) while the 2010 discovery of ununseptium has yet to be verified. The predictive properties of the periodic table have been used to aid in the search for elements, thus, the exact number of possible elements is an active research question. Feynman calculated that elements with a Z greater than 137 the ground state energy of the 1s electron would become imaginary and thus oscillatory. This by itself does not rule out elements with a Z greater than 137, it just means that the atoms would be charged. In fact, when this calculation was revisited with a better model of the atom the 1s orbital energy remained positive until Z around 150. A recent model of the periodic table has been created for $Z \leq 172$, based on updated computer models. These predicted, super heavy elements have been yet to be found, but have orbitals in the 6f and 5g, extending period 8.