The Atom

1. The *atom* is the basic unit of matter. It is made up of three components the proton, neutron, and electron.

2. Protons are located in the nucleus and have a positive charge. The number of protons defines the element. When you change the number of protons you create a new element.

3. Electrons are located in the orbitals and have a negative charge. The electrons (primarily valence electrons) define the reactivity of the element. When you change the number of electrons you create an ion.

4. Neutrons are located in the nucleus and have a neutral charge. When you change the of neutrons you create an isotope.

5. Define the components and how they would be determined in the chemical symbol

$$ {}^{A}_{Z}X $$

   a. X

      X represents the chemical symbol of the particular element. This symbol can be determined by looking at the periodic table. For example, if you were dealing with carbon, you would use C for X.

   b. Z

      Z represents the atomic number.
      Z = number of protons

If you were given the symbol ^{12}C, you might notice that there wasn't a Z value provided. This is not an issue because we have the atomic symbol C. The atomic symbol tells us which element we are dealing with, and because the element is defined by the number of protons, we can use the periodic table to figure out the atomic number. Carbon is element 6, thus, there are 6 protons.

c. A

A represents the mass number.
A = number of protons + number of neutrons
For example, if you were, once again, given the symbol ^{12}C. You would be able to determine the number of neutrons. You know that the mass number is equal to the number of protons plus neutrons. We know, that because this is carbon, there are 6 protons. That means there would have to be 6 neutrons because 6 + 6 = 12

6. How many protons, neutrons and electrons are in each of the following?

a. ^{56}Fe

protons = 26
(determined by periodic table)

electrons = 26
(because this symbol has no charge indicated, we know that the number of protons = number of electrons)

neutrons = 30
(Mass number – number of protons = number of neutrons)
(56 – 26 = 30)

b. ^{19}F

protons = 9
(determined by periodic table)

electrons = 9
(because this symbol has no charge indicated, we know that the number of protons = number of electrons)

neutrons = 10
(Mass number – number of protons = number of neutrons)
(19 – 9 = 10)

c. ^{15}N

protons = 7
(determined by periodic table)

electrons = 7
(because this symbol has no charge indicated, we know that the number of protons = number of electrons)

neutrons = 8
(Mass number – number of protons = number of neutrons)
(15 – 7 = 8)

d. ^{23}Na

protons = 11
(determined by periodic table)

electrons = 11
(because this symbol has no charge indicated, we know that the

number of protons = number of electrons)

neutrons = 12
(Mass number – number of protons = number of neutrons)
(23 – 11 = 12)