Mr. Gleicher – Biology/Chemistry   Name: _____

How to Deal with Atoms, Ions, and Isotopes

THE BASICS

Atomic Number = # of protons

Atomic Mass = weighted average of isotope masses (rounded mass ≈ protons + neutrons)

Mass Number = # of protons + # of neutrons

(Except in ions)   # of protons = # of electrons   *(Except in ions)*

Charge = # of protons - # of electrons

Change in protons = Create a new *element* (and change Atomic Number)

Change in neutrons = Create a new *isotope* (and change Atomic Mass/Mass Number)

Change in electrons = Create a new *ion* (and change charge)

Ask yourself these questions **in order**:

FIRST QUESTIONS

1. Does it have a + or – next to it?
   a. Yes, it does. This means it's an <u>ion</u>, which means the whole atom has a *charge*. Go to **IONS** section on the back.
   b. No, it doesn't. This means it's not an ion, which means the whole atom is *neutral*. Go to #2 below.
2. Does it have a new atomic mass written near it? (a number with no + or – next to it?)
   a. Yes, it does. This means it's an <u>isotope</u>, which means there are a *different number of neutrons* than normal. Go to **ISOTOPES** section on the back.
   b. No, it doesn't. This means it is not an isotope. It's also not an ion. Numbers of protons, neutrons, and electrons are all normal. Solve the problem.

Important Note: *If you come across and atom that is <u>both</u> an ion and an isotope, you need to use <u>both</u> sections on the back. Just work through the problem one at a time.*

IONS

1. Remember that under normal circumstances, # of protons = # of electrons. *However,* in ions, the number of electrons is different. *Protons and neutrons stay the same*.
    a. Use this equation: [# of protons] – [# of electrons] = CHARGE (+ or -)
    b. You know the number of protons by the atomic number. Plug that value in.
    c. Use your algebra skills and solve the equation.

ISOTOPES

1. Remember that an isotope has a new atomic mass (usually written to the left or right of the element symbol). Since *protons* can't change, this means it has a new number of *neutrons*.
    a. Use this equation: [# of protons] – [# of electrons] = Mass Number
    b. You know the number of protons by the atomic number. Plug that value in.
    c. Use your algebra skills and solve the equation.

ISOTOPES AND PERCENT ABUNDANCE

1. In some situations you will need to calculate an element's atomic mass from the percent abundances and masses of its isotopes. Here is the formula:
    a. First, convert all percents to decimals.
    b. [(% abundance of isotope one)*(mass of isotope one) + (% abundance of isotope two)*(mass of isotope two)] = Atomic Mass
    c. Expand as necessary for multiple isotopes.