5.8 – INVESTIGATE **KEY**

1. a) H and the alkali metals have the lowest first ionization energies. So it’s: H, Li, Na, K

b) the first column, group 1

c) it’s high, it will require a large amount of energy to remove the 2nd electron

d) once the first electron is removed, they have a configuration similar to the noble gases. Losing one electron gives them a full outer shell. So it takes a lot of energy to remove a second electron. Also the nucleus positive charge is able to pull the remaining electrons closer to it after the first one is removed.

e) alkaline earth metals, 2nd column or group 2

f) when alkaline earth metals lose 1 electron they have a configuration like alkali metals. They now have 1 electron in their outermost shell. They really, really want to lose just one more electron to have a full outer shell (like a noble gas). It’s like by losing one, they got one step closer to being full, complete/stable – they want to finish the job!!

1. a) Ne - 1s22s22p6

b) Na - 1s22s22p63s1 , when it loses the 1 electron in the 3s it’s configuration will be 1s22s22p6

exactly like neon

c) it lost one electron, so +1, or Na+ (it now has more protons than electrons)

d) Chlorine has 7 valence electrons (2 in the s, 5 in the p sublevels of the 3rd shell, the 3rd is the outermost so 2+5 = 7!)

e) Chlorine would have to lose 7 electrons

f) Chlorine would have to gain 1 electron

g) gaining 1 electron is MUCH easier than losing 7, so Cl will gain 1 and it’s charge will be -1

h) Na and Cl are a perfect match! ☺

i) Na will GIVE it’s one valence electron to Cl, Cl TAKES the one valence electron that Na wants to get rid of

j) go back to 5.7 What Do You See…it’s a give/take bonding = everyone leaves happy with a full outer shell as a result. It takes one Na atom to bond perfectly with one Cl atom so the formula is NaCl.

1. a) it takes 2 chlorine atoms, because calcium has 2 to give away and chlorine can only take 1

b) CaCl2 - this shows it takes 2 chlorine atoms to accept the 2 valence electrons that Ca needs to give away

c) the guy in the middle of the illustration is Ca and the 2 on the ends are Cl, showing a 2:1 ratio in their bonding or forming of this compound. That’s why the formula is CaCl2.

1. a) Al has 3 valence electrons

b) it can gain 5 or give up 3. Giving up 3 is easier….takes less energy so it will LOSE 3 valence electrons

c) they are now aluminum ions and their charge is +3

d) remember, each chlorine atom can only accept 1 electron, so it will take 3 chlorine atoms to accept the 3 electrons Al wants to get rid of

e) AlCl3

1. The compounds in numbers 1-4 are called IONIC compounds.

This one in #5 is different. It is called a COVALENT compound – electrons are SHARED, not given/taken like in ionic compounds. It’s easy to remember because IONIC compounds are formed between IONS, atoms that LOSE or GAIN electrons. Makes sense right? ☺

1. Carbon has 4 valence electrons.
2. Carbon can gain 4 more to be full/stable (like Ne) or lose 4 to be full/stable (like He). Doing either takes a lot of energy, 4 electrons is a LOT to lose/gain.
3. It will take 4 chlorine atoms to share 4 valence electrons with one carbon atom.
4. CCl4