Trends of the Periodic Table Homework # 1 name: _____

1. Net nuclear charge is the total charge of a nucleus of an atom. Since there are only positive protons, and neutral neutrons in a nucleus, the charge is always POSITIVE, and is shown by the atomic number with a PLUS SIGN.

2. What are the net nuclear charges for these 10 atoms? Mg +12 P +15 Sc +21 V +22
Au +79 Ir +77 Cr +24 Hg +80 Al +13 Pb +82

3. The GROUP TREND for net nuclear charge is increasing. (you add multiple protons going down any group).

4. The PERIOD TREND for the net nuclear charge is increasing. (you add 1 proton per box going across the period)

5. Explain what happens with the MASS of Cobalt & Nickel. Does this destroy the general trend?
Cobalt and Nickel are tricksters, they are an exception to the trend. They don't destroy it. Just a little glitch.

6. Using the boxes, figure out the group trend for atomic radius, then STATE it in one sentence.
The group trend for atomic radius is increasing.

Group 2	atomic radius (pm)
Be	
Mg	
Ca	
Sr	
Ba	

7. Using the boxes, figure out the period trend for atomic radius, then STATE it.
The period trend for atomic radius is decreasing.

8. Explain why the group trend and the period trend for atomic radius occurs.
Going down a group, each box represents the addition of a WHOLE ORBITAL. Going across a period, you are adding protons with the same number of electron orbitals, the inward pull towards the nucleus increases with each additional proton added. Atoms "shrink" in size.

Period 3	Na	Mg	Al	Si	P	S	Cl	Ar
atomic radius (pm)								

Trends of the Periodic Table Homework # 2 name: _____

1. What is the most nonmetallic element on the periodic table? Helium
2. What is the most metallic element on the periodic table? Francium
3. Circle the most metallic of these three elements. Iron
4. Circle the most non metallic of these three elements Fluorine
5. What is the technical name of the group 2 metals? ALKALINE EARTH METALS
6. What is the name of the group 17 nonmetals? HALOGENS
7. What are the group 1 metals also known as? ALKALI METALS
8. How many elements are in group 3? 32 (Sc, Y, La, Ac, and ALL of the inner transitional metals too)
9. List ALL of the non metals: H, He, B, C, N, O, F, Ne, Si, P, S, Cl, Ar, As, Se, Br, Kr, Te, I, Xe, At, Rn
10. List the symbols of ALL of the metalloids: B, Si, Ge, As, Sb, Te, At
11. The number of metals on the Periodic Table is 118 – 22 = 96
12. Name five metallic properties: luster, malleability, ductility, high density, low specific heat capacity, conduct electricity, conduct heat, forms cations only
13. Name five nonmetallic properties: brittle, dull, lower density, higher specific heat capacity, does not conduct heat or electricity, forms anions only
14. Groups 2-12 (and the "triangle" of metals from Al to Tl to Po) make up what are known as the INNER TRANSITIONAL metals
15. Silicon in a metalloid. What is a metalloid? A non metal (silicon is nonmetal) that has some metallic properties as well. Silicon conducts electricity and is quite shiny.
16. Antimony is also a metalloid; what is a metalloid? A metal (antimony is a metal) that has some nonmetallic properties as well. Antimony is brittle, it cracks when struck by a hammer.
17. How many protons, neutrons and electrons are in the element with the greatest density on the table? Osmium has density of 22.587 g/cm^3. It has mass of 190 amu, 76 protons, 76 electrons, and (190—76 =) 94 neutrons
18. What is the mass of the most common isotope of the element tantalum? On the periodic table tantalum has mass of 180.948 amu. When we round that to the nearest whole number of 181 amu, that is the mass of the most common isotope of this element.

Trends of the Periodic Table Homework # 3 name: _____

1. Define 1st Ionization Energy. The amount of energy required to turn a mole of atoms into a mole of +1 cations.

2. What this the GROUP TREND for 1st Ionization energy going down any group?
   The group trend for first ionization energy is decreasing.

3. What is the PERIOD TREND for 1st Ionization energy going across any period?
   The period trend for first ionization energy is increasing.

4. What atoms have the highest 1st Ionization energy and WHY?
   The noble gases, they have no willingness to give up their electrons, because they have the MOST PROTONS for any atom with that number of orbitals, they make the smallest atoms, that hold onto their electrons the tightest.

5. Electronegativity is the tendency to "get" an electron in a bonding situation more so than the other atom involved. The higher the electronegativity, the more that atom pulls electrons towards it. You need to compare the two different electronegativity Values of two atoms to determine which "gets" the electrons more of the time.

6. Define relative scale: a scale where all members are ranked to one standard. All atoms are measured against fluorine, which has the strongest, or highest electronegativity of all atoms.

7. Define arbitrary scale: when a scale uses numbers or units that are not connected to the actual measurement. For example, on the electronegativity scale, fluorine has a value of 4.0 without unit. That is just the highest number. Carbon has an electronegativity value of 2.6 which is also without unit. These numbers allow comparisons, but do not mean anything in particular. Linus Pauling could have used a scale of 1-10, or 1-25 or even 5.0 to 9.0, the numbers are arbitrary, they merely rank different members of a group.

8. Which element has the highest EN value? What does that mean about this atom? Fluorine has electronegativity value of 4.0 which means it will "pull" the hardest when bonding, and "take" the electrons from other atoms in an unfair share.

9. Which part of the periodic table tends to have the highest EN values? Why? Towards fluorine (top right) excluding the noble gases of course, they do not bond, nor tend to gain electrons in bonding situations.

10. Which part of the periodic table tends to have very low EN values? Why? Bottom left of the table has the lowest electronegativity values, these are the metals that most easily give up electrons when forming cations. They have little tendency to gain electrons.

Trends of the Periodic Table Homework # 4 name: _____

1. Which is bigger or smaller, the Na Atom or the Na^{+1} cation? Say it in a sentence.
   The Na+1 cation is smaller than the sodium atom; it lost an electron and a WHOLE ORBITAL.

2. Which is bigger or smaller, the Mg Atom or the Mg^{+2} cation? Say it in a sentence.
   The Mg atom is notably larger than the cation, it has a WHOLE ORBITAL more than the cation.

3. Which is bigger or smaller, the Al Atom or the Al^{+3} cation? Say it in a sentence.
   Atoms are always larger than their cations, they have a whole orbital more than the cations do.

4. Which is bigger or smaller, the N Atom or the N^{-3} anion? Say it in a sentence.
   The nitride anion is slightly larger than the atom, with the extra electrons added to the valence orbital, these negative electrons "push" away from each other, stretching out the valence orbital a bit.

5. Which is bigger or smaller, the O Atom or the O^{-2} anion? Say it in a sentence.
   The oxygen atom is smaller than the slightly larger anion. It has less valence electrons, and they are not pushing so hard away from each other (because there are less of them in the atom)

6. Which is bigger or smaller, the F Atom or the F^{-1} anion? Say it in a sentence.
   The fluoride anion is slightly larger than the fluorine atom.

7. Why are cations smaller than their atoms, and anions larger than their atoms - all of the time?
   Cations have less electrons, but more importantly, LESS ORBITALS than the atoms they formed from.

8. State the GROUP TREND for cation size. Full sentence only for credit.
   The group trend for cation size is increasing. (because each box "down" the group adds an orbital)

9. State the PERIOD TREND for cation size. Full sentence only for credit.
   The period trend for cation size is decreasing. (because each box to the right adds protons, but same number of orbitals, the ions pull tighter)

10. State the GROUP TREND for anion size. Full sentence only for credit.
    The group trend for anion size is increasing. (because each box "down" the group adds an orbital)

11. State the PERIOD TREND for anion size. Full sentence only for credit.
    The period trend for anion size is decreasing. (because each box to the right adds protons, but same number of orbitals, the ions pull tighter)