When it comes to the Trends of the Periodic Table, I can…

(write the answers on this handout now)

1. I can classify elements as metals, nonmetals, or metalloids based upon their location on the Periodic Table.
   Classify each element as a metal (M), a nonmetal (NM), or a metalloid (MTLD).

B nonmetal	K metal	Li metal	C nonmetal	Ar nonmetal
Sb metalloid	H nonmetal	Fe metal	Au metal	S nonmetal
F nonmetal	Si metalloid	Fr metal	He nonmetal	Rn nonmetal
Ge metalloid	Al metal	As metalloid	Bi metal	I nonmeal

2. (1) = Alkali metals, (2) = Alkaline Earth Metals, (17) = Halogens, and (18) = Noble Gases.

3. In a group, all atoms have the same number of valence electrons (those are the electrons in the outer shell) and so they all BOND in the same way and in the same ratios. Chemical properties are all about the way atoms bond with each other.

4. Group 18 Noble Gases all have "full" outermost, valence shells. They have no "need" to bond to gain this perfect electron configuration (like all other atoms in the 17 other groups) so they don't.

5. STP = standard temperature and pressure, in Table A.

6. At STP only mercury (Hg) and bromine (Br) are liquids.

7. At STP these elements are gases: H, He, N, O, F, Ne, Cl, Ar, Kr, Xe and Rn.

8. The atoms of the periodic table are arranged in increasing atomic number order. (1 to 118)

9. The diatomic elements are the HONClBrIF twins, H_2, O_2, N_2, Cl_2, Br_2, I_2 and F_2.

10. Electronegativity is the tendency of an atom to "gain" an electron in a bond with another atom.

11. Arbitrary scales have numbers that have no meaning other than to rank.
    Relative scales compare other atoms to one "standard" atom.

12. 1st ionization energy is how many kJ it takes to remove one mole of electrons from one mole of atoms, turning them into "first order cations, or +1 cations. There is also 2^{nd} and 3^{rd} Ionization energies, etc.

13. Skip this one!

14. Atomic radius is the distance from the center of an atom to the outermost shell. Ionic radius is the same measurement for a cation or anion. All are measured in picometers (pm).

15. Net nuclear charge is the overall charge of any nucleus, which has to be positive, depending upon how many protons it contains. Hydrogen has 1 just one proton, it has a +1 charge. Neutrons have no charge; they don't really count. Negative electrons are not in the nucleus, they don't really count here either.

16. Metallic character means having properties of metals.
Non-metallic character means having properties of nonmetal atoms.

17. Allotropes are pure forms of atoms that have different atomic bonding, and therefore different properties.

18. The group trend for electronegativity is decreasing, because even though there are more protons with stronger pull inward on electrons, the extra electrons shells create distance that weakens more than more protons create. The period trend for electronegativity is increasing, because in a period each of the atoms has the same number of shells, but more and more protons with greater inward "pull" on electrons. Noble gases are the exception; they have perfectly balanced atoms and have no electronegativity values.

19. The group trend for 1st ionization energy is decreasing, as there are more and more protons "pulling" on the electrons, the increasing size weakens the inward attraction more than the extra protons increase it. The period trend for 1st ionization energy is increasing, as in the same period there are the same number of electron shells, with more and more protons that have a stronger inward attraction, making it harder to pull electrons off of any atoms.

20. The group trend for atomic radius is increasing because each atom in the group adds another shell, making atoms larger and larger. The period trend for atomic radius is decreasing because in a period all the atoms have the same number of shells, but more and more protons, with a stronger inward pull on the electrons, making the atoms get tighter and smaller.

21. The group trend for metallic character is increasing because the "most metallic" element is Francium. The table is set up so that the closer an atom is to Fr, the more metallic qualities it will have.
The period trend for metallic character is decreasing, because the further away from Fr that an atom is on the periodic table it will have less metallic quality but more nonmetallic quality.

22. The group trend for nonmetallic character is decreasing, the "most nonmetallic" element is helium.
The table is set up so that the closer an atom is to He, the more non-metallic qualities it will have.
The period trend for nonmetallic character is increasing, because the closer to He that an atom is on the periodic table it will have more nonmetallic quality.

23. The group trend for Net Nuclear Charge is increasing because going down a group, each atom will have many more protons in its nucleus. The period trend for Net Nuclear Charge is increasing as well, because for each successive atom in a period, they will have one more proton than the atom previous.

24. The group trend for cation size is increasing, because each metal atom that becomes a cation loses a whole shell while losing electrons, each successive atom (or cation) still has one more shell than the atom above. The period trend for cation size is decreasing, for the same reason that the atomic radius decreases in a period, more protons pulling on the same number of electron shells has a greater inward pull.

25. The group trend for anion size is increasing, because each nonmetal atom that becomes a anion gains enough electrons to fill up its valence shell. Each successive atom (or anion) still has one more shell than the atom (or anion) above. The period trend for anion size is decreasing, for the same reason that the atomic radius decreases in a period, with more protons pulling on the same number of electron shells, there is a greater inward pull, making the anions shrink in radius.

26. Compared to the nonmetals, metals have the tendency to lose electrons and form cations, have luster, conduct heat and electricity better, are malleable and ductile, have a higher density, higher melting points, have higher boiling points, have lower electronegativity values, lower first ionization energy, greater atomic size (compared to the nonmetals in the same period), and have lower specific heat capacity constants.

27. Compared to the metals, nonmetals have the tendency to gain electrons and form into anions, are dull (non-lustrous), are brittle (shatter when banged on), have lower density, lower melting points, they have lower boiling points, have higher electronegativity values (not including the noble gases), they have higher first ionization values (including the noble gases), smaller atomic size (compared to metals in the same period), and have higher specific heat capacity constants.