5.1 Properties and Changes	
2	a) physical b) chemical c) chemical (silver reacts with air) d) physical (density) e) chemical (all cooking/baking changes the original substance) f) chemical ('it changes' is your clue)
3	a) physical – nothing is changed – just mixing ice cream and air b) physical – water becomes a gas – simply a state change c) chemical – pop means something ignited quickly d) chemical – energy source is burned in vehicles e) physical – water turns to steam – state change – its still water! f) chemical (same as #2 c)
4	Corrosive – this is a chemical property because the substance in the cleaner reacts with your skin and 'eats' some of it away.
5	This is a chemical change. When 'bubbles' show up, this is a chemical change. Note the 5 'clues' that a chemical change has occurred.
6	a) physical property – paint should flow smoothly (be viscous), and the solvents should have a low evapouration temperature so they dry quickly. Chemical property – the solvent shouldn't react with air. Shouldn't be flammable in case there is a spark around b) Another convenient characteristic would be non-odorous. Some paint really stinks!!
7	This is chemical. The cola produces bubbles – this is a new substance! The presence of bubbles also is a clue of a chemical change.
10	Braces – physical – bendable Braces – chemical – doesn't react with water (saliva) , doesn't react with food or water which are often in your mouth.

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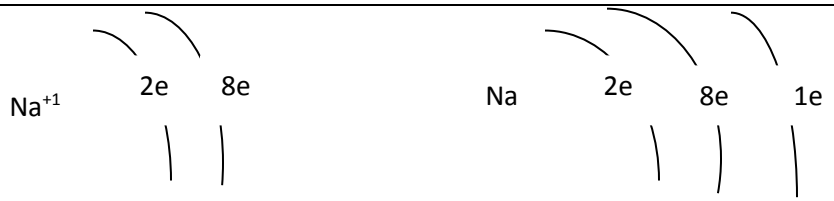
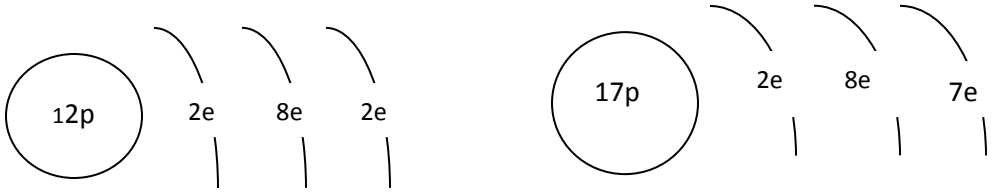
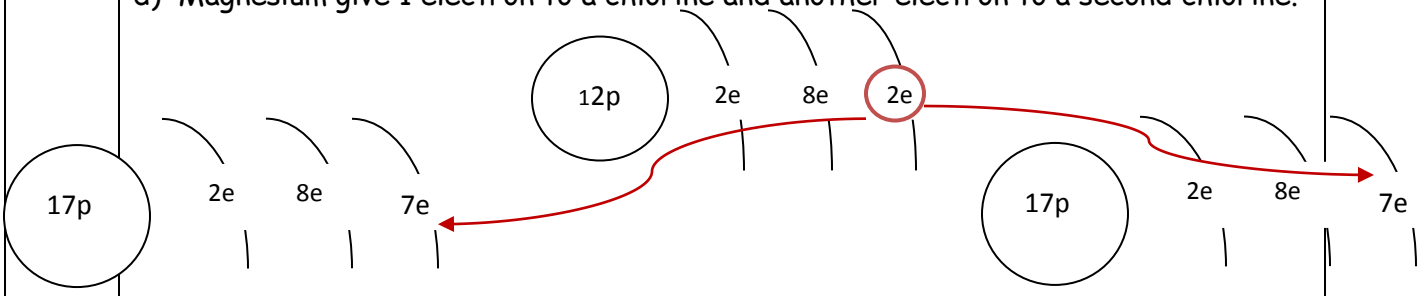
5.4 – Patterns in the Periodic Table	
1	The atomic number is the number of protons and this also equals the number of electrons in the neutral atom.
2	a) state: metals are mostly solid while non-metals are all 3 states b) metals are decent conductors (copper) while non-metals are not good conductors c) metals are shiny while non-metals are not shiny d) metals have few electrons in outer orbit (tend to lose them) while non-metals have lost of electrons (near full) in outer orbit
3	PERIODS go → horizontal while groups (also called families) go vertical ↓ a) fluorine b) strontium c) helium d) iodine e) potassium f) aluminum g) neon
4	For Bohr-Rutherford diagrams – check the handout we did on 1st day or see me.
5	Count 1 after #118 and you will be in the alkali metals. It will have 1 valence electron (like all alkali metals). It will also be highly reactive (like al alkali metals) It will also have metals properties: shiny, conductor and solid.
6	a) yellow powder → non-metals (non-shiny) b) gold → metal (shiny) c) gas → non-metals because metals are not gasses at room temp. d) metal → liquid and shiny = mercury!
7	Within a period → going horizontally from left to right the # valence electrons increases by 1 as you go along. Within a group (also called a family) → the number of valence electrons is the same.
8	Atoms are electrically neutral because they contain the same number of electrons and protons. If you do the math, the net charge = 0
9	Potassium is not found in many highschools because it is so reactive.

5.5 Atoms & Ions	
1	 a) Sodium ion (Na+1) and a sodium atom have the same number of protons and neutrons BUT the sodium ion has 1 less electron giving it a +1 charge. The sodium ion also has one less electron orbit than the sodium atom. (see drawings above). b) Neon atom – large and tough to draw! So I'll describe – see me if you need more help. Neon atom has electrons orbits with 2e/8e So...Na+1 (sodium ion) has electron orbits LIKE NEON. The ion is more stable because it's electron arrangement looks like the noble gas. (2 orbitswith 2e/8e)
2 & 3	I will describe the electron arrangement from innermost orbit to outer most Lithium electrons = 2e/ 1e Lithium **ion** = 2e = Li^{+1} Oxygen = 2e/ 6e Oxygen **ion** = 2e / 8e = O^{-2} Calcium = 2e / 8e/ 8e/ 2e Calcium **ion** = 2e / 8e / 8e = Ca^{+2} Phosphorus = 2e/ 8e/ 5e Phosphorous **ion** = 2e / 8e / 8e = P^{-3}
3	A cation is a positively charged ion. It is a metal ion An anion is a negatively charged ion. It is a non-metal ion.
4	a) magnesium cation b) sulphide anion c) iron cation d) bromide anion e) nitride anion
5	a) $S^{-2} \rightarrow P^{3-}$, Cl^-, Ar b) $Al^{+3} \rightarrow Mg^{+2}$ Na^+ Ne c) $P^{3-} \rightarrow S^{2-}$ Cl^- Ar d) Kr $\rightarrow$ Br^- Se^{2-} Rb^+ e) Cs+ $\rightarrow$ Kr Ba^{+2} Br^-
6	Alkali earth metals have 2 valence electrons and so will this new element. This element will give away 2 valence electrons and become a +2 ion (cation)
7	K^{+2} does not normally exist because K has 1 valence electron so it wants to give away just 1 electron and become K+ O_- doesn't normally exist because O has 6 valence electrons and tries to gain 2 to become stable. This means oxygen would become O^{-2}.

8	Groups 1, 2 and 13 tend to lose electrons and become cations (+ ions) Groups 15, 16, 17 tend to gain electrons and become anions. (- ions)
9	Hypoatremia means too much water. You have over-diluted your blood and you become disoriented and lose balance. You need a drink with Na+. You need salt water!

5.6 Ionic Compounds p. 195 # 1, 2, 3, 5, 6, 7, 8	
1	A metal plus a non-metal form ionic compounds
2	a) Mg and O would form an ionic compound because there is a metal (Mg) and a non-metal (O). The metal wishes to give electrons away and the non-metal wishes to gain electrons. b) Zn and Cl would form an ionic compound because there is a metal (Zn) and a non-metal (Cl). The metal wishes to give electrons away and the non-metal wishes to gain electrons. c) C and F would NOT form an ionic compound because both of these elements are non-metals. Both want to gain extra electrons. d) H and F would form an ionic compound. The Hydrogen would give away an electron (and act like a metal) and the Flourine would gain the electron.
3	a) Magnesium is the metal and chlorine is the non-metal b)  magnesium chlorine c) Magnesium will LOSE 2 electrons while chlorine will GAIN 1 electron d) Magnesium give 1 electron to a chlorine and another electron to a second chlorine. 
5	Non-metals need to GAIN electrons to become stable. IF 2 non-metals are together, there isn't an atom to GIVE AWAY an electron. Also…non-metals become + ions. + ions are NOT attracted to + ions.
6	a) NaF → in water will release 1 Na for every 1 F (1:1 ratio for Na:F) b) Li_3N → in water will release 3 Li for every 1 N (3:1 ratio for Li:N)

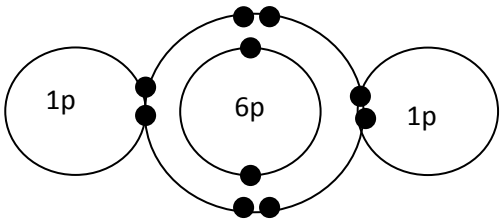
	c) $FeCl_3$ → in water will release 1 Fe for every 3 Cl (1:3 ratio for Fe:Cl) d) K20 → in water will release 2 K for every 1 O (2:1 Ratio for K:0)
7	a) Element X with 3 electrons in outermost orbit is a metal (similar to Aluminum). Element Y with 7 electrons in outermost orbit is a non-metal (similar to chlorine) b) Element X will become a +3 ion X^{+3} Element Y will become a -1 ion. Y^{-1} Using the criss-cross method, the compound will be XY_3
8	When ions are dissolved in water, the H_2O water molecules surround the ions and prevent them from rejoining and forming a solid again. (if you evapourate or boil away the water, the ionic solid **does** form again.)

5.7 Names and Formulas of Ionic Compounds p. 200 # 2, 3, 4, 9	
2	a) Calcium fluoride b) Potassium sulfide c) aluminum oxide d) lithium bromide e) calcium phophide
3	Remember to use the criss-cross method (or if you are mathematically inclined, you can figure it out with the zero-sum rule) a) KBr b) CaO *** Note: criss-cross method will give you Ca_2O_2. Since ionic compounds just give you the ratio, you want to reduce to simplest ratio. Divide both subscripts by 2 to give you 1:1 ratio. c) Na_2S
4	Tin (IV) oxide = SnO_2 Yes..criss-cross will give you Sn_2O_4 but this is a ratio, so you reduce to lowest form. Divide by 2 on both subscripts and you get SnO_2
9	a) $FeBr_2$ b) MnO_2 c) $SnCl_4$ d) Cu_2S e) FeN f) CuO g) lead (II) chloride h) iron (III) oxide i) tin (II) sulfide j) copper (II) phosphide k) calcium bromide

	l) copper (II) fluoride m) potassium phosphide n) copper (I) phosphide

5.9 Polyatomic Ions p. 205 # 1,2, 5 (ionic & polyatomic mixed), 4 (read chapter to find answer), 9, 10	
1	a) potassium nitrate (nitrate ion) b) calcium hydroxide (hydroxide ion) c) calcium carbonate (carbonate ion) d) copper (II) sulphate (sulphate ion) e) potassium hydroxide (hydroxide ion) f) iron (III) nitrate (nitrate ion) g) copper (II) chlorate (chlorate ion) h) ammonium phosphate (phosphate)
2	a) KNO_3 b) $BaSO_4$ c) NH_4NO_3 d) $Al_2(SO_4)_3$ e) $KClO_3$ f) $Cu(NO_3)_2$ g) $PbSO_4$ h) $Sn_3(PO_4)_2$
4	Nitrates occur naturally in soil and they are also present in farm fertilizers.
5	**I also noted whether the compound was ionic or polyatomic. You should be able to tell by the name. a) tin (II) carbonate → polyatomic compound b) calcium chloride → ionic compound c) iron (III) hydroxide → polyatomic compound d) manganese (IV) oxide → ionic compound e) potassium sulphide → ionic compound f) ammonium sulphate → polyatomic compound g) manganese (II) chlorate → polyatomic compound h) lead (II) iodide → ionic compound
9	The positive ion (cation) is always named first (look at question # 1 above). Usually the positive ion is a metal. Once in a while it is ammonium (NH_4^+)
10	Cation(s) : Anion(s) $Fe(OH)_3$ - 1 Fe^{3+} : 3 OH^- Note: Do the reverse criss-cross to figure out the ion charge! $Cu(NO_3)_2$ - 1 Cu^{2+} : 2 NO_3^{1-} $Fe(OH)_3$ done for you. Remember no

	$Al_2(SO_4)_3$ - 2 Al^{+3} : 3 SO_4^{2-} $(NH_4)_2CO_3$ - 2 NH_4^{+1} : 1 CO_3^{2-} K_3PO_4 - 3K^{+1} : 1 PO_4^{3-} subscript with Fe means there is 1 Fe.  You need to remember metals are positive ions and OH is negative.

5.10 Molecules and Covalent Bonding p. 212 # 1a, 2,3,4, 5, 6, 9	
1 a)	Nitrogen triodide, carbon tetrachloride, oxygen diflouride, diphosphorous pentoxide, and dinitrogen trioxide
2	a) CO b) SF_4 c) N_2O_4 d) NBr_3 e) CS_2
3	a) S = non-metal O = non-metal SO_2 is an molecular compound **sulphur dioxide** b) Pb = metal O = non-metal PbO_2 is an ionic compound **lead (IV) oxide** c) Al = metal Cl = non-metal $AlCl_3$ is an ionic compound **aluminum chloride** d) N = non-metal O = non-metal N_2O is a molecular compound **dinitrogen monoxide** e) K = metal Cl = non-metal O = non-metal $KClO_3$ is a polyatomic (ionic) compound **potassium chlorate** f) Sn is a metal O = non-metal SnO_2 is an ionic compound **tin (IV) oxide** g) Fe is a metal P is a non-metal O = non-metal $FePO_4$ is a polyatomic (ionic) compound **iron (III) phosphate** h) N = non-metal O = non-metal N_2O_4 is a molecular compound **dinitrogen tetroxide**
4	a) hydrogen has 1 valence electron while oxygen has 6 valence electrons b) hydrogen needs 1 more electron to be stable while oxygen needs 2 more electrons to be stable c) H_2O 
5	A molecule is a particle in which the atoms are joined by covalent (sharing electron) bonds. The subscripts tell you exactly how many atoms of each element there are in the molecule. For example, HF (hydrogen fluoride), molecules have 1 atom of hydrogen and 1 atom of fluorine. (see page 207 for diagram) However, NaCl (sodium chloride) is an ionic compound and is not considered a molecule. The formula tells us that there is a RATIO of 1Na: 1Cl. But ionic compounds form

	crystals of various sizes. The crystal could have 100 Na atoms and 100 Cl atoms! Or the crystal could have 5 Na atoms and 4 Cl atoms. The formula just tells us the ratio. The Na+ and Cl- join because positive and negative charges attract. (see page.193 for a diagram)
6	Ionic (and polyatomic) compounds achieve stability by **giving away electrons** (metals) or by **gaining electrons** (non-metals or –ve polyatomic ions). Molecular compounds achieve stability by **sharing** electrons.
9	Hydrogen peroxide, H_2O_2, is a molecular compounds so the subscripts are not describing a ratio but the actual number of atoms of hydrogen and oxygen in the molecule. So there is exactly 2 hydrogens and 2 oxygens in hydrogen peroxide. You cannot reduce because it is incorrect to say the molecule has 1 hydrogen and 1 oxygen. That is not hydrogen peroxide.