Key

Unit 3 Test Review: Matter, Bonding, & Nomenclature

- Matter

- Physical and Chemical Properties and Changes

1. Determine if the following are physical properties/changes or chemical properties/changes.
   a. Melting point – physical
   b. Ability of rust – chemical
   c. Density – physical
   d. Transparency – physical
   e. Glass breaking – physical
   f. A rusting bicycle – chemical
   g. Frying an egg – chemical
   h. Squeezing oranges for juice – physical
   i. Mixing salt and water – physical
   j. Cutting the grass – physical
   k. Fireworks exploding – chemical
   l. Boiling water – physical

- Kinetic Molecular Theory and States of Matter

2. What are the 4 states of matter and how are they different from each other in terms of…

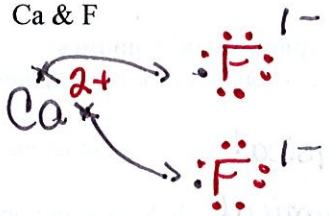
	solid	liquid	gas	plasma
a. Particles				
	very close together	close but can slide by	far apart	very far apart + charged
b. Movement	vibrate in position	slide past each other	random	random
c. Speed of particles	slow ←			→ fast
d. Kinetic energy	lowest ←			→ highest

Bonding

3. Ionic Bonds
   e. Occurs between a metal & a nonmetal
   f. When electrons (e^-) are transferred
   g. Ionic compound properties
      1. hard, crystalline solids
      2. high melting & boiling points
      3. conduct electricity when molten &/or dissolved in solution

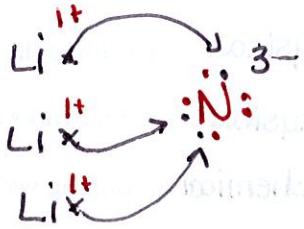
h. Electron Dot Diagrams

1. Ca & F



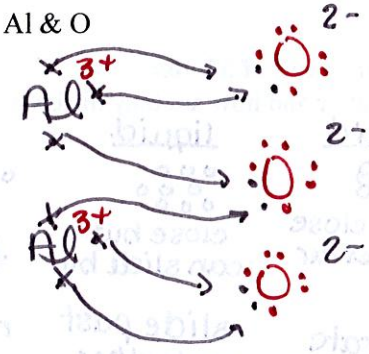
CaF_2

2. Li & N



Li_3N

3. Al & O



Al_2O_3

4. Covalent Bonds

a. Occurs between a nonmetal & a nonmetal

b. When electrons (e^-) are shared

c. Covalent Compound Properties

1. soft solids, liquids, or gases
2. low melting & boiling points
3. nonconductors of electricity

5. Lewis Structures: Show how valence e⁻ are shared between two atoms.

a. CCl_4

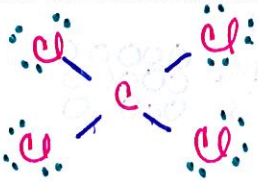
$1(4e^-) + 4(7e^-)$

$4e^- + 28e^-$

$32e^- / 2 = 16$ pairs

-4 lines

12 lone pairs



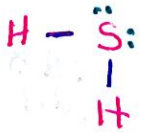
b. H_2S

$2(1e^-) + 1(6e^-)$

$2e^- + 6e^-$

$8e^- / 2 = 4$ pairs $- 2$ lines

2 lone pairs



c. CO_2

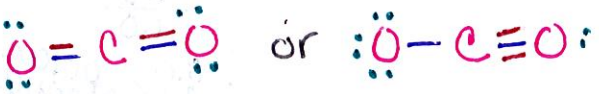
$1(4e^-) + 2(6e^-)$

$4e^- + 12e^-$

$16e^- / 2 = 8$ pairs

-2 lines

6 lone pairs



d. NF_3

$1(5e^-) + 3(7e^-)$

$5e^- + 21e^-$

$26e^- / 2 = 13$ pairs

3 lines

10 lone pairs

e. OF_2

$1(6e) + 2(7e^-)$

$6e^- + 14e^-$

$20e^- / 2 = 10$ pairs

-2 lines

8 lone pairs

f. SO_2

$1(6e^-) + 2(6e^-)$

$6e^- + 12e^-$

$18e^- / 2 = 9$ pairs

-2 lines

7 lone pairs

5. What is a metallic bond?

A strong bond between 2 metals when the electrons delocalize and float freely among all the positive metal cations

a. What is an alloy?

2 metals metallically bonded together.

b. Describe the 2 types of alloys.

Substitutional

a metal's atoms take the place of another metal's atoms.

Interstitial

a smaller element's atoms slip in between the spaces of the larger element

7. Use the periodic table with electronegativities on it to determine if the following bonds are ionic (greater than 1.8), polar covalent (between .4 and 1.8), or pure covalent (less than .4). use your cream colored Periodic Table

a. H – C 2.5 − 2.1 = .4 polar covalent

b. Al – O 3.5 − 1.5 = 2.0 ionic

c. N – P 3.0 − 2.1 = .9 polar covalent

d. O - F 4.0 − 3.5 = .5 polar covalent

e. Ge - S 2.5 − 1.8 = .7 polar covalent

7. Intermolecular Forces (IMFs)

a. What are the 3 types of IMFs? Describe each in terms of what they are and their strength compared to each other.

- London dispersion forces (LDFs) - very weak, occur in all molecules when valence e-'s temporarily all move to one side of the molecule - creating a temporary dipole - causes a momentary attraction b/w 2 molecules

b. How are IMFs different than intramolecular bonds, such as ionic and covalent bonds?

IMFs occur between 2 different molecules while ionic & covalent bonds (intramolecular bonds) occur inside one molecule & between 2 atoms

dipole-dipole forces - when 2 polar molecules get near each other. The + side of one molecule is weakly attracted to the - side of another molecule

Hydrogen bonds - when a N, O, or F on one molecule is attracted to the H on another molecule. Strongest IMF

Nomenclature

How do you know what type of compound it is?

Type I Binary Regular metal + nonmetal	**Type II Binary** Transition metal + nonmetal Name has Roman Numerals	**Type III** 2 nonmetals Name uses prefixes	**Binary Acid** Hydrogen + anion NO Oxygen Name has hydro------ic acid
Type I Tertiary Regular metal + polyatomic ion	**Type II Tertiary** Transition metal + polyatomic ion Name has Roman Numerals		**Oxyacid** Hydrogen + polyatomic ion with Oxygen Name is ------ic acid or ------ous acid

8. NOMENCLATURE - MIXED REVIEW

Type					Type
III	1. carbon tetrachloride	CCl_4	26. $CaCO_3$	calcium carbonate	I
II	2. mercury(II) oxide	HgO	27. Li_2S	lithium sulfide	I
I	3. potassium chlorate	$KClO_3$	28. HI	hydroiodic acid	acid
Acids	4. hydrobromic acid	HBr	29. $Tl(NO_3)_3$	thallium nitrate	I
I	5. sodium hydroxide	$NaOH$	30. NH_4NO_3	ammonium nitrate	I
II	6. copper(I) dichromate	$Cu_2Cr_2O_7$	31. $Cu(ClO_4)_2$	copper(II) perchlorate	II
III	7. boron trifluoride	BF_3	32. H_3PO_4	phosphoric acid	acid
Acids	8. phosphorous acid	H_3PO_4	33. S_2O_5	disulfur pentoxide	III
I	9. aluminum sulfate	$Al_2(SO_4)_3$	34. $Rb_2Cr_2O_7$	rubidium dichromate	I
II	10. copper(II) nitrate	$Cu(NO_3)_2$	35. $KMnO_4$	potassium permanganate	I
I	11. sodium phosphate	Na_3PO_4	36. $Cu(NO_3)_2$	copper(II) nitrate	II
II	12. mercury(II) nitrate	$Hg(NO_3)_2$	37. $Ni(OH)_2$	nickel(II) hydroxide	II
I	13. aluminum hydroxide	$Al(OH)_3$	38. $XeCl_2$	xenon dichloride	III
Acids	14. sulfuric acid	H_2SO_4	39. $(NH_4)_2SO_4$	ammonium sulfate	I
II	15. lead (II) carbonate	$PbCO_3$	40. $PbCl_2$	lead (II) chloride	II
I	16. sodium chromate	Na_2CrO_4	41. HCN	hydrocyanic acid	acid
III	17. silicon dioxide	SiO_2	42. $Fe_3(PO_4)_2$	iron(II) phosphate	II
I	18. barium chloride	$BaCl_2$	43. $AgNO_3$	silver(I) nitrate	II
II	19. nickel(II) phosphate	$Ni_3(PO_4)_2$	44. $HClO_3$	chloric acid	acid

Type

20. copper(I) acetate $Cu(C_2H_3O_2)_2$ — II
21. chlorous acid $HClO_2$ — acid
22. iodine pentafluoride IF_5 — III
23. tin(IV) sulfate $Sn(SO_4)_2$ — II
24. chromium(II) oxide CrO — II
25. lithium iodide LiI — I

Type

45. N_2O_5 dinitrogen pentoxide — III
46. $AlCl_3$ aluminum chloride — I
47. $TiCl_4$ titanium (IV) chloride — II
48. $Cr_2(SO_3)_3$ chromium (III) sulfite — II
49. KOH potassium hydroxide — I
50. CBr_4 carbon tetrabromide — III