Bonding and Structures Exam Review

1.Summary:

Use the word bank below to fill in the summary.

- Electrostatic
- Metallic
- Shared
- Hammered
- Double
- Electrons
- London Dispersion
- Dipoles
- Metal
- Molecules
- Ductility
- Gains
- Hydrogen
- Positive
- Anion
- Conductors

Ionic bonds occur between a __metal__ and a nonmetal. The metal forms a cation with a __positive__ charge when it loses electrons while the nonmetal forms a(n) __anion__ with a negative charge when it __gains__ electrons. __Electrostatic__ attraction occurs between the cation and anion. (opposites attract!)

__metallic__ bonds are made up of shared electrons around the nuclei of multiple atoms of a metal. This "sea of valence __electrons__" give metals their distinctive properties like being good __conductors__ and their malleability and ductility. Malleability is the ability of a metal to be __hammered__ into sheets and __ductile__ is the ability to be pulled into wires.

Covalent bonds form when electrons are shared between nonmetals. Covalently bonded compounds can have single, double or triple bonds. Intermolecular forces occur between molecules. Polar forces exist if electrons are shared unequally, creating two areas of charge, or dipoles, in a molecule. One type of dipole is the hydrogen bond. Hydrogen bonds exist between hydrogen on one molecule and highly electronegative atoms (like fluorine, oxygen or nitrogen) on another molecule. Nonpolar forces exist between molecules that have equal internal sharing of their electrons. These nonpolar forces are called london dispersion forces and are relatively weak.

metallic — between metals — electrons are free-floating

ionic - between metals & nonmetals — electrons are transferred

IMF

covalent - between 2 or more nonmetals

electrons are shared evenly — nonpolar : LDF

electrons are shared unevenly — polar — dipole / h-bond

2. Use the electronegativity chart below to determine if the following bonds are ionic, polar covalent, or nonpolar covalent.

H 2.20																	He n.a.
Li 0.98	Be 1.57											B 2.04	C 2.55	N 3.04	O 3.44	F 3.98	Ne n.a.
Na 0.93	Mg 1.31											Al 1.61	Si 1.90	P 2.19	S 2.58	Cl 3.16	Ar n.a.
K 0.82	Ca 1.00	Sc 1.36	Ti 1.54	V 1.63	Cr 1.66	Mn 1.55	Fe 1.83	Co 1.88	Ni 1.91	Cu 1.90	Zn 1.65	Ga 1.81	Ge 2.01	As 2.18	Se 2.55	Br 2.96	Kr 3.00
Rb 0.82	Sr 0.95	Y 1.22	Zr 1.33	Nb 1.60	Mo 2.16	Tc 1.90	Ru 2.20	Rh 2.28	Pd 2.20	Ag 1.93	Cd 1.69	In 1.78	Sn 1.96	Sb 2.05	Te 2.10	I 2.66	Xe 2.60
Cs 0.79	Ba 0.89	La 1.10	Hf 1.30	Ta 1.50	W 2.36	Re 1.90	Os 2.20	Ir 2.20	Pt 2.28	Au 2.54	Hg 2.00	Tl 1.62	Pb 2.33	Bi 2.02	Po 2.00	At 2.20	Rn n.a.
Fr 0.70	Ra 0.89	Ac 1.10	Rf n.a.	Db n.a.	Sg n.a.	Bh n.a.	Hs n.a.	Mt n.a.	Ds n.a.	Rg n.a.	Uub n.a.	—	Uuq n.a.	—	—	—	—

a. H-F 3.98-2.20=1.78 polar

d. O-Cl 3.44-3.16=0.28 polar

b. Mg-O 3.44-1.31=2.13 ionic

e. K-Br 2.96-0.82=2.14 ionic ionic

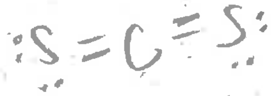
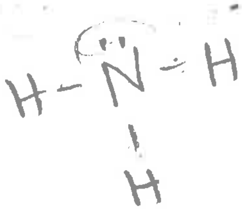
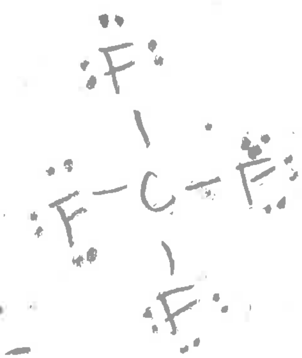
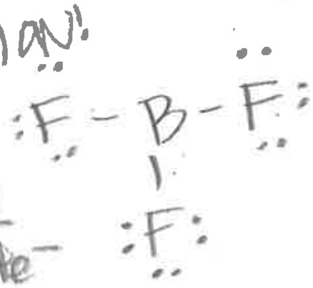
c. C-S 2.58-2.55=0.03 polar

f. H-H 2.20-2.20=0 nonpolar

Subtract big# - small# (cannot be negative) → electronegativity diff:

electronegativity diff:	bond type:
>2	ionic
0-2	polar
0	nonpolar

3.Practice:

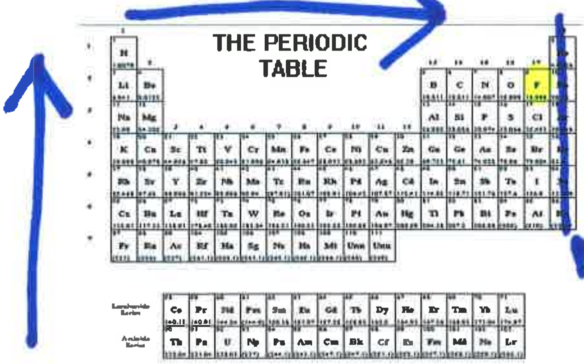
	Electron dot structure	Shape	Bond Type	Molecule Polarity	IMF
			Plnp		intermolecular force
			$3.98-3.44=0.54$		
OF_2 O $1 \times 6e^- = 6$ F $2 \times 7e^- = 14$ $20e^-$		bent	polar	polar	dipole
CS_2 C $1 \times 4e^- = 4$ S $2 \times 6e^- = 12$ $16e^-$		linear	polar	nonpolar	LDF
NH_3 N $1 \times 5e^- = 5$ H $3 \times 1e^- = 3$ $8e^-$		trigonal pyramidal	polar	polar	h-bond
CF_4 C $1 \times 4e^- = 4$ F $4 \times 7e^- = 28$ $32e^-$		tetrahedral	polar	nonpolar	LDF
BF_3 EXCEPTION! B $1 \times 3e^- = 3$ F $3 \times 7e^- = 21$ $24e^-$		trigonal planar	polar	nonpolar	LDF

8A

4. Why do we not use the noble gases when drawing electron dot structures?

b/c they have a full valence shell and do not make compounds. (no need to share e-)

5. Draw the trend for electronegativity on the periodic table below.



No!

the ability to attract electrons.

6. What elements are exceptions to the octet rule? Why?

P, B, S can be an exception! b/c if they share their valence electrons. & extra e^- are placed in the d-sublevel

P: $10e^-$ B: $6e^-$ S: $12e^-$

7. Draw the resonance structures for the carbonate ion. CO_3^{2-}

more than one acceptable structure

C $1 \times 4e^- = 4$

O $3 \times 6e^- = \underline{18}$

$22 + 2 = 24e^-$