KEY 1.17.13

Review for Honors Molecular Geometry, Intermolecular forces, Naming

What is the strongest intermolecular force present for each of the following compounds?

1) water H_2O H-bonding

2) carbon tetrachloride CCl_4 London

3) ammonia NH_3 H-bonding

4) carbon dioxide O=C=O London

5) phosphorus trichloride Dipole

6) nitrogen London

7) ethane (C_2H_6) London

8) acetone (CH_2O) Dipole

Resonance
Draw the resonance structure:

9) formate ion (CHO_2^{-1}):
4+1+12+1
18

10) ozone (O_3):

1) What is the main idea behind VSEPR theory?
VSEPR - the atoms in a molecule arrange themselves in space so that the repulsion forces between valence electrons are as small as possible

2) For each of the following compounds, determine the bond angles, molecular shapes, polarity and intermolecular forces.

a) carbon tetrachloride

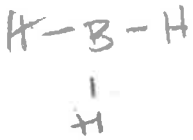
tetrahedral; tetrahedral

<109.5°

nonpolar

London

b) BH_3



trigonal planar
"
120°
nonpolar, London

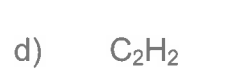
c) silicon disulfide

SiS_2

$4 + 6 \cdot 2 = 16$

linear, Linear
180°
nonpolar London

d) C_2H_2



Linear "
180
non polar London

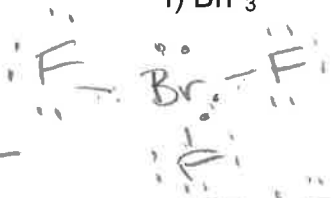
look at 1 C

e) PF_3

5+21
26

tetrahedral
trigonal pyramidal
109.5° Polar Dipole-Dipole

f) BrF_3

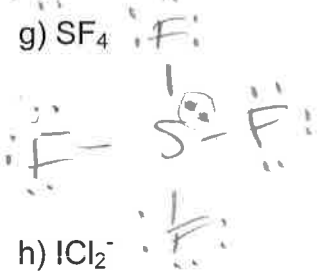


7
21
28

trigonal bipyramidal, T-shaped
120, 90 polar, Dipole-Dipole

g) SF_4

28+6
34



Trigonal Bipyramidal
See-saw 120, 90
polar Dipole

h) ICl_2^-

7+14+1=22

Trigonal Bipyramidal
Linear polar Dipole

i) PF_5

5+35=40

PF_5

Trig. Bipyramidal
Trig. Bipyramidal
120, 90 non polar
London

For each of the following questions, determine whether the compound is ionic or covalent and name it appropriately.

1) Na_2CO_3 sodium carbonate I

2) P_2O_5 diphosphorous pentoxide C

3) NH_3 Ammonia C

4) $FeSO_4$ Iron (II) sulfate I

5) SiO_2 Silicon dioxide C

6) $GaCl_3$ gallium chloride I

7) $CoBr_2$ cobalt (II) bromide I

8) B_2H_4 diboron tetrahydride C

9) CO carbon monoxide C

10) P_4 Phosphorous C

For each of the following questions, determine whether the compound is ionic or covalent and write the appropriate formula for it.

11) dinitrogen trioxide N_2I_3 C

12) nitrogen N_2 C

13) methane CH_4 C

14) lithium acetate $LiC_2H_3O_2$ I

15) phosphorus trifluoride PF_3 C

16) vanadium (V) oxide V_2O_5 I

17) aluminum hydroxide $Al(OH)_3$ I

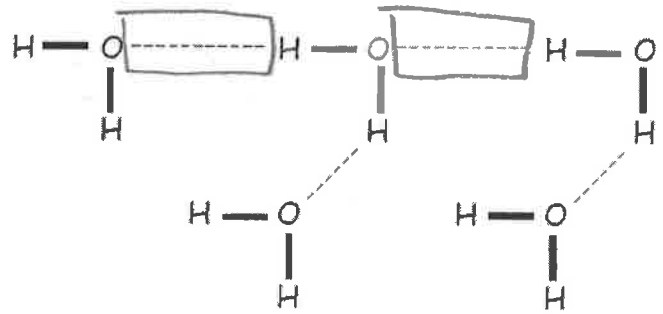
18) zinc sulfide ZnS I

19) silicon tetrafluoride SiF_4 C

20) silver phosphate Ag_3PO_4 I

Intermolecular Forces

While bonding is the force of attraction WITHIN molecules, Intermolecular forces are the forces of attraction BETWEEN molecules. Circle these forces in the following diagram.



*dotted lines are intermolecular forces H-bonds

* solid lines are bonds (intramolecular)

Define "Dipole-dipole Forces."

Happen between polar molecules (More electronegative atom or lone pair)

Define "Hydrogen Bonding."

Strongest A special type of dipole-dipole; Hydrogen bonded to F, O, N

Define "London-Dispersion Forces."

Weakest - nonpolar molecules
- electrons equal distributed between atoms or
- dipoles cancel