Chem 1121
Spring 2012
Exam 2A

Name: KEY

Show all work to receive credit. You must use the factor-label (conversion-factor) method for all conversions. Be sure to show all units and write your answers using the correct number of significant figures or decimal places.

Q1. [12 pts.] Identify the following compounds as being either IONIC (I) or MOLECULAR (M).

a) $FeBr_2$ I metal + non-metal

b) NO_2 M non-metal + non-metal

c) I_3Br_{10} M " — " — "

d) P_4O_{10} M " — " — "

e) $NaNO_3$ I $Na^+ + NO_3^-$ (have to recognize polyatomic ion!)

f) K_2S I metal + non-metal

Q2. [16 pts.] Name the following compounds:

a) $FeCl_3$ iron(III) chloride

b) NH_4Br ammonium bromide

c) N_3F_8 trinitrogen octafluoride

d) $Cu(NO_3)_2$ copper(II) nitrate

e) Br_2O_7 dibromine heptoxide

f) Li_3PO_4 lithium phosphate

g) $Ca(HCO_3)_2$ calcium bicarbonate

h) P_4S_6 tetraphosphorus hexasulfide

Q3. [16 pts.] Write formulas for the following compounds:

a) calcium sulfate $CaSO_4$

b) trisulfur octabromide S_3Br_8

c) ammonium carbonate $(NH_4)_2CO_3$

d) potassium nitrite KNO_2

e) copper(II) hydroxide $Cu(OH)_2$

f) heptanitrogen tetroxide N_7O_4

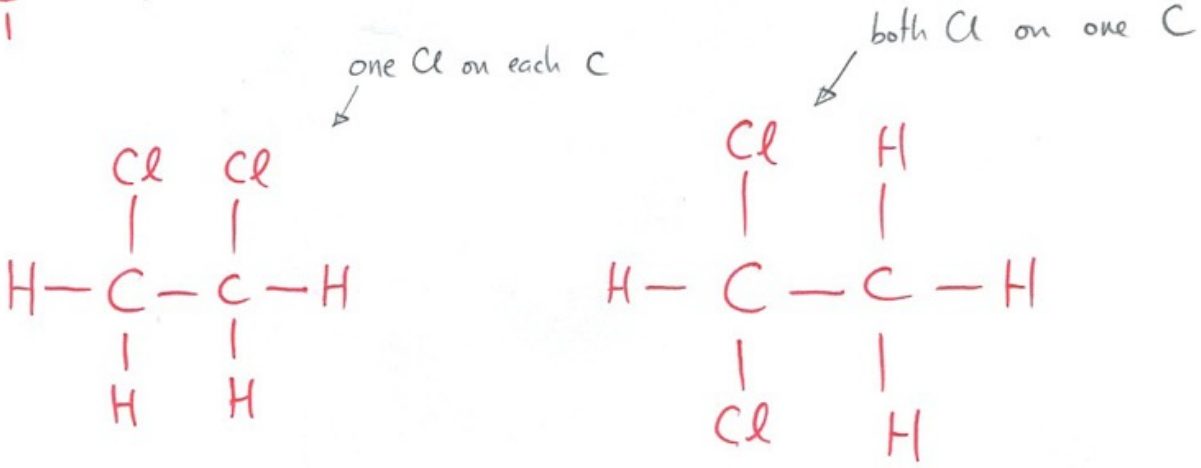
g) octaphosphorus trichloride P_8Cl_3

h) magnesium cyanide $Mg(CN)_2$

Q4. [6 pts.] Give the name and the formula of the ion released by an ACID when it dissolves in water?

BEST: H_3O^+ / Hydronium OK: H^+ / Hydrogen

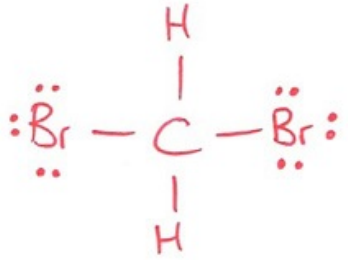
Q5. [12 pts.] Using the normal number of bonds that the atoms make, draw two different **structural isomers** with the formula: $C_2H_4Cl_2$. Explain what a structural isomer is part of your answer.



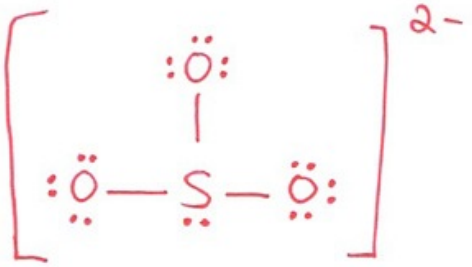
Structural Isomer: Same formula, but differently bonded atoms!

Q6. [20 pts.] Write out valid Lewis structures for the following substances:

a) CH_2Br_2



b) SO_3^{2-}

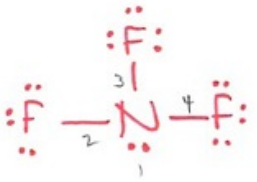


c) HCN

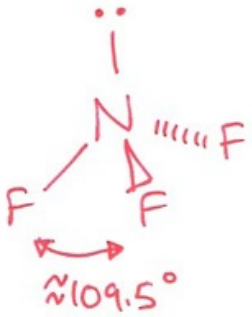
(hint: take carbon to be the central element.)

Q7. [18 pts.] Predict the geometry of the NF_3 molecule using VSEPR. Your answer should include:
(1) a valid Lewis structure, (2) a sketch of the geometry *(using line, wedge, and dash notation)*,
(3) the name of the **molecular** geometry, and
(4) the approximate bond angle written out.

Lewis:



VSEPR
(4-repulsions)



e⁻ pair geom: tetrahedral (4 reg.)

molecular geom: trigonal pyramidal

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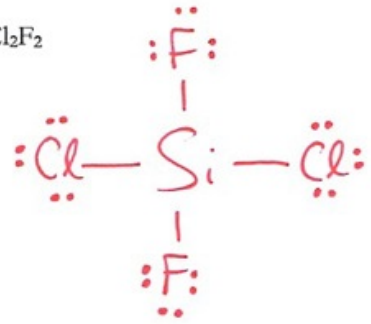
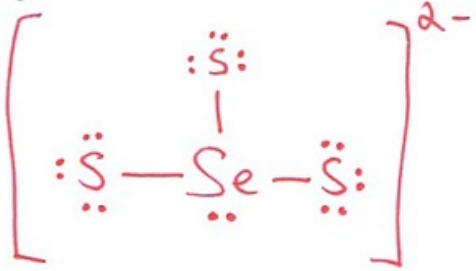
Show all work to receive credit. You must use the factor-label (conversion-factor) method for all conversions. Be sure to show all units and write your answers using the correct number of significant figures or decimal places.

Q1. [20 pts.] Write out valid Lewis structures for the following substances:

a) $SiCl_2F_2$



b) SeS_3^{2-}



c) HNC

(hint: take nitrogen to be the central element.)

Q2. [18 pts.] Predict the geometry of the SO_2 molecule using VSEPR. Your answer should include:
(1) a valid Lewis structure, (2) a sketch of the geometry *(using line, wedge, and dash notation)*,
(3) the name of the **molecular** geometry, and
(4) the approximate bond angle written out.

Lewis: 

VSEPR: (3 regs)

e⁻ pair geom: trigonal planar

molecular geom: BENT

Q3. [12 pts.] Identify the following compounds as being either IONIC (I) or MOLECULAR (M).

a) $FeBr_2$ I

b) NO_2 M

c) I_3Br_{10} M

d) P_4O_{10} M

e) $NaNO_3$ I

f) K_2S I

Q4. [16 pts.] Name the following compounds:

a) Br_2O_7 dibromine heptoxide

b) Li_3PO_4 lithium phosphate

c) $Ca(HCO_3)_2$ calcium bicarbonate

d) P_4S_6 tetraphosphorus hexasulfide

e) $CuCl_2$ copper(II) chloride

f) NH_4Br ammonium bromide

g) N_3F_8 trinitrogen octafluoride

h) $Fe(NO_3)_2$ iron(II) nitrate

Q5. [16 pts.] Write formulas for the following compounds:

a) heptaphosphorus trichloride P_7Cl_3

b) magnesium phosphate $Mg_3(PO_4)_2$

c) calcium carbonate $CaCO_3$

d) trisulfur pentabromide S_3Br_5

e) ammonium sulfate $(NH_4)_2SO_4$

f) potassium hydroxide KOH

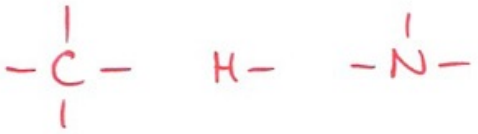
g) copper(II) cyanide $Cu(CN)_2$

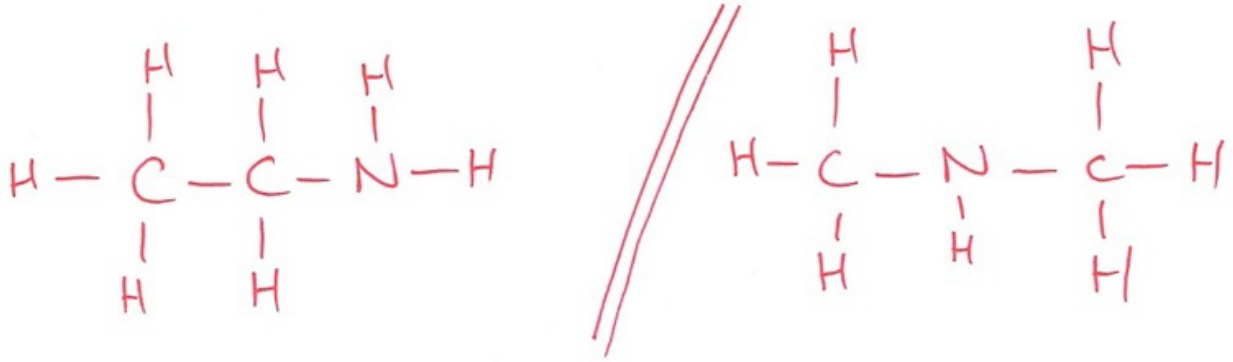
h) octanitrogen tetroxide N_8O_4

Q6. [6 pts.] Give the name and the formula of the ion released by a BASE when it dissolves in water?

Hydroxide : OH^-

Q7. [12 pts.] Using the normal number of bonds that the atoms make, draw two different **structural isomers** with the formula: C_2H_7N. Explain what a structural isomer is part of your answer.





Structural Isomers have the same chemical formulas, but the atoms are bonded differently