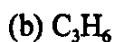
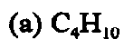


Homework #1

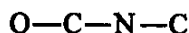
1. Draw all reasonable acyclic (no rings) Lewis structures for organic compounds with the following formulas. For each Lewis structure draw a good 3-D representation of the actual shape of the molecule or ion. Indicate the approximate bond angles.



(c) $C_2H_5O^-$ (Consider which atom is most likely to have a negative charge – this limits the number of Lewis structures possible.)

(d) $C_2H_5N^+$ (Consider which atom is most likely to have a positive charge – this limits the number of Lewis structures possible.)

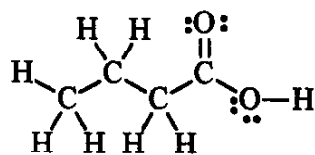
2. Draw all reasonable Lewis structures for molecules with molecular formula C_2H_3NO and the following connectivity between non-hydrogen atoms:



(HINT: There are three main possibilities, plus one more that is subtly different from one of the three.) For each Lewis structure draw a good 3-D representation of the actual shape of the molecule or ion. Indicate the approximate bond angles.

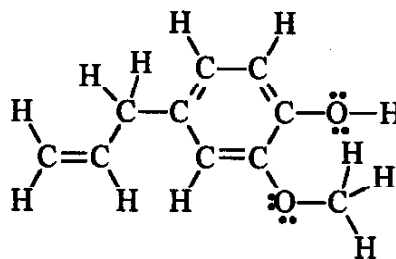
3. Draw C framework structures for the following compounds.

(a)



Butyric acid (smell of rancid butter)

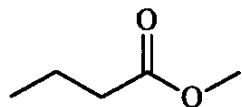
(b)



Eugenol (a dental antiseptic)

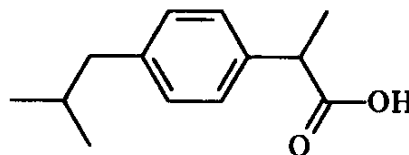
4. What is the molecular formula for the following compounds drawn using C framework structures? (To answer this correctly you need to fill in the missing C's and H's.) Give your answer in the standard format, that is, C first, then H, then the other elements in alphabetic order.

(a)



methyl butanoate (apple flavor)

(b)



ibuprofen ("Advil" or "Motrin")

5. Draw a Lewis structure for the following inorganic compounds. Assume symmetry. For each Lewis structure draw a good 3-D representation of the actual shape of the molecule or ion. Indicate the approximate bond angles.



6. Draw Lewis structures for all the best resonance structures of CO_3^{2-} . These will be the ones with the least number of formal charges. What is the approximate O-C-O bond angle in these structures?

7. Draw Lewis structures for all the best resonance structures of CrO_4^{2-} . These will be the ones with the least number of formal charges. (Cr has 6 valence electrons.) What is the approximate O-Cr-O bond angle in these structures?

8. Consider the following *unbalanced* reaction which is known to go to completion:



(a) What is the name of the solid product of this reaction?

(b) What is the balanced reaction?

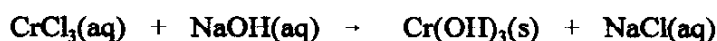
(c) If 5.00 g of $\text{Ca}_3(\text{PO}_4)_2(\text{s})$ was formed, how many grams of $\text{Na}_3\text{PO}_4(\text{aq})$ reacted?

Lets say the reaction was accomplished by mixing 10. mL of 0.20 M Na_3PO_4 solution with 10 mL of 0.25 M CaCl_2 solution.

(d) How many moles of each reactant was used?

(e) How many moles of $\text{Ca}_3(\text{PO}_4)_2$ will be formed?

9. Consider the following *unbalanced* reaction which is known to go to completion:



(a) What is the name of the solid product of this reaction?

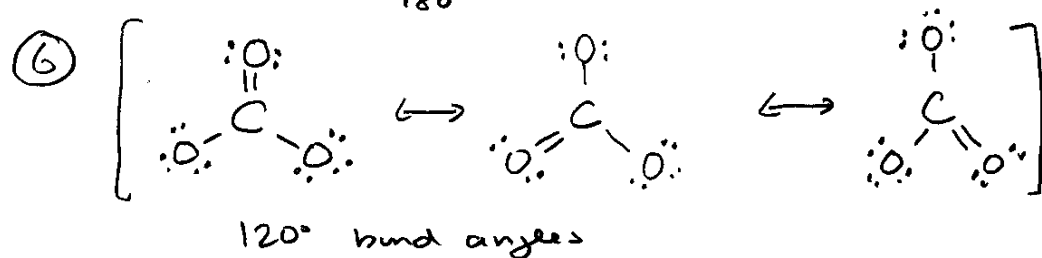
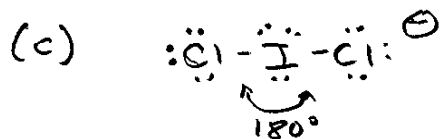
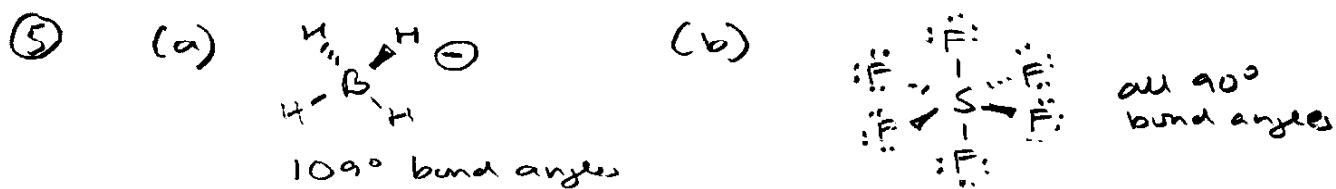
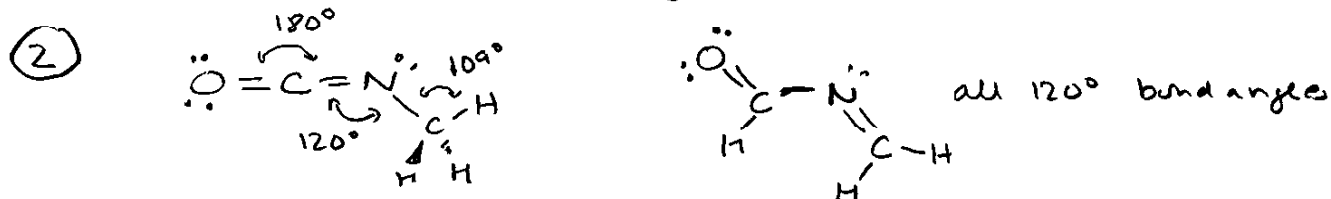
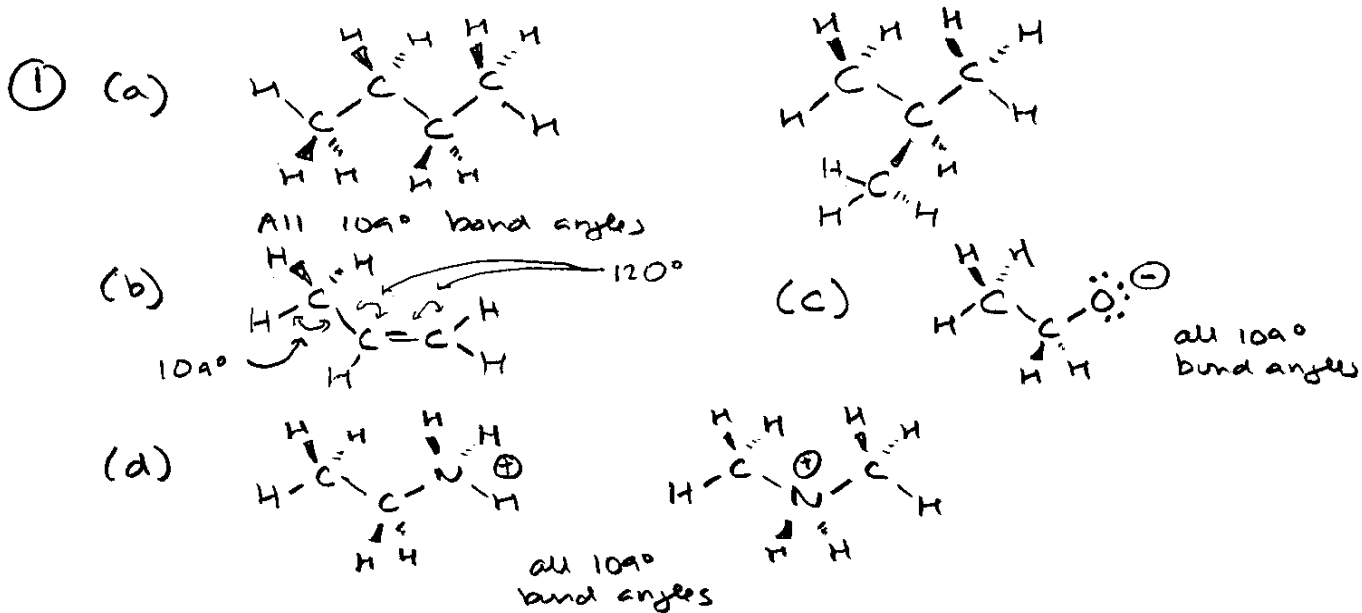
(b) What is the balanced reaction?

(c) If 10.5 g of $\text{Cr}(\text{OH})_3$ were formed by this reaction, how many grams of NaOH reacted?

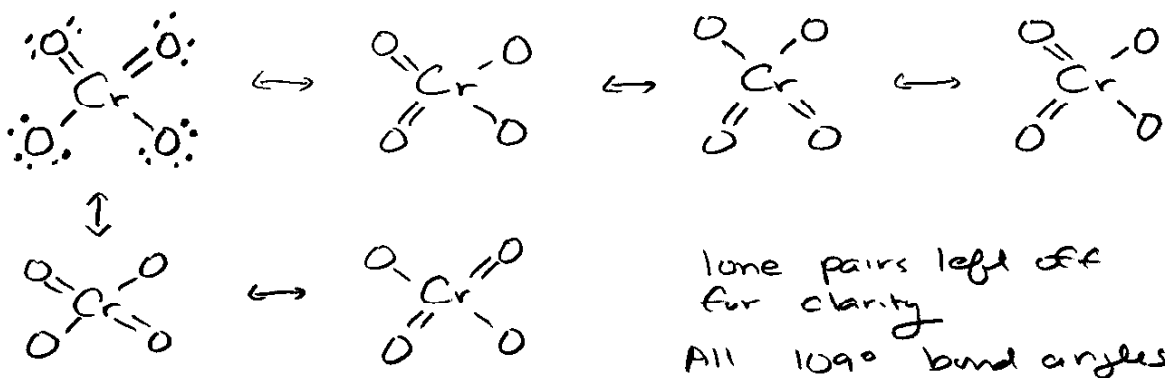
Lets say the reaction in the previous question was accomplished by mixing 15 mL of 0.10 M CrCl_3 solution with 25 mL of a 0.15 M NaOH solution.

(d) How many moles of each reactant was used?

(e) How many moles of $\text{Cr}(\text{OH})_3$ will be formed?

HOMEWORK #1
ANSWERS

7



8

(a) calcium phosphate



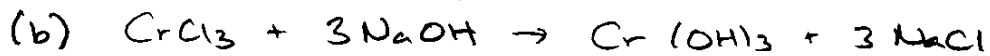
(c) 5.25 g

(d) 2.0×10^{-3} mol Na_3PO_4 , 2.5×10^{-3} mol CaCl_2

(e) 8.3×10^{-4} mol $\text{Ca}_3(\text{PO}_4)_2$ (CaCl_2 is limiting reagent)

9

(a) chromium (III) hydroxide



(c) 12.2 g

(d) 1.5×10^{-3} mol CrCl_3 , 3.8×10^{-3} mol NaOH

(e) 1.3×10^{-3} mol $\text{Cr}(\text{OH})_3$ (NaOH is limiting)