Chem 21 **Homework set 1**

This assignment is split into two parts — the first two pages are *not* to be turned in for credit. These are recommended problems from the text and other problems for extra practice. We will work on those or similar problems during the Monday discussion sections.

The next two pages are the ones that you will turn in for credit on Wednesday, Sept 16.

End-of-chapter problems from Hornback: Ch1: 15, 17, 18, 21, 22, 26ab, 33 (that's an important rule!), 36, 38, 40.
Ch2: 17 - 24 (you'll notice that several problems like 22 - 25 are also below), 25 (why is it not necessary to "calculate the DU"?), 26, 39, 40

1. Draw the single best Lewis structure for each of the following compounds. You don't need to draw out all the single-bonded Hs, just be sure the bonding between the "heavy atoms" (i.e. Cs, Ns, Os) is clear, i.e., "partially condensed" structures are fine. Be sure to include all lone pairs and formal charges, if any. The condensed formulas given show the *overall* charge and connectivity for each molecule — don't change them!

(a) $CH_3CCCHCH_2$

(b) $CF_2CHC(OCH_3)CHCN$

(c) $OCH_2CH(CH_2Br)_2{}^-$

(d) $CH_3CH_2O(CH_3)_2{}^+$

(e) $(CH_3CH_2)_2CNNH_2$

(f) $(CH_3)_3CNH_2CH_3{}^+$

(g) $NaOCH(CH_3)_2$

(h) $FCHC(CH_3)CH_2OK$

(i) Reminder: check that your structures contain (i) no octet violations (overflows), (ii) a minimum of incomplete octets (*none* for these particular molecules), (iii) the correct FCs and overall charge, and (iv) the specified connectivity. *Please don't skip this — do these checks carefully, one at-a-time*. (v) Did a few of those have ionic bits? Hmmmm...

Watch out for embedded carbonyls... or not...

(j) CH_3CO_2H

(k) $HOCOCH_3$ (does this look familiar?)

(l) $HCO_2C(CH_3)_3$

(m) $CH_3CH_2O_2CH(CH_3)_2$

(n) $CH_3COCCCH_3$

(o) $CH_2CHCONHCH_3$

(p) Repeat part i. Do you think this is a good idea for every structure you draw? (Hint: Yes.)

2. Draw all the possible isomeric compounds having each molecular formula below. Keep in mind that stable, neutral molecules will normally have *complete octets on all atoms* and *no charges*. The numbers in parentheses are the number of isomers I found (which doesn't necessarily mean they're correct!). Be careful not to draw the same compound twice! Your time is valuable, so instead of drawing out every single H, please write *partially condensed structures, e.g.* "CH_3—CH_2—O—H", etc. (Do NOT try to write fully condensed formulas like the ones given in problem 1.

(a) $C_5H_{11}Cl$ (8) (b) $C_4H_{10}O$ (7) (c) C_3H_9N (4)

(d) Reminder: check that every single one of your structures contains *complete octets and no formal charges!* This means 4 bonds to C, 3 to N, 2 to O and 1 to H and halogens!

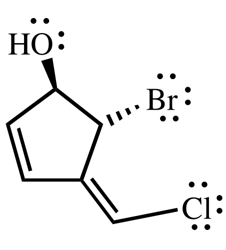
(e) Now for the tough part — check that you didn't accidentally draw the same compound more than once. All we're concerned with for now is connectivity — if two structures have the same connectivity, then they're the same molecule!

Draw skeletal structures for these.

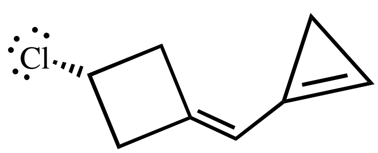
(f) C_5H_{10} (10) (g) C_3H_7N (12) (h) C_4H_7Br (12)

3. Add Hs to the skeletal structures below so that the geometry is clear. Any Hs already shown should be drawn in the proper position as well.

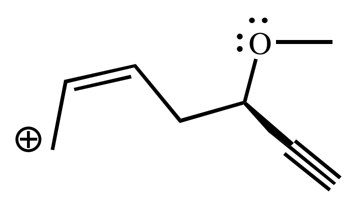
(a)



(b)

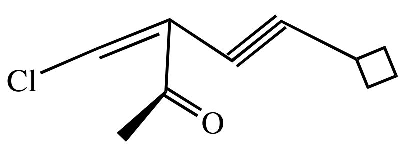


(c)

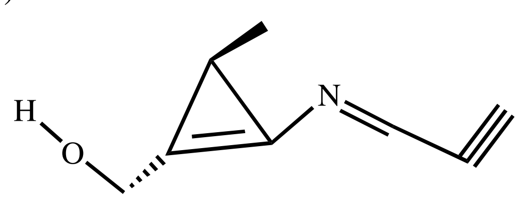


The molecules below are geometrically whacked. Poor things look like molecular road-kill. Fix them up, please. Stick with skeletal notation, don't add Hs, just straighten out the whacked bits.

(d)



(e)



Chem 21
Fall 2009 *Name* ____
HW set 1
25 points; due Wed, Sept 16

Now for the ones that you need to turn in... If you need more detailed instructions, see the previous pages — they're the same kinds of problems.
Remember, to earn credit, homework must be turned in at the *beginning* of class.

1. Draw Lewis structures.

(a) $CH_3CON(CHCH_2)_2$

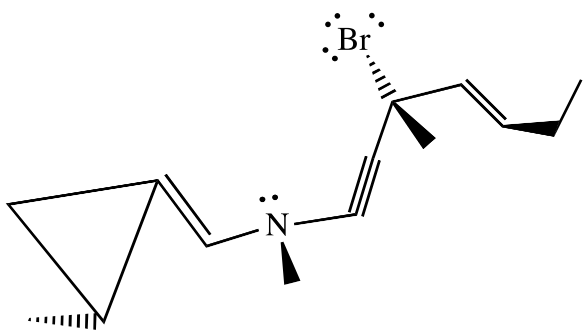
(b) $LiN(CH(CH_3)_2)_2$

(c) $(CH_3CO)_2CNCHFCH_3$

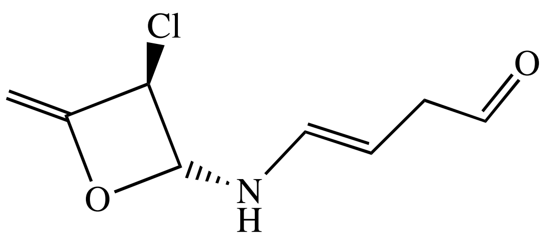
(d) $NaBH(OCH_3)_3$

(e) $(CH_3)_2NCH_2C(CN)CHCO_2CH_3$

2. (a) Straighten this out (keep it in skeletal notation; don't add Hs)



(b) Add Hs to this one. Add the lone pairs too.



3. Draw as many different compounds with the molecular formula C_3H_4O as you can. There are more than 10.