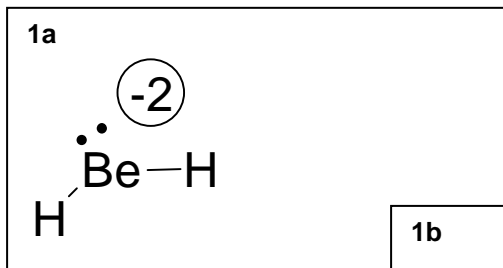
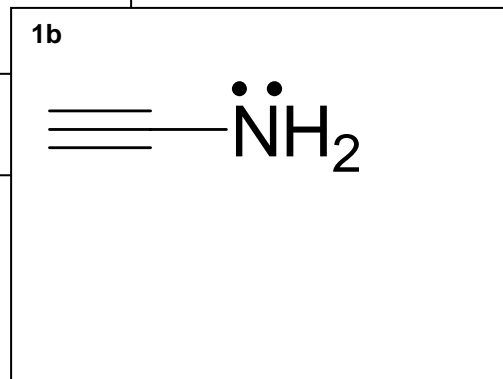


1. (15 pts) Draw line structures (as the low-energy resonance structures) for the following compounds. **Include all lone pairs and include all formal charges** (unless the formal charge is zero). Indication regarding how to connect the atoms is present in the molecular formulas given below at left.

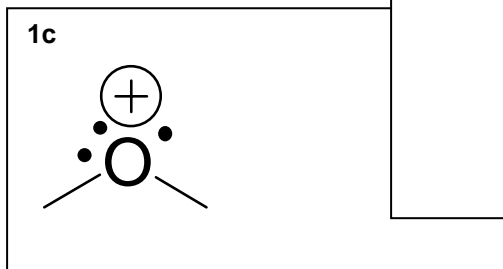
1a. $\text{BeH}_2(-2)$



1b. HCCNH_2



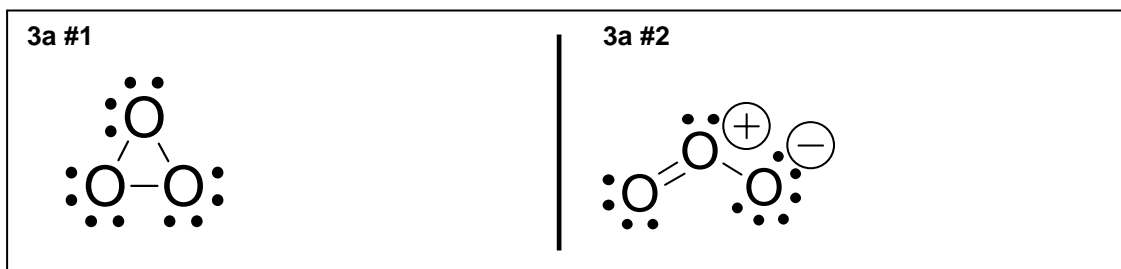
1c. $\text{CH}_3\text{OCH}_3(+)$



2. (5 pts) Compute the degrees of unsaturation in $\text{C}_9\text{H}_5\text{NCl}_2$; show your work.

My answer for 2a: 7 = $9 - 7/2 + 1/2 + 1$

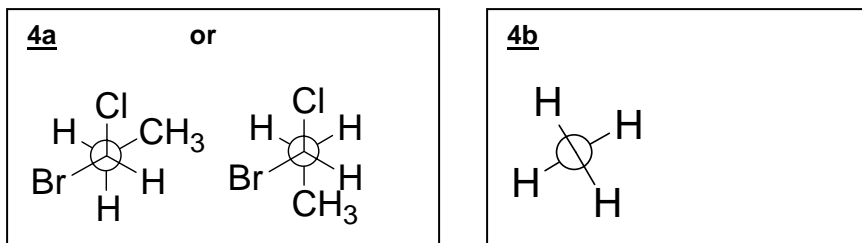
3a (10 pts) Draw two structural isomers possessing molecular formula O_3 . You might want to compute the degrees of unsaturation first (hint).



3b. (5 pts) What is the difference between resonance structures and structural isomers?

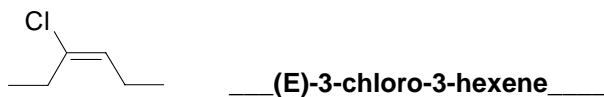
Resonance structures show possible placement of electrons on a structure. Often more than one resonance structure is needed to adequately define one real molecule. Structural isomers are different molecules with different atomic connections.

4a. (10 pts) Draw a Newman projection of 1-chloro-1-bromopropane ($\text{BrClCHCH}_2\text{CH}_3$) in its most stable conformation.



4b. (5 pts) Draw a Newman projection of 1,2-propadiene (H_2CCCH_2).

5. (5 pts) Name the following structure. Partial credit will be awarded.



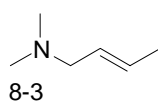
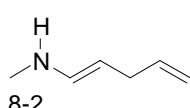
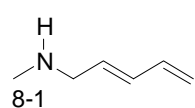
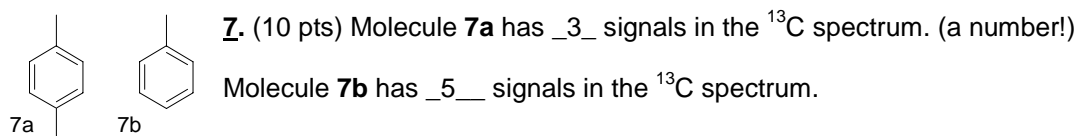
6. (15 pts) Estimate the bond angles in the following structures. (Fill in the blanks)



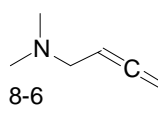
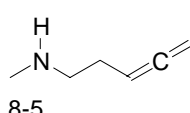
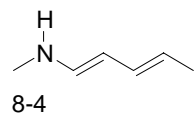
a) The C-N-C bond angle in the amide at left is approximately ___120___.

b) The Cl-C-Cl bond angle in CCl_3^- is a little less than ___109___.

c) How are the N-H bonds hybridized in $(\text{CH}_3)_2\text{BNH}_2$? ___sp²___.

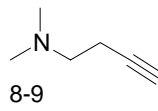
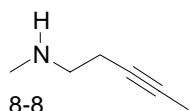
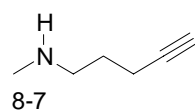


8a. (5 pts.) Which isomer absorbs light at the longest wavelength (lowest energy)?



___8-4___

8b. (5 pts) Which isomer absorbs light at the next lowest energy?



___8-1; 8-2___ (two possible choices, pick one)

9. (10 pts.) Draw a picture of the pi antibond of ethylene ($\text{H}_2\text{C}=\text{CH}_2$).

