

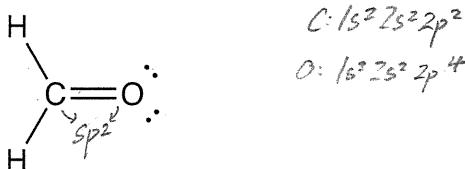
15 points possible

Please provide answers for the following questions within the provided boxes to receive credit. Only answers inside of boxes will be viewed and scored.

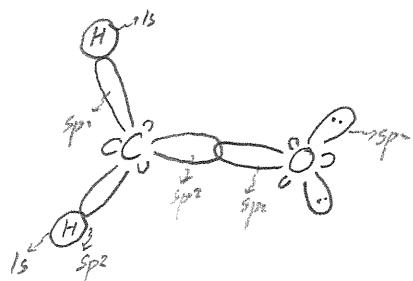
Name: Aihao Lin
 PID: 108901197

Exercises

1. Draw the orbital structure of formaldehyde.



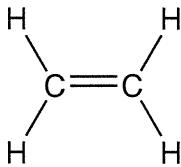
a. σ -bond (sigma) bonding orbital structure:



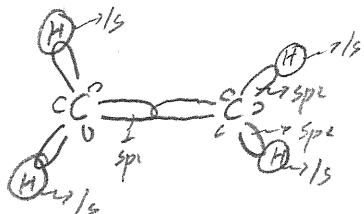
b. π -bond (pi) bonding orbital structure:



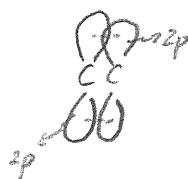
2. Draw the orbital structure of ethene.



a. σ -bond (sigma) bonding orbital structure:

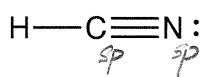


b. π -bond (pi) bonding orbital structure:

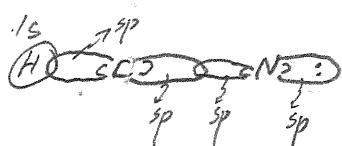


Adapted from Ruder, S. *Organic Chemistry; A Guided Inquiry*, Wiley, 2015.

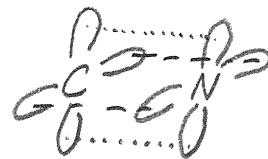
3. Draw the orbital structure of hydrogen cyanide.



a. σ -bond (sigma) bonding orbital structure:

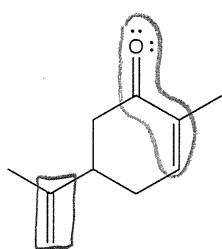


b. π -bond (pi) bonding orbital structure:



4. Circle the sets of conjugated bonds and draw boxes around the isolated double bonds in the molecules below.

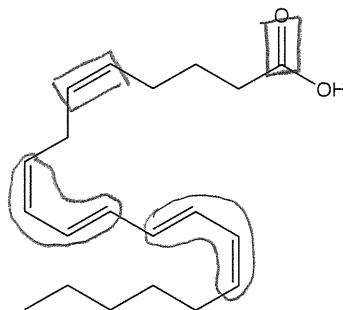
a.



Carvone

Responsible for the flavor and fragrance of spearmint and caraway seeds

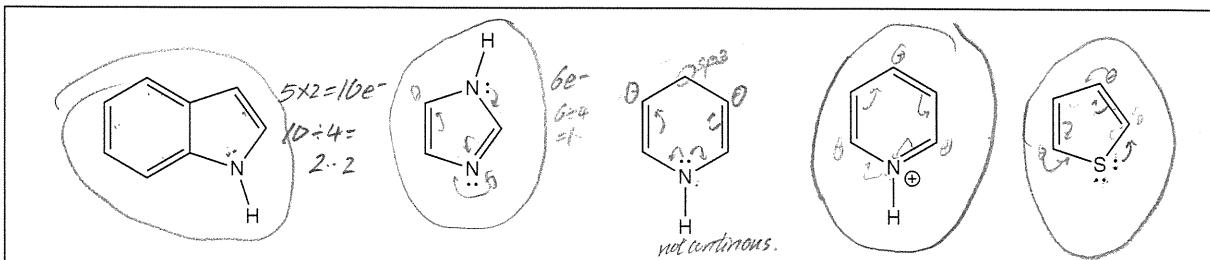
b.



Bosseopenatenoic acid

Metabolite of the red alga *Bossiella orbigniana*

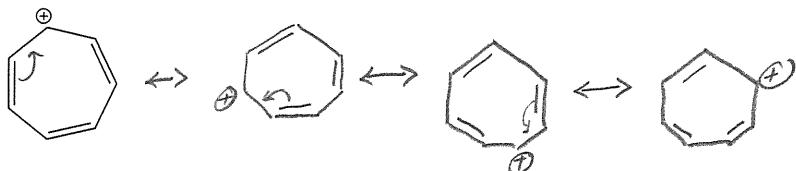
5. Circle the molecules below that are aromatic:



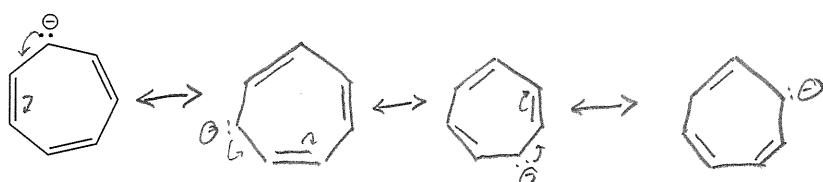
Adapted from Ruder, S. *Organic Chemistry; A Guided Inquiry*, Wiley, 2015.

6. Draw at least 3 additional (i.e., in addition to the structure provided) valid resonance (major contributors only) forms of the following ions:

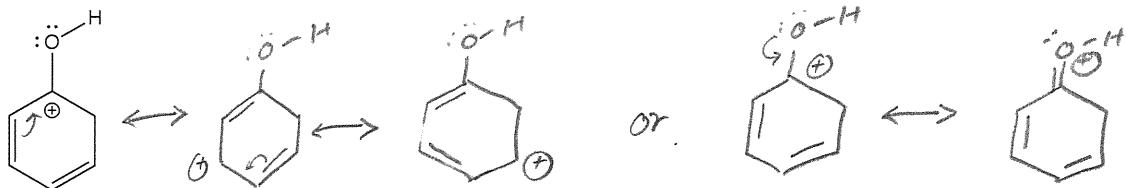
a.



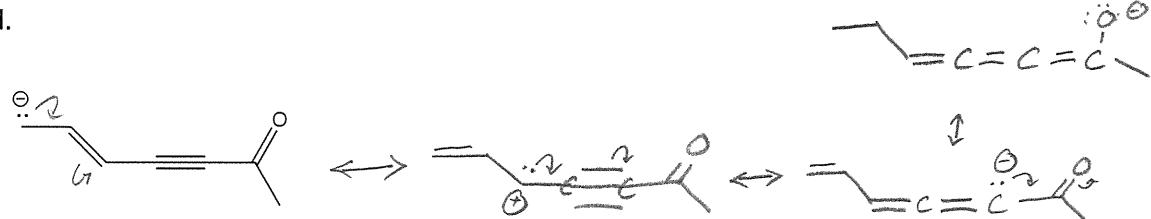
b.



c.

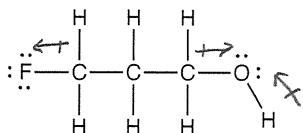


d.

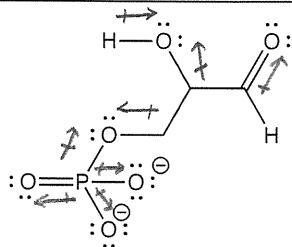


7. Using bond dipole arrows, indicate the bond polarity present in all bonds to carbon, hydrogen or phosphorous other than carbon-carbon and carbon-hydrogen bonds in the following molecules:

a.

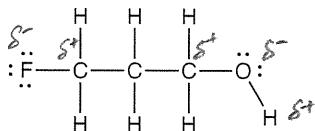


b.

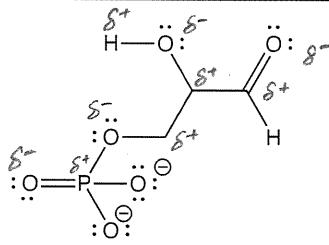


8. Using partial charge notation, indicate where the partial charges reside in the alcohol, fluorocarbon, phosphate ester, and carbonyl groups in the following molecules:

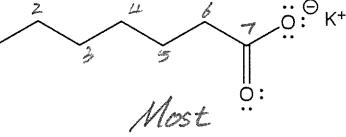
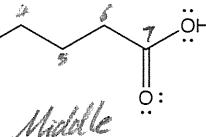
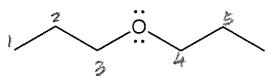
a.



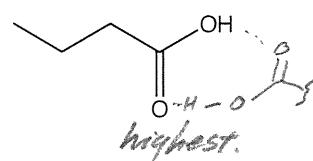
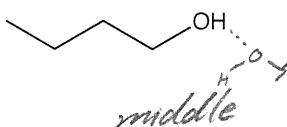
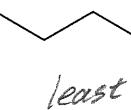
b.



9. Rank the following compounds according to expected solubility in water by labeling each compound either "most", "middle", or "least":



10. Rank the following compounds according to expected boiling point by labeling each compound either "most", "middle", or "least":



Adapted from Ruder, S. *Organic Chemistry; A Guided Inquiry*, Wiley, 2015.

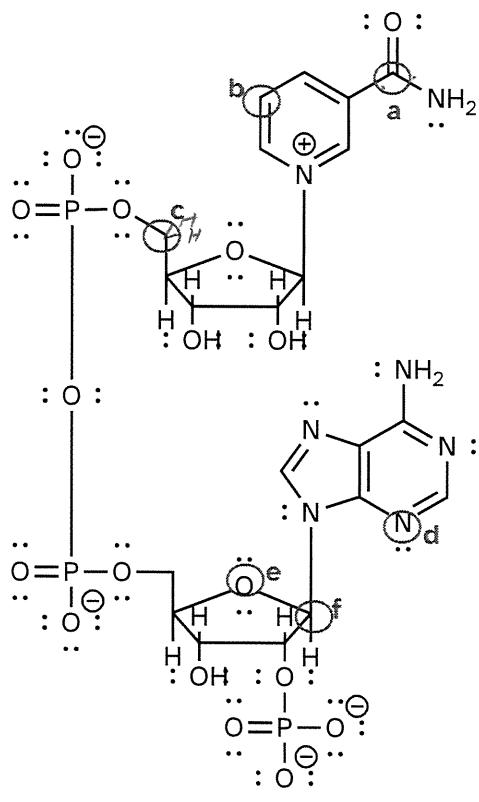
Connections to biology

The enzyme cofactor Nicotinamide Adenine Dinucleotide Phosphate (NADP^+) is an important oxidizing agent in Biochemistry. The structure has several recognizable structural components relevant to this chapter.

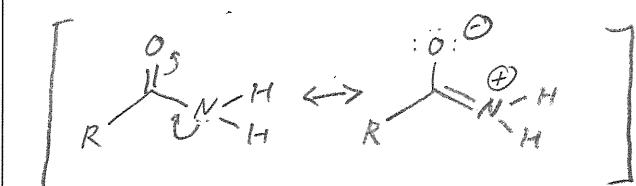
11. What is the hybridization of each of the atoms circled in red?

- | | | |
|---------------------|---------------------|---------------------|
| a:
sp^2 | b:
sp^2 | c:
sp^3 |
| d:
sp^2 | e:
sp^3 | f:
sp^3 |

12. Draw one key resonance form (i.e., in addition to the one shown) of the amide functional group in this molecule. (You may use the "R" abbreviation convention to avoid drawing the full structure of NADP^+)

Nicotinamide Adenine Dinucleotide Phosphate (NADP^+)

Amide resonance form:



13. Draw 3 additional resonance forms (i.e., in addition to the one shown) of the phosphate ester group in NADP^+ . (You may use the "R" abbreviation convention to avoid drawing the full structure of NADP^+)

Phosphate ester resonance forms:

