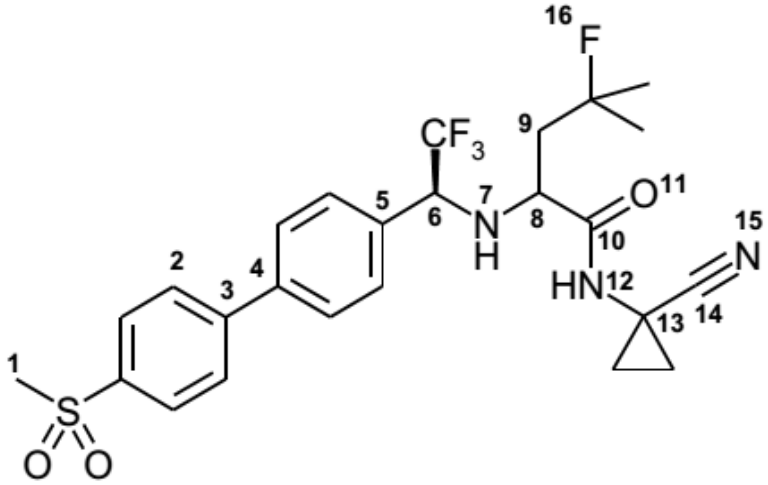
2 Bonding

2.1 Draw the orbital overlap that results in one of the sigma (σ) bonds between N and H in NH_3. Identify the participating orbitals as s, p, sp, sp^2, or sp^3.

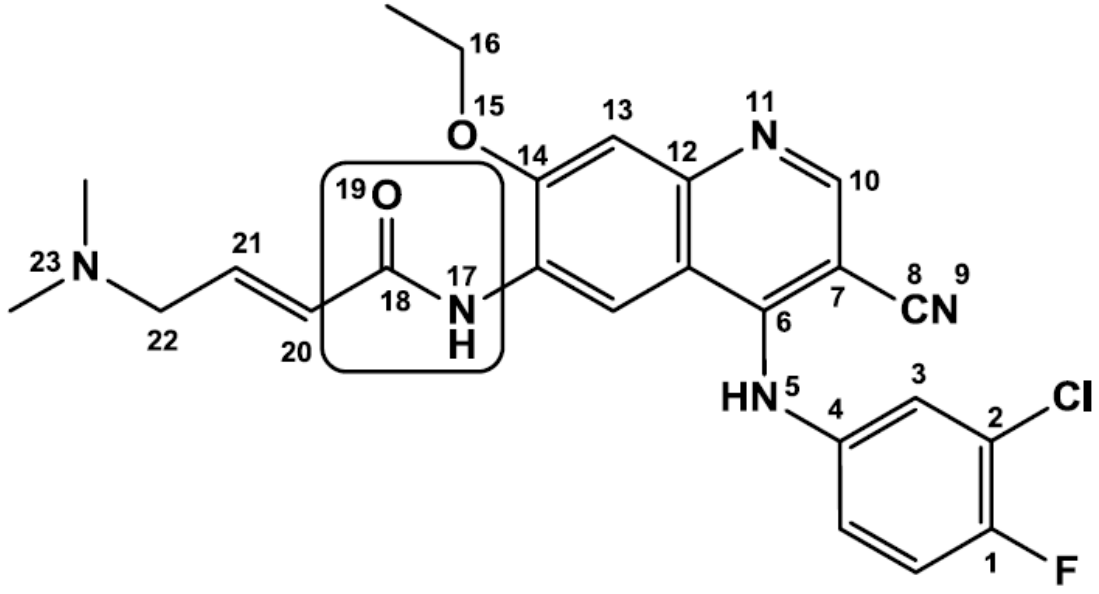
2.2 Draw the orbital overlap that results in the pi (π) bind between C and O in acetone ($CH_3C(O)CH_3$). Identify the participating orbitals as s, p, sp, sp^2, or sp^3.

2.3 Odanacatib, a potential drug for ostereoprosis and bone metastasis is drawn below. Use this structure to answer questions a-j.



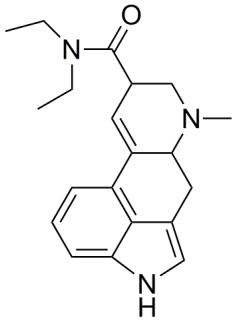
a) How many pi bonds are in Odanacatib?
b) Draw in any lone pairs
c) What is the hybridization of O11?
d) What is the hybridization of C1?
e) What is the hybridization of N15?
f) What is the geometry of C14?
g) What is the geometry and hybridization of C2?
h) What orbital are the lone pairs on O11 in?
i) What orbital is the lone pair on N7 in?
j) How many Hydrogens are in Odanacatib?

2.4 Use the structure of Pelitinib, a potent irreversible epidermal growth factor receptor (EGFR) inhibitor with potential anti-tumor activity, as depicted below to answer the questions



a. What is the hybridization of C-1?
b. What is the functional group in the box?
c. What is the geometry of C-16?
d. Are there any lone pairs on N-23? If yes, how many?
e. How many π bonds are in the molecule?

2.5 Answer the following questions regarding LSD:

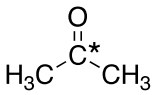


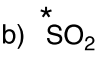
Lysergic acid diethylamide (LSD)

a. Which nitrogen in the most nucleophilic?
b. How many pi bonds are present in LSD
c. LSD is not very soluble in water, but the solubility significantly increases when concentrated HCl is added to the solution. Why?

d. What is the hybridization of each nitrogen?
e. What orbital are the lone pairs on each nitrogen in?
f. What is the most acidic hydrogen in LSD?

2.6 Provide the shape as well as the bond angles for the attoms with an *.

a) 

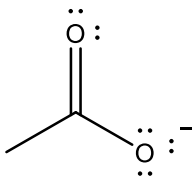
b) 

c) 

d) 

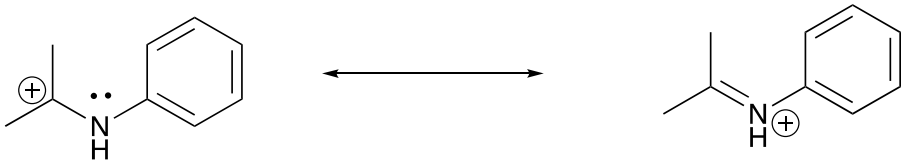
3 Resonance

3.1 Draw one resonance structure for the compound below. Be sure to include the curly arrows to show the movement of electrons

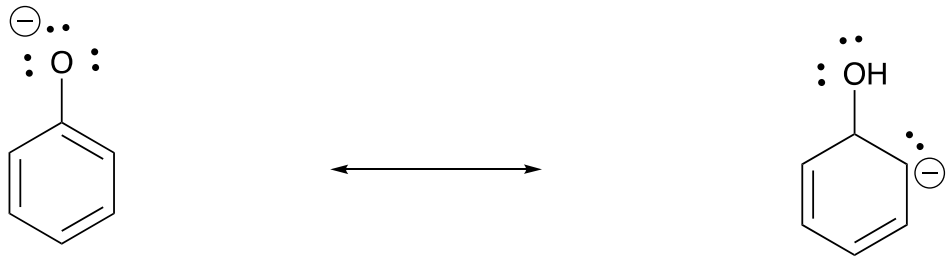


3.2 Provide the correct arrow pushes to go from one resonance structure to the other:

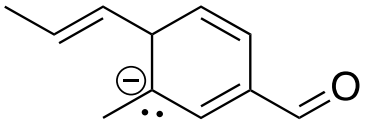
a.



b.

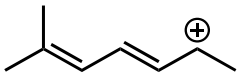


3.3 Provide three (more) reasonable resonance structures of the molecule below. You will likely find it useful to provide the arrow pushes.

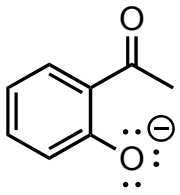


3.4 Provide reasonable resonance structures for the following molecules (there may be more than one):

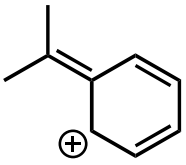
a.



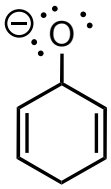
b.



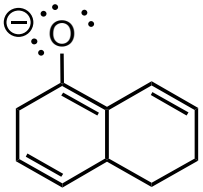
c.



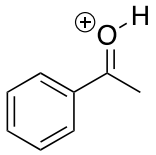
d.

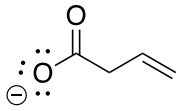


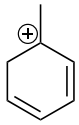
e.



3.5 Provide all of the reasonable resonance structures for the following compunds. Circle the MOST relevant where applicable. Show all arrow pushing for practice.

a) 

c) 

b) 

d)