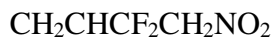
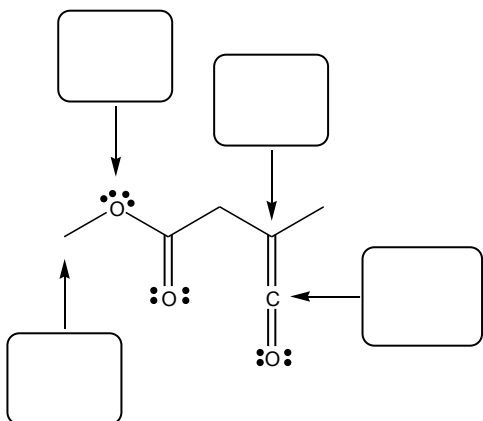


1. Draw a **line angle structure** for each of the following compounds, **but depict all hydrogen atoms**. Attempt to **accurately depict the molecular geometry** (which means you will need to use wedge bonds for pyramidal and tetrahedral centers). Indicate any nonzero formal charges and **include all nonbonding electrons**.



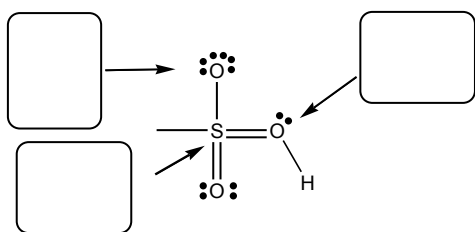
6_____

2. Indicate the hybridization of each indicated atom in the structure below.



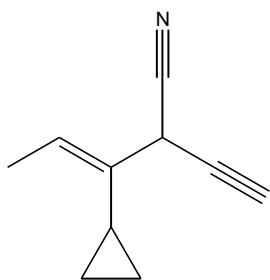
4_____

3. Determine the formal charge at each indicated atom, **and draw a resonance structure with no formal charges**.

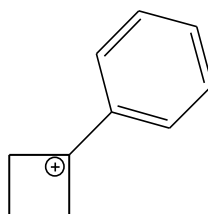


5_____

4. Determine the number of carbon and hydrogen atoms in the following structures.



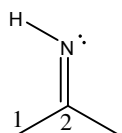
C _____ H _____



C _____ H _____

4 _____

5. Answer the following questions about the compound shown below.



a. What is the hybridization of nitrogen? _____

b. Which orbitals on carbon and nitrogen combine to form the C-N σ -bond? C _____ N _____

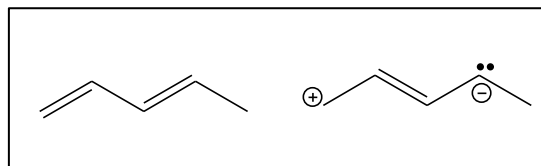
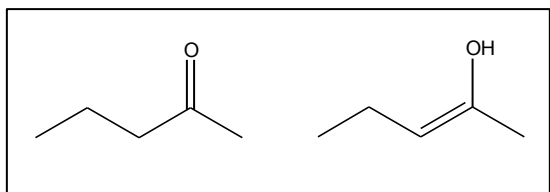
c. Which orbitals combine on the carbon atoms to form the C-C σ -bond? C(1) _____ C(2) _____

d. Which orbitals combine on carbon and nitrogen to form the C=N π -bond? C _____ N _____

e. What type of orbital does the lone pair on nitrogen occupy? _____

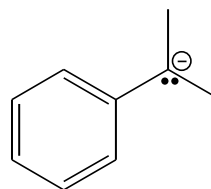
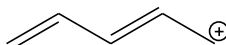
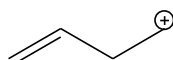
10 _____

6. Determine whether each pair of structures are related by being resonance structures. Answer **yes** or **no**.



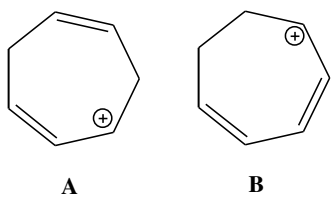
6 _____

7. Circle all ions below that can delocalize charge.



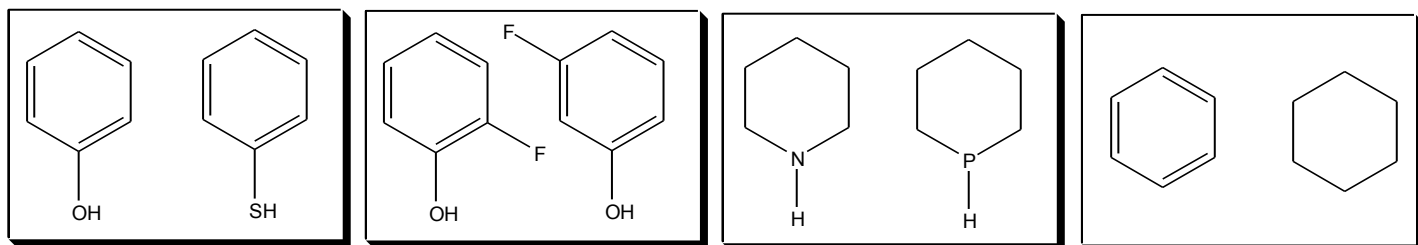
6 _____

8. Determine which cation is more stable and briefly explain your reasoning.



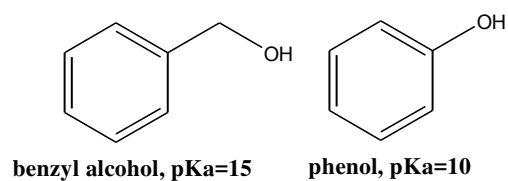
9. Circle the more acidic compound in each pair of compounds below.

6 _____



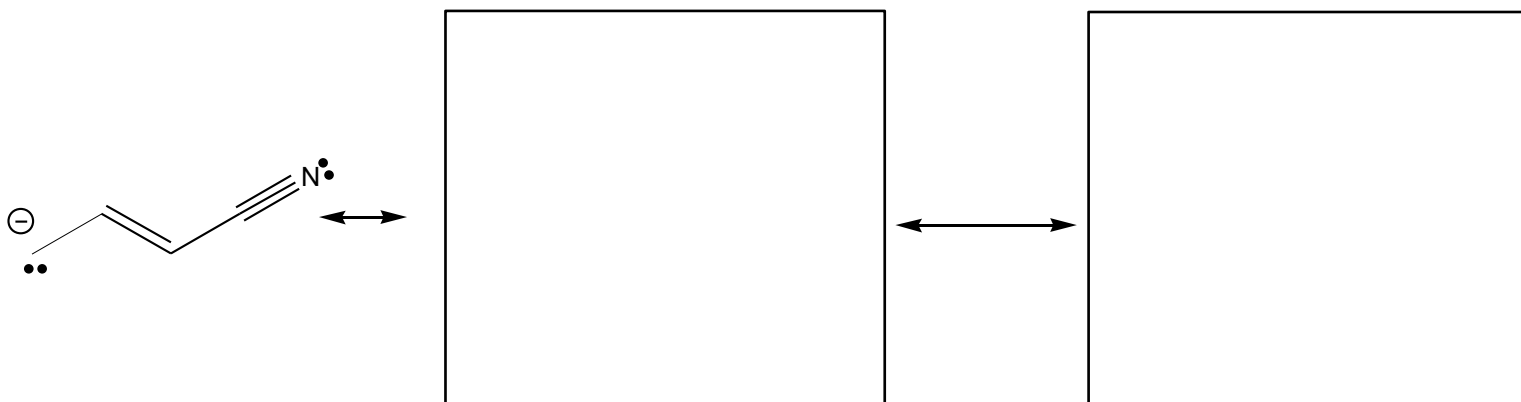
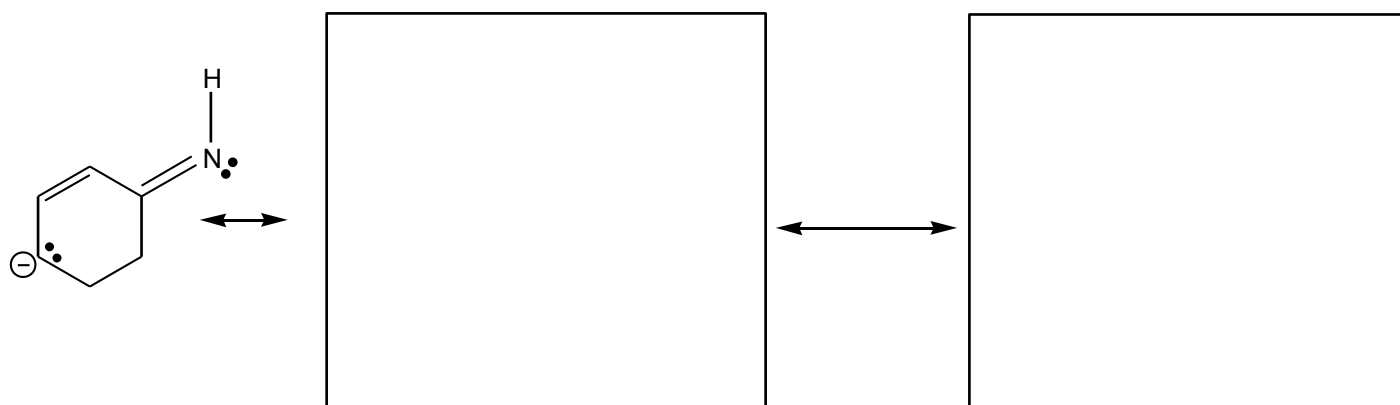
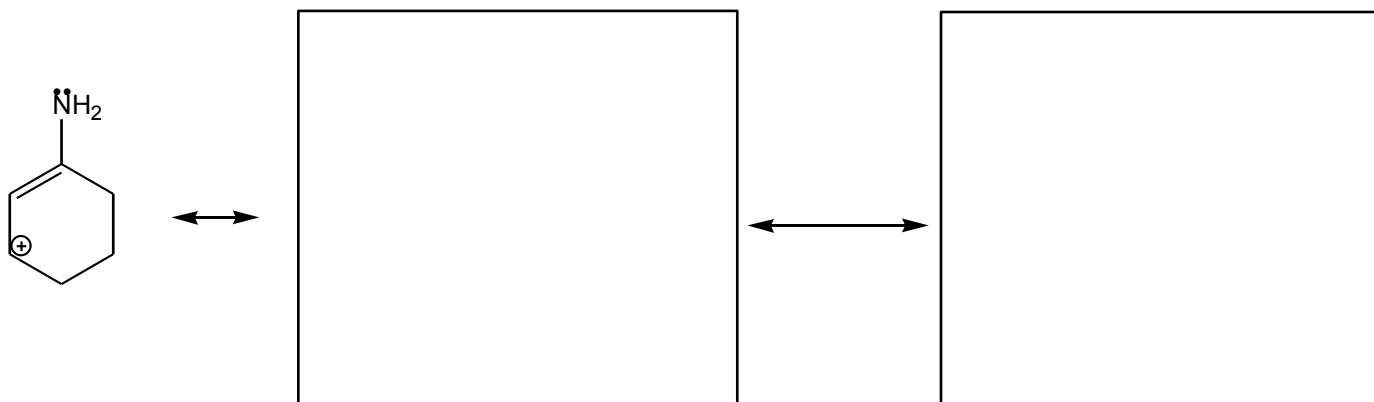
8 _____

10. Explain the difference in acidity between phenol and benzyl alcohol in terms of the structure and stability of their respective conjugate bases. Be specific.



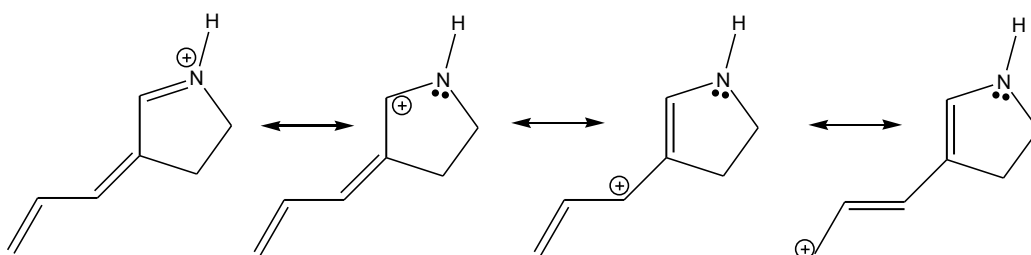
6 _____

11. Provide two additional (significant) resonance structures for each of the ions below. Use curved arrows to illustrate how one structure can be converted into the next. Write "major" under the major contributor for each set of resonance structures.



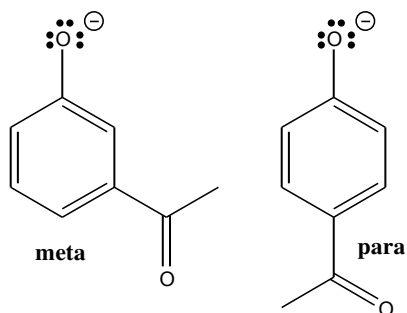
18 _____

12. Circle the **major** resonance contributor in the set of resonance structures below.



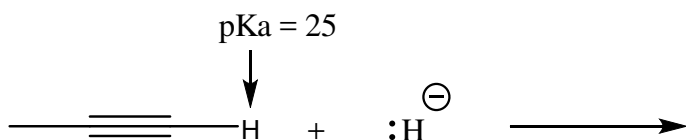
4 _____

13. Explain why the *para* anion is more stable than the *meta* anion. Draw any resonance structures that support your choice.



6_____

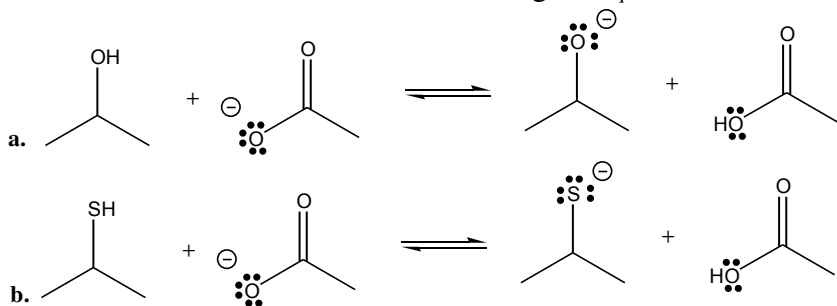
14. a) Predict the products of the following acid-base reaction. Use curved arrows to show the flow of electrons in the reaction.



b) Would the methoxide ion (CH_3O^-) irreversibly deprotonate the alkyne above? **Briefly explain your response.** (pKa of $\text{CH}_3\text{OH} = 15$)

7_____

15. Which reaction below will have a larger K_{eq} ?



4_____

Name: _____

Exam 3

CHEM 12A—FA 2014

Prof. Trego

November 26, 2014