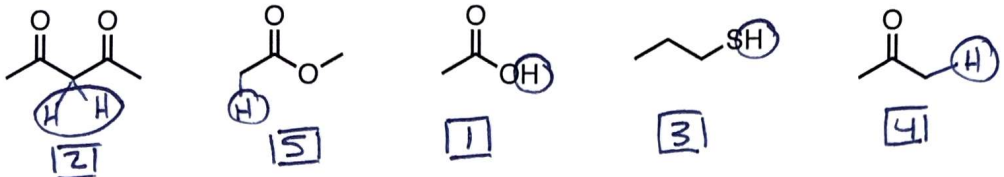
**Chemistry 531**
**Fall 2019**
**Name:** Answer Key

# Quiz 1

*Due: 9/6/19*

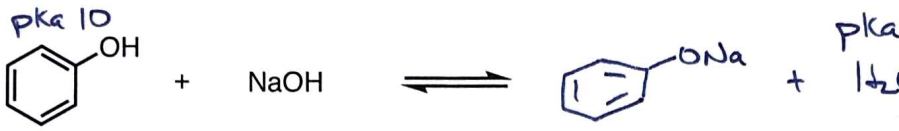
1. Draw in and/or circle the most acidic proton in each of the following. Then, rank from most acidic (1) to least acidic (5).



[2] [5] [1] [3] [4]

+1 each correctly circled proton
+5 Correct ordering

2. Complete the following reaction and estimate the $K_{eq}$ and $\Delta G$ (kcal/mol).

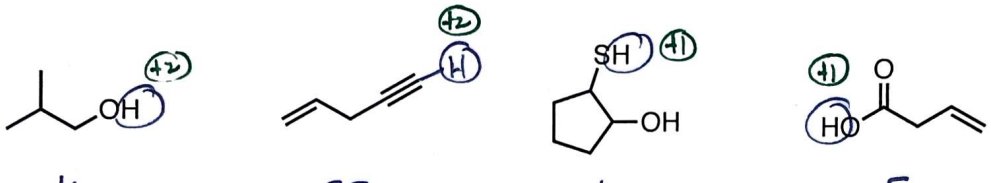



+2 for each Correct prod.
+3 $K_{eq}$ +3 $\Delta G$

$K_{eq}$ $10^{16-10} = 10^6$

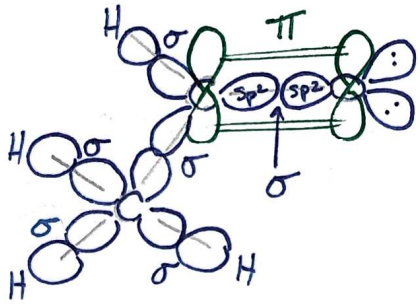
$\Delta G$ $-6 \times 1.4 = -8.4$ kcal/mol

3. Circle the most acidic proton in each molecule and provide the $pK_a$ value.



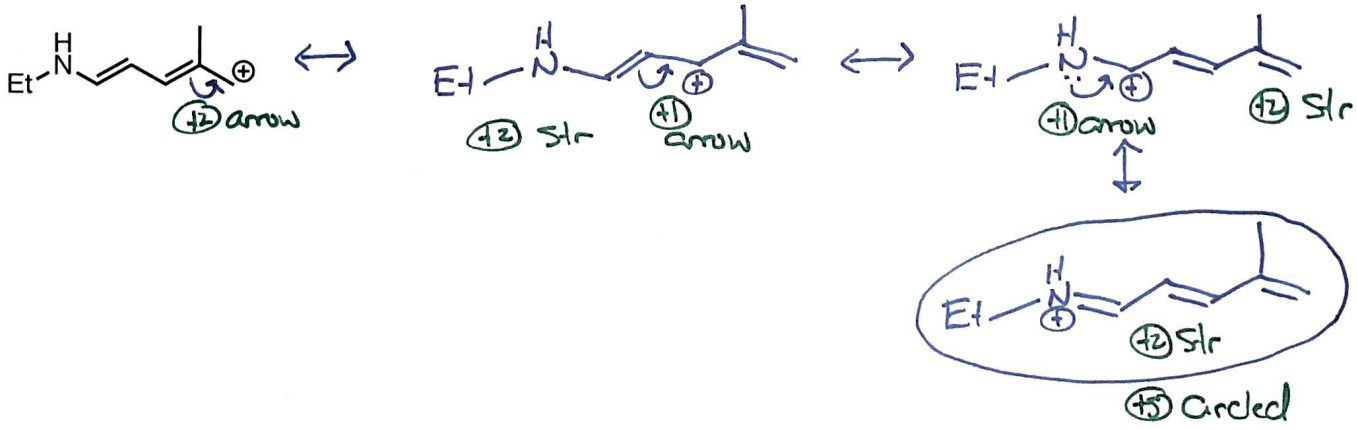
16 (+1) 25 (+1) 11 (+1) 5 (+1)

4. Draw the orbital picture for acetaldehyde. In your picture label the σ and π-bonds.

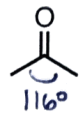



+8 Correct orbital picture
+2 Correct σ + π labels

5. Draw all relevant resonance structures for the molecule shown below. Use curved arrows to indicate electron flow in each step. Circle the major contributor to the resonance hybrid.



6. Determine the hybridization index for the central carbon atom in each molecule below. You can find the appropriate bond angles in your lecture notes.

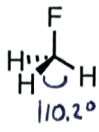



(+5)

$sp^{2.3}$

$1 + i\cos(116) = 0$

$i = -1/\cos(116)$

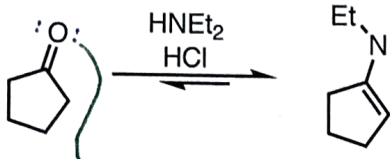



(+5)

$sp^{2.9}$

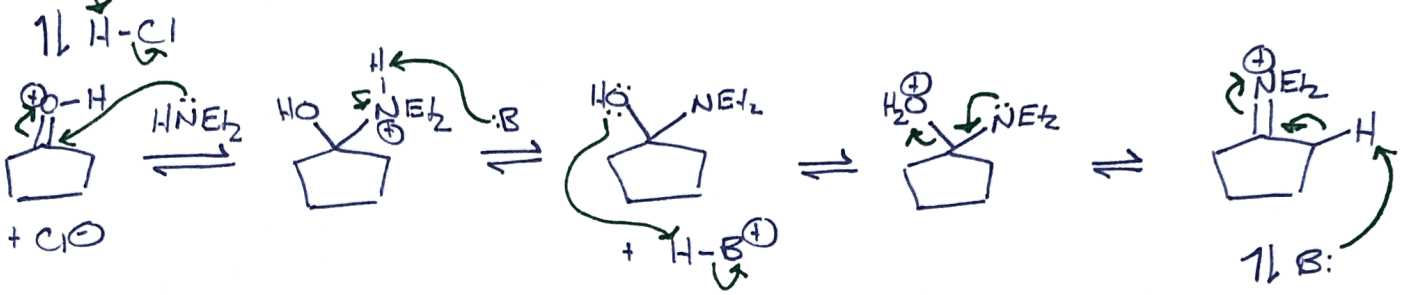
$1 + i\cos(110.2) = 0$

7. Provide the complete electron pushing mechanism for the reaction shown below.




(+2) → each correct str

(+1) → each correct set of arrows } Max (+15)

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8. Provide an explanation for why the molecular dipoles of furan and pyrrole point in opposite directions.

(+10)

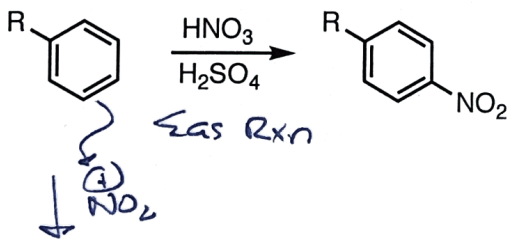

N's only lone pair is tied up in aromaticity while O has one lone pair in an $sp^2$ orbital. Also O is more e- neg than N


vs


N is a better resonance donor than O putting ⊖ on the 4 C's resulting is polarization toward the ring.

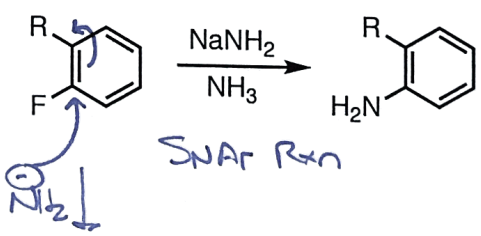
9. Explain why reaction **a** proceeds fastest with an electro donating -R group (i.e. $-NH_2$) while reaction **b** proceeds fastest with an electron withdrawing -R group (i.e. $-NO_2$).

**a.**

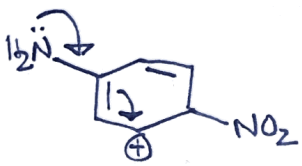



Eas Rxn

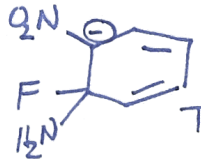
**b.**




SNAr Rxn




EDG Stabilizes the ⊕ intermediate (+5)




(+5)

The EWG Stabilizes the ⊖ intermediate