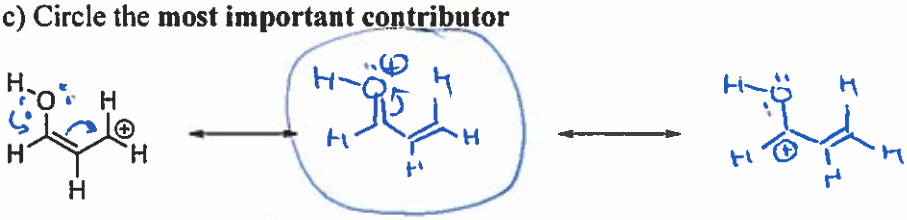
CHEM 3451 Sammakia Midterm Exam 2 Name Key

1a) A resonance structure for a molecule is shown below. The molecule has two others that are important contributors (10 points total).
a) **Draw the other two** including all lone pairs
b) Provide **curved arrow mechanisms** for their formation
b) Provide the **hybridizaton** for the oxygen in the structures you draw.
c) Circle the **most important contributor**

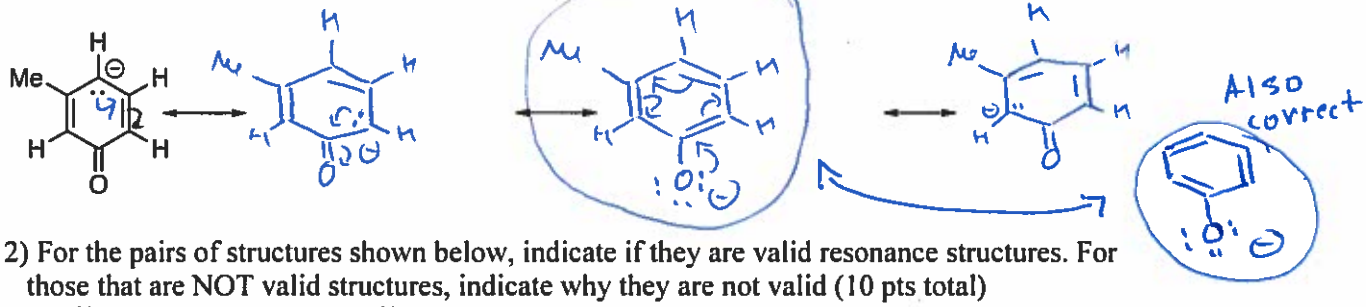


All "O" sp^2 hybrids

1b) A resonance structure for a molecule is shown below. The molecule has three others that are important contributors (14 points total).
a) **Draw the other ~~two~~** including all lone pairs
b) Provide **curved arrow mechanisms** for their formation
b) Provide the **hybridizaton** for the oxygen in the structures you draw.
c) Circle the **most important contributor**

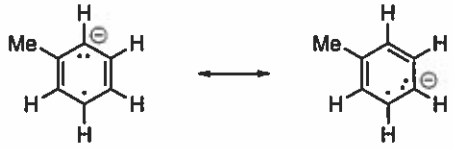
copy/paste mistake. If you only provided 2, we will not penalize

All "O" sp^2



Also correct

2) For the pairs of structures shown below, indicate if they are valid resonance structures. For those that are NOT valid structures, indicate why they are not valid (10 pts total)



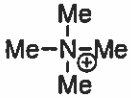
Valid resonance structures? **YES** or **NO**. If no, why not?

Valid resonance structures? **YES** or **NO**. If no, why not? The compound on the right violates the octet rule for carbon

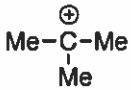
Valid resonance structures? **YES** or **NO**. If no, why not? The two compounds have numbers of unpaired electrons (0 on the left, 2 on the right) ↳ different

Total pts this page:

4 Consider the molecules or ions shown below. Are they capable of reacting as Lewis acids (LA), Bronsted acids (BA), Lewis bases (LB) or Bronsted bases (BB)? **Circle yes or no** for each (12 points).

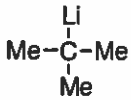


LA (Yes / No) BA (Yes / No) LB (Yes / No) BB (Yes / No)



LA (Yes / No) BA (Yes / No) LB (Yes / No) BB (Yes / No)

will also accept "Yes"



LA (Yes / No) BA (Yes / No) LB (Yes / No) BB (Yes / No)

will also accept "No"

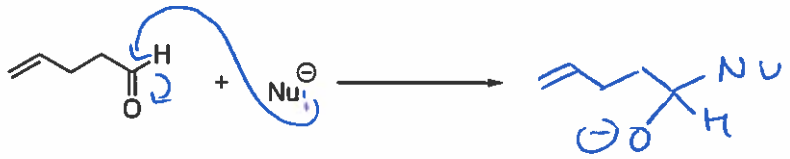
5. Provide the products and **curved arrow mechanism** for the reactions shown below. In each case the nucleophile has a (-) charge and the electrophile has a (+) charge, so be sure to **show the correct charge in the product** you draw. If no reaction would occur, write NR (4 pts each).

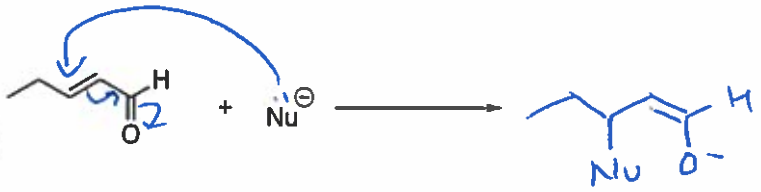
a)

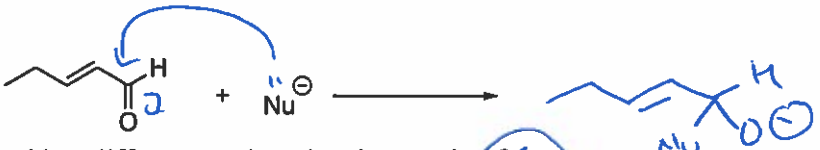
b)

c)

Provide a different product than in question b)

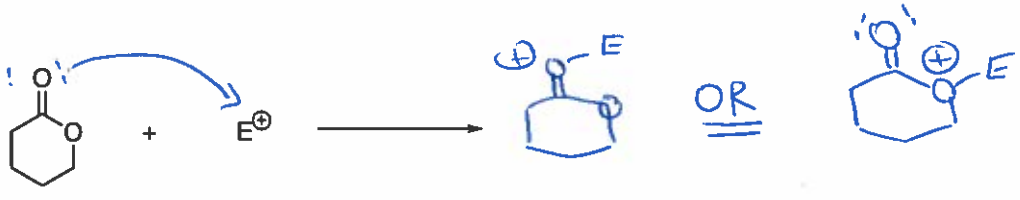
d) 

e) 

f) 

Provide a different product than in question ~~f~~ e

g) 

h) 

i) 

j) 

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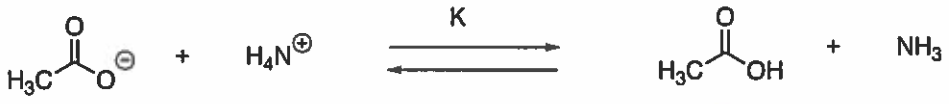
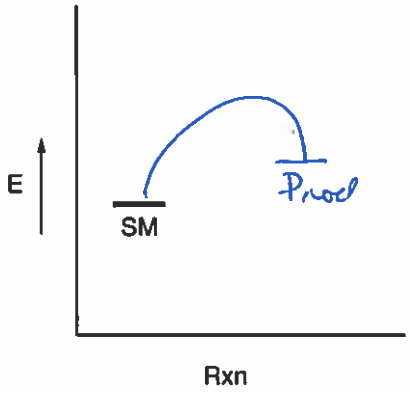
6a) Provide the equilibrium constant and pKa values for the two molecules acting as acids in the reaction below (8 points):



pKa values = 9 5

K = 9 - 5 = 4 $K = 10^{-4}$

6b) Draw an energy diagram for the reaction shown above indicating the relative energies of the SM and products (2 pts)



7) Lewis acids most commonly have which one of the following (circle one) (4 points):

An empty antibonding orbital

A filled antibonding orbital

An empty nonbonding orbital

A filled nonbonding orbital

An empty bonding orbital

A filled bonding orbital

 Total pts this page: