

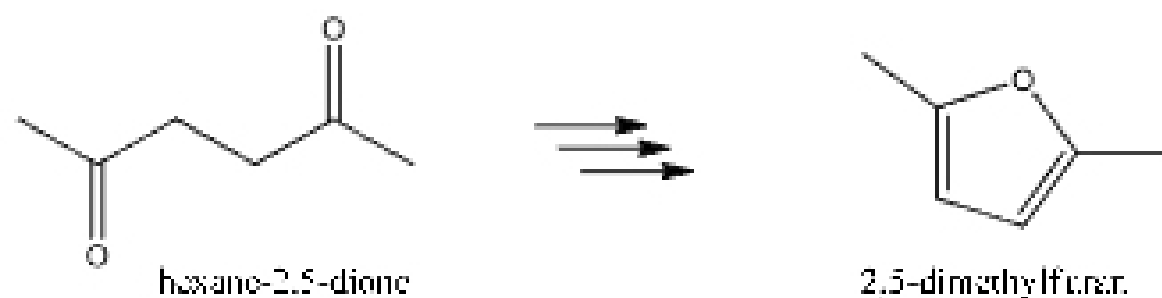
1) Consider the reaction $AH^{(+)} + H_2O \rightarrow A^{(-)} + H_3O^{(+)}$. For the following named acids: **a)** draw the structure of the acid, **b)** give the approximate pKa of the acid, **c)** give the name of the conjugate base, and **d)** draw the structure of the conjugate base. *16 points possible*

Acid	Benzyl oxonium cation pKa_____	Propyl propanoate pKa_____	Pentane-2,4-dione pKa_____	Allyl amine pKa_____
Conjugate Base	name:	name:	name:	name:

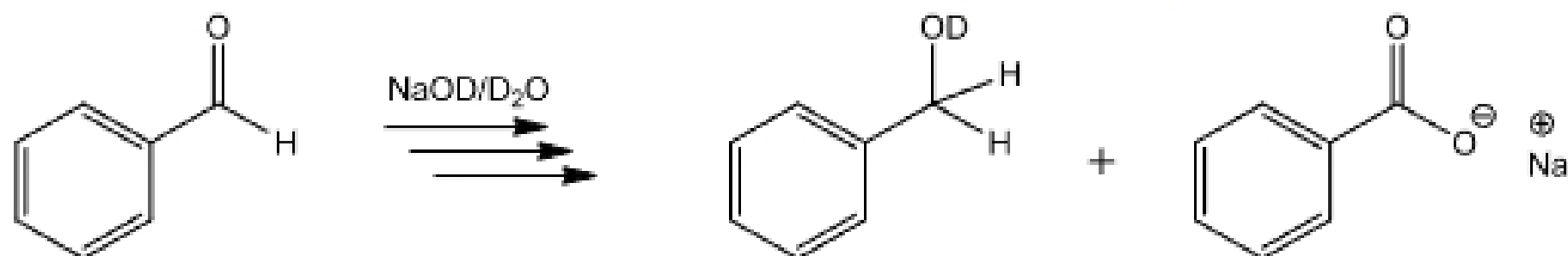
2) Consider the reaction $B^{(-)} + H_3O^{(+)} \rightarrow BH^{(+)} + H_2O$. For the following named bases: **a)** draw the structure of the base, **b)** draw the structure of the conjugate acid, **c)** give the approximate pKa of the conjugate acid, and **d)** give the name of the conjugate acid. *16 points possible*

Base	3-Pentoxide anion	Methanide anion	<i>p</i> -Ethoxyaniline	Cyclopentadienyl anion
Conjugate Acid	pKa_____	pKa_____	pKa_____	pKa_____
	name:	name:	name:	name:

3) Consider the diketone hexane-2,5-dione, which under acidic conditions and high heat is converted to 2,5-dimethylfuran. Devise a reasonable mechanism that accounts for this transformation using the curved arrow notation to account for all bond making and bond breaking. Remember this reaction is run under acidic condition so do not show any negatively charged species in your mechanism. 10 points possible



4) Benzaldehyde reacts with a 50 % solution of aqueous sodium hydroxide to give a 1:1 mixture of two products - benzyl alcohol and benzoate - in the *Cannizzaro Reaction*, a reaction you have not seen before but have the tools to rationalize. When deuterium is used for labeling, the following is observed:

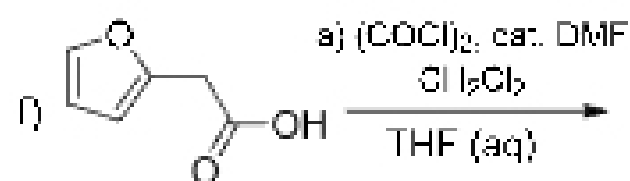


Devise a reasonable mechanism that accounts for this reaction using the curved arrow notation to account for all bond making and bond breaking. 10 points possible

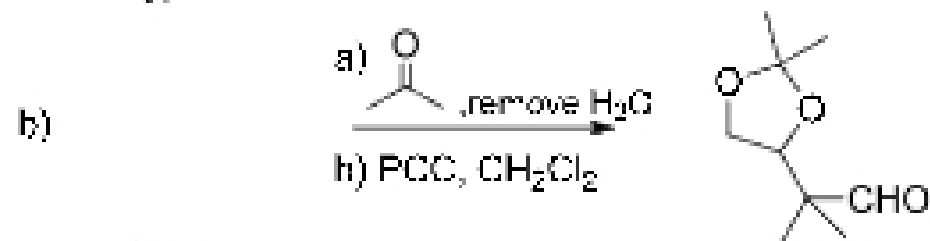
5) Complete the following: *Stereochemistry and regiochemistry are important. 30 points possible*



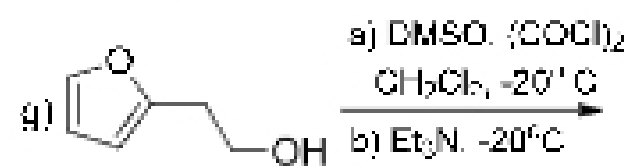
type EAS - Alkylation



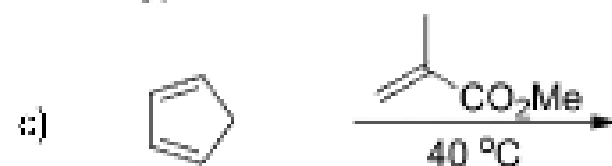
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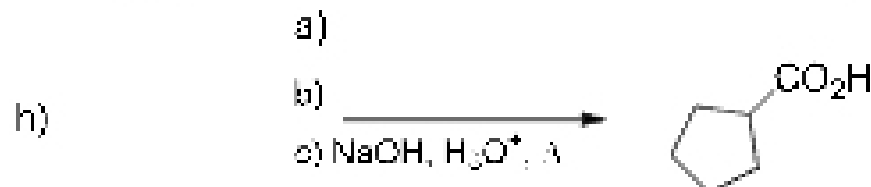
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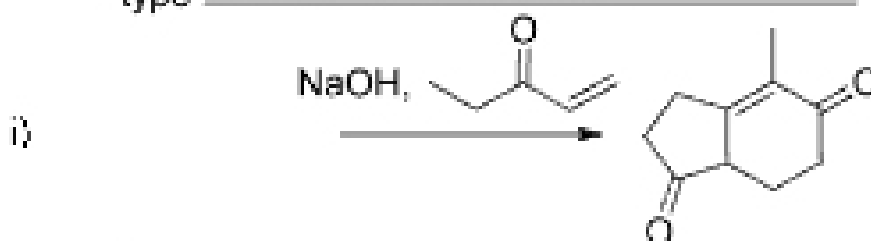
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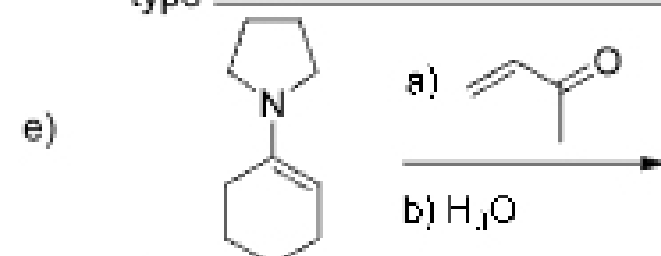
type Malonic Ester Synthesis



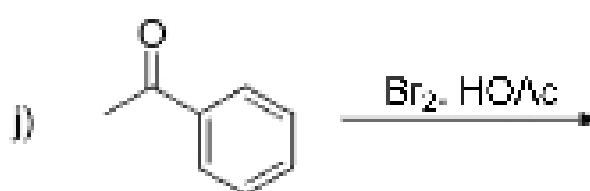
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6) Use molecular orbital analysis (sketch the HOMO/LUMO pi interactions) used to predict the Diels Alder reaction to predict if allyl anion OR allyl cation could react with ethylene in a thermal cycloaddition reaction. *8 points possible*