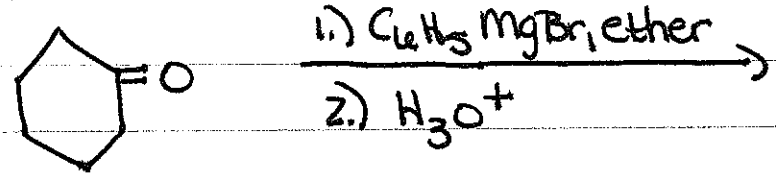
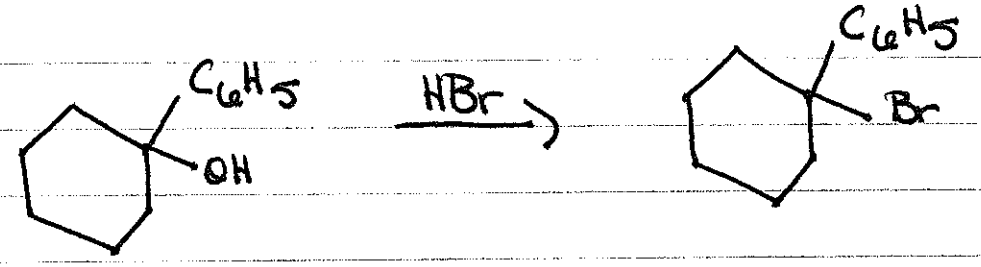
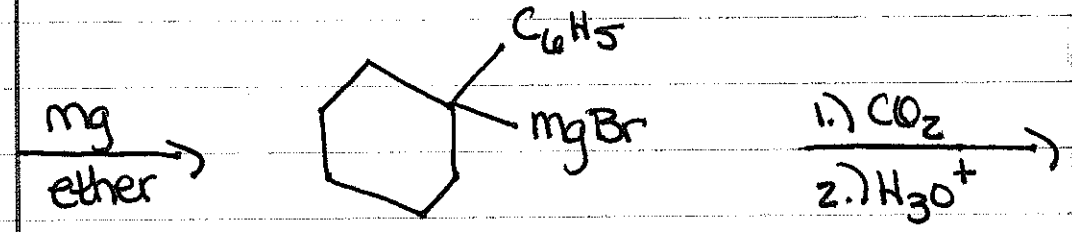
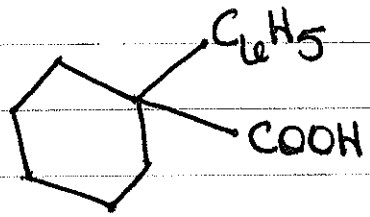
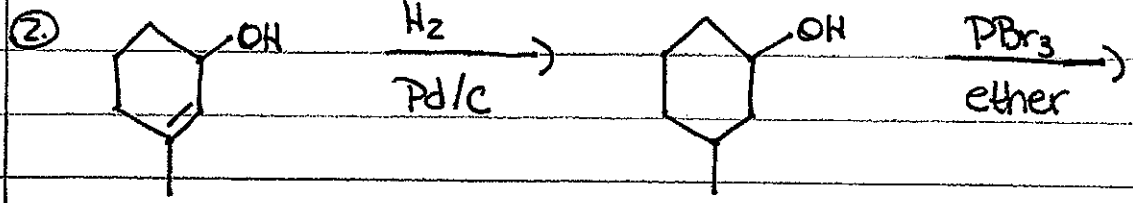
1.

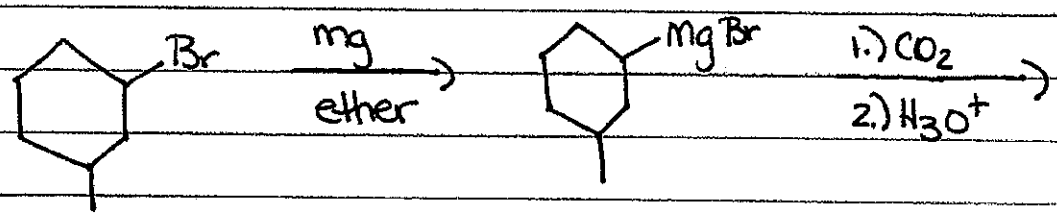

1.) C_6H_5MgBr, ether
2.) H_3O^+

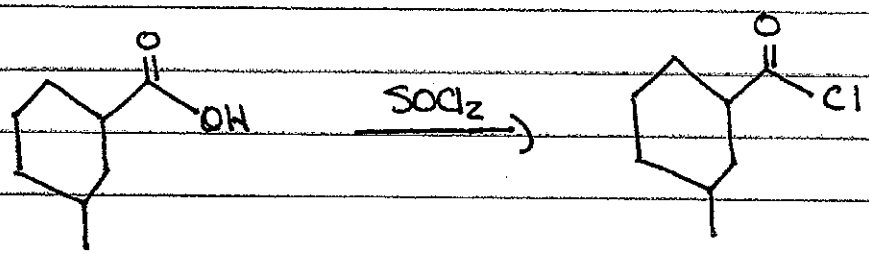

C_6H_5
OH
HBr
C_6H_5
Br

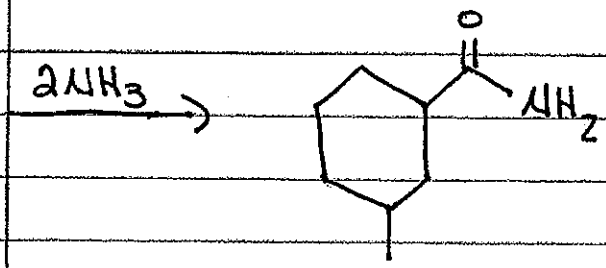

Mg
ether
C_6H_5
MgBr
1.) CO_2
2.) H_3O^+

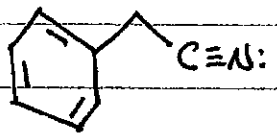

C_6H_5
COOH

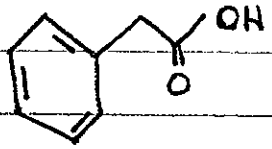
② 
OH
H_2
Pd/C
OH
PBr_3
ether

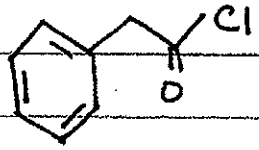

Br
mg
ether
MgBr
1.) CO_2
2.) H_3O^+

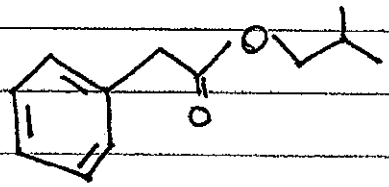

O
OH
$SOCl_2$
O
Cl

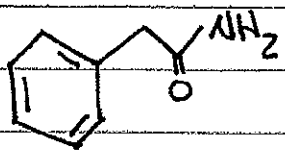

$2NH_3$
O
NH_2

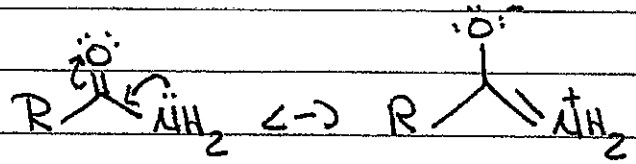
③ A.) 

B.) 

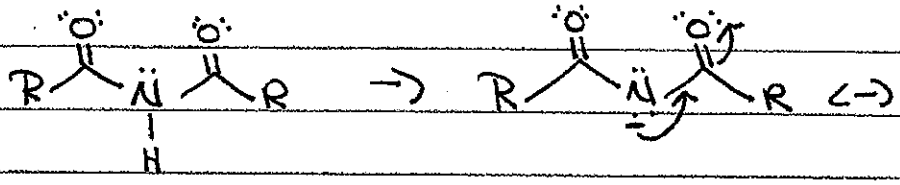
C.) 

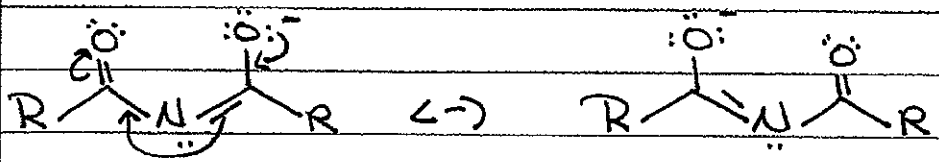
D.) 

E.) 

④ Amide 

home pair e⁻ tied up in resonance

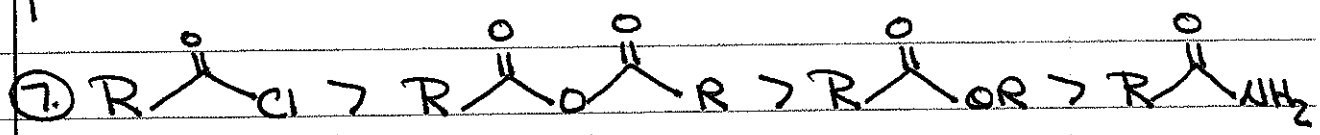
Imide 



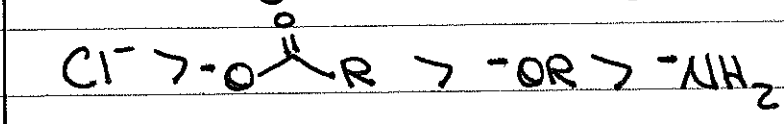
C. Base is Resonance Stabilized

⑤ The byproduct w/ acid chloride + anhydride is an acid that must be neutralized or the amide product will be hydrolyzed to a carboxylic acid. The byproduct w/ ester is an alcohol that is inactive towards the amide product.

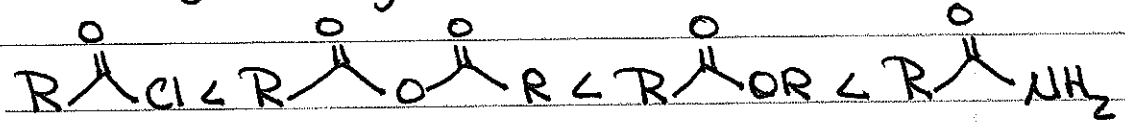
⑥ Acid Chlorides + esters have leaving groups therefore, their tetrahedral intermediates collapse to reform the carbonyl + kick out the leaving group. The 2nd mole of Grignard is needed to react w/ the reformed carbonyl. Aldehydes + Ketones do not have leaving groups therefore, their tetrahedral intermediates are immediately protonated.

⑦ 

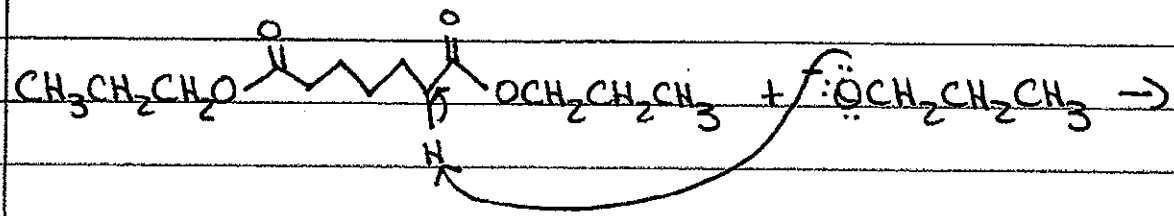
① leaving Group Ability

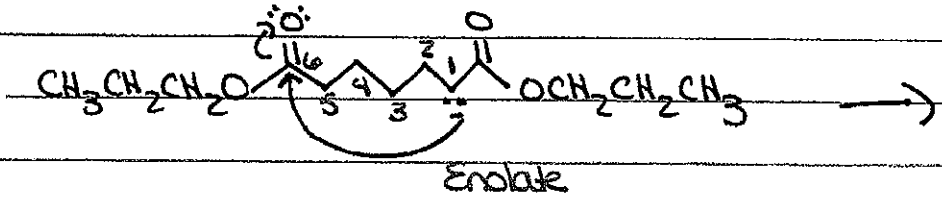


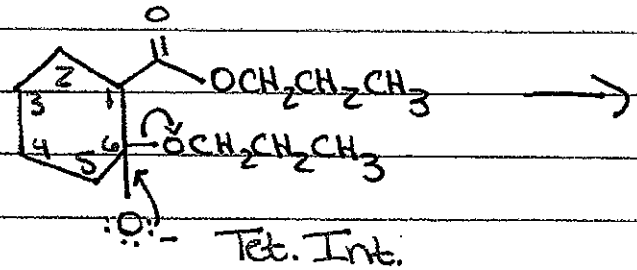
② Stabilization by Resonance

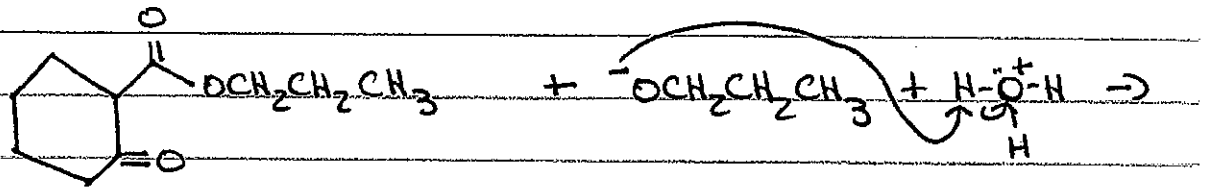


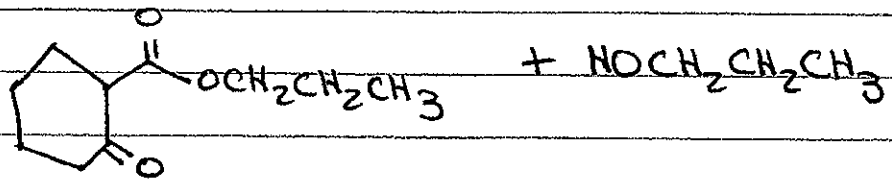
(8.) A.) β-ketoester: Dieckmann (Intramolecular Claisen)



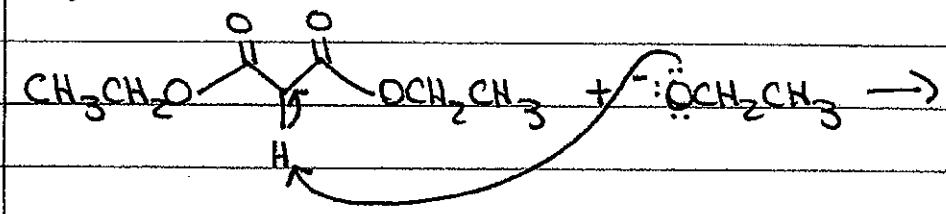


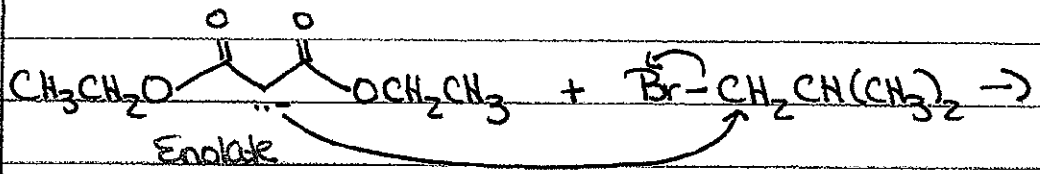


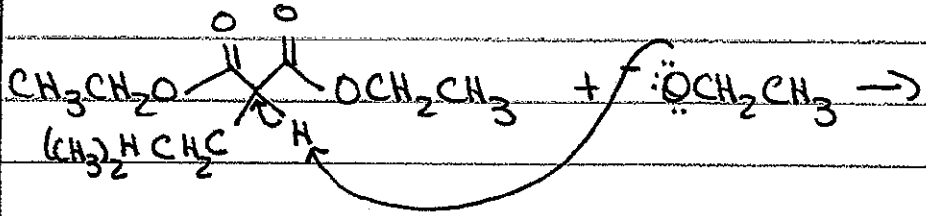


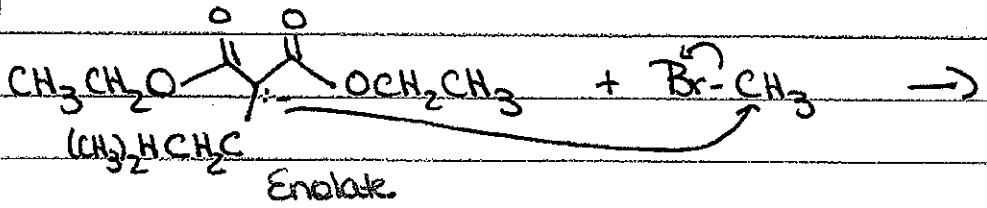


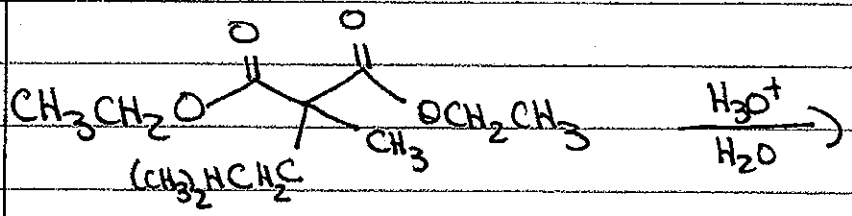
B.) Disubstituted Carboxylic Acid :
Malonic Ester

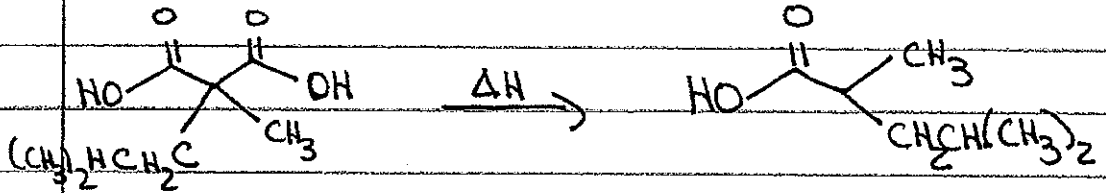


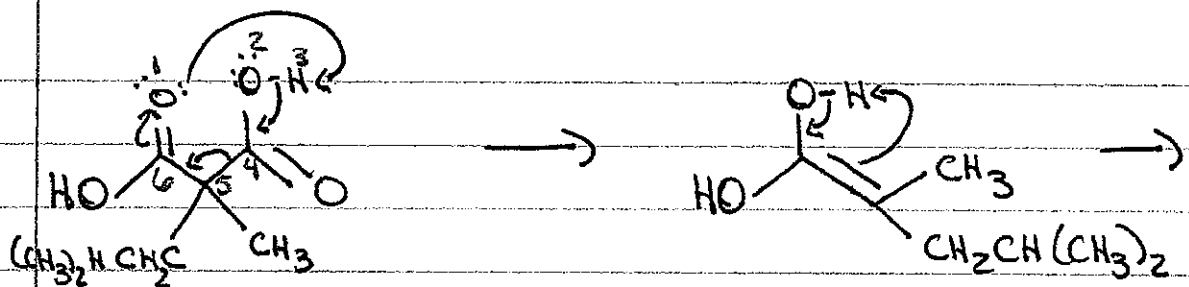






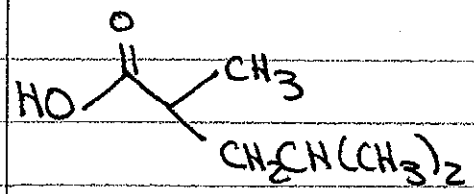




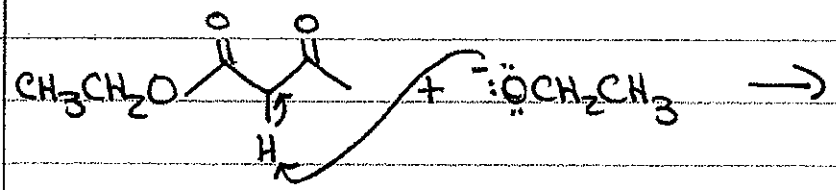


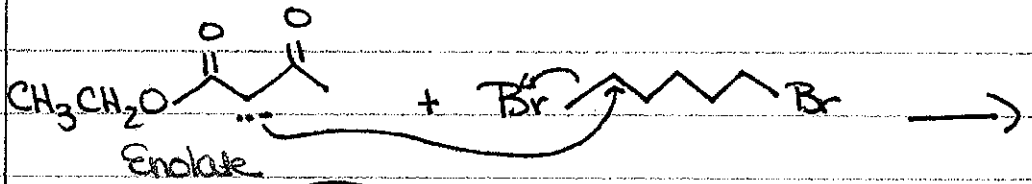
Enol int.

6 membered
Transition State

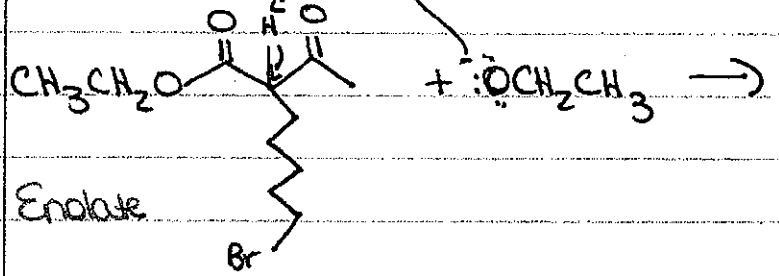


c) Disubstituted ketone : Acetoacetic Ester

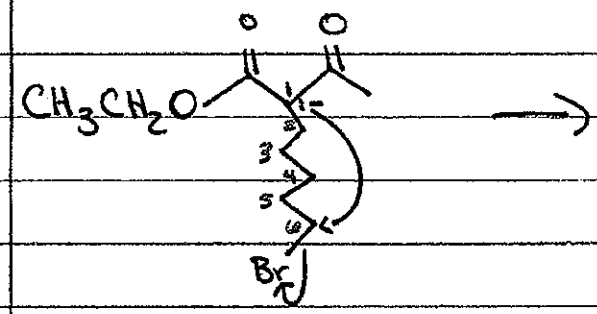


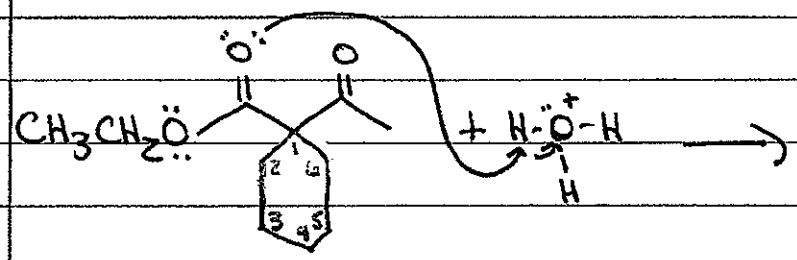


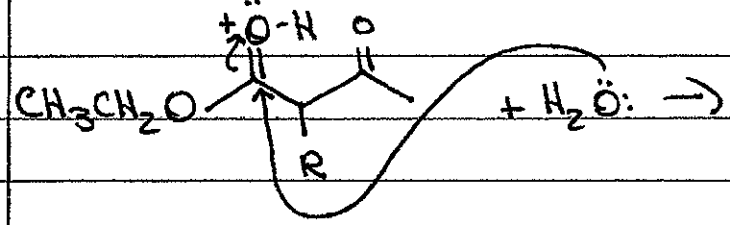
Enolate

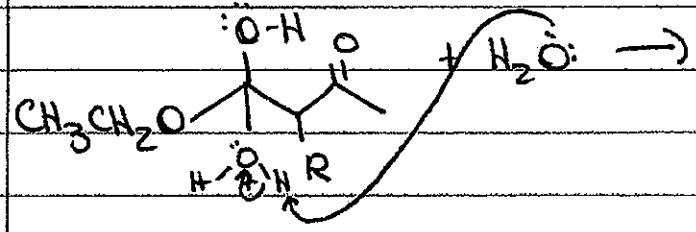


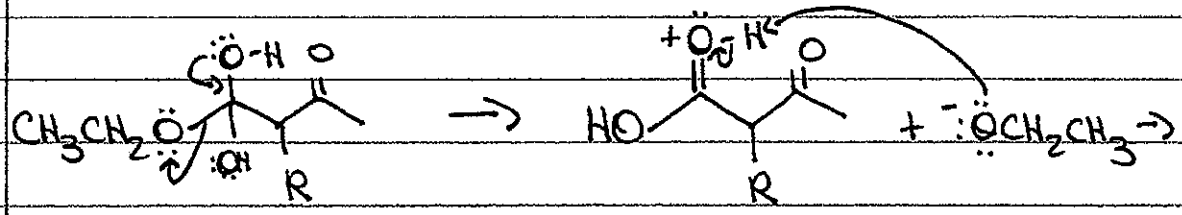
Enolate

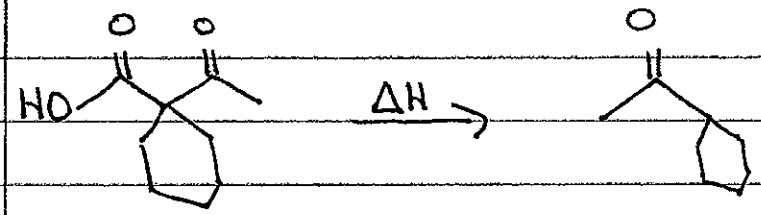




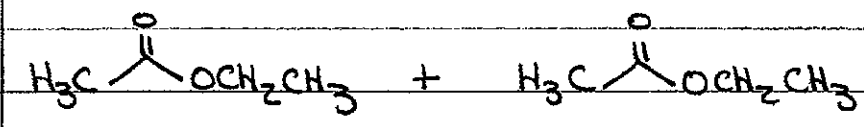


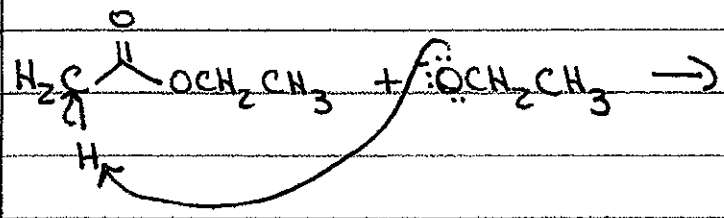


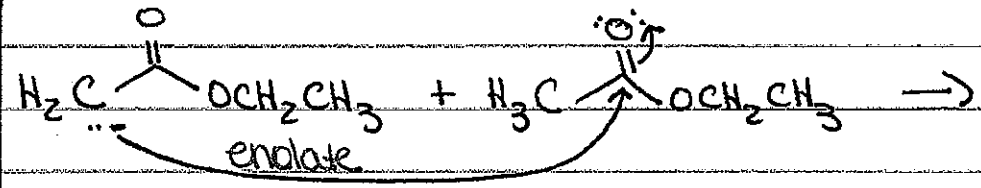


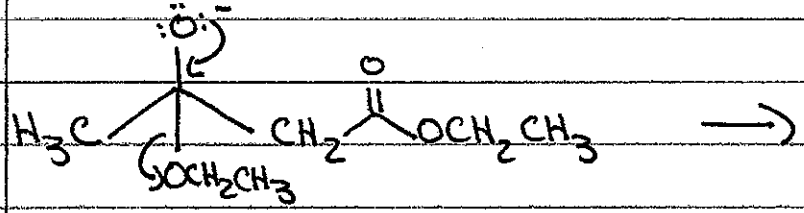


D.) β-Ketoester: Claisen

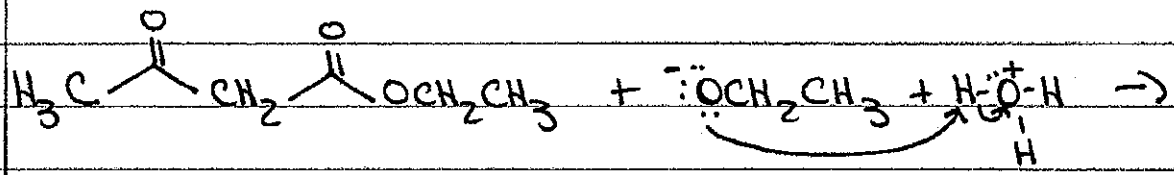


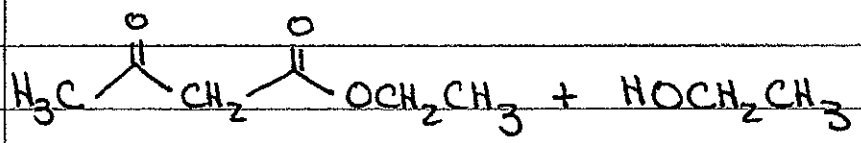






tet. int.





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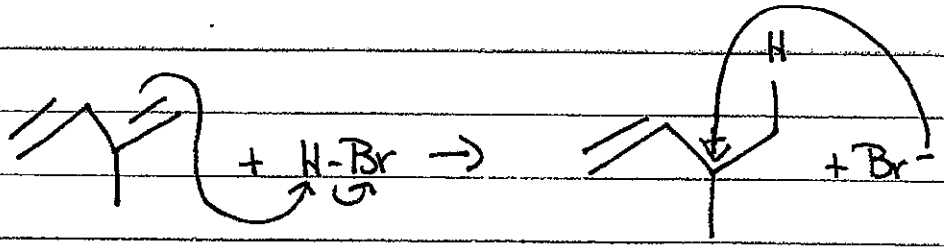
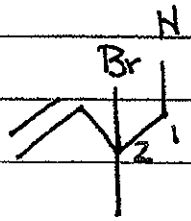
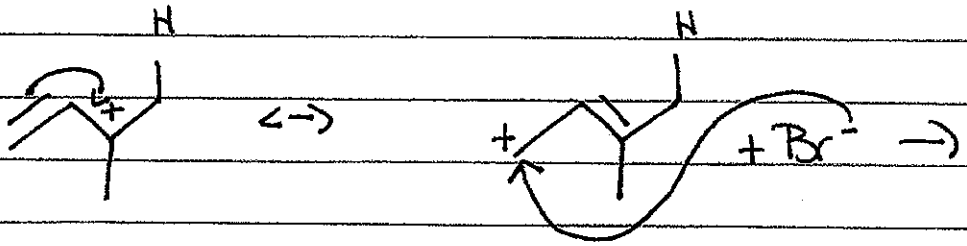


3° Allylic C⁺ int.

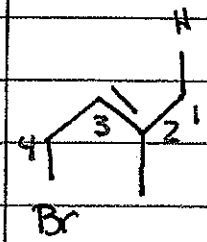


1,2-Addition
Kinetic Product = Most Stable C⁺ int.

Or

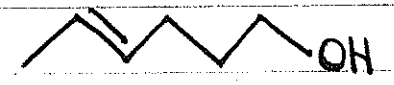


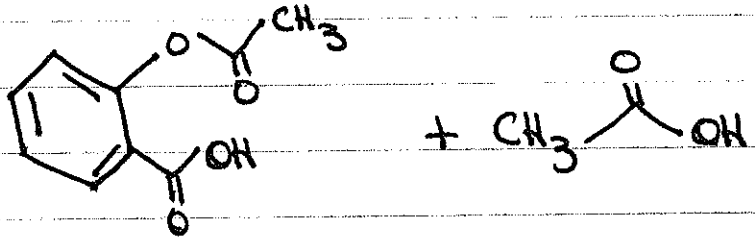
1° Allylic C⁺ int.

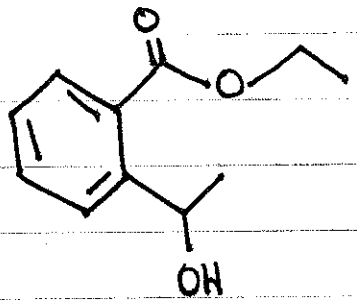


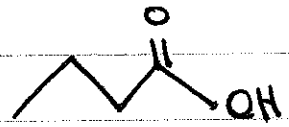
1,4-Addition
Thermodynamic Product = Most Stable Double Bond

10.









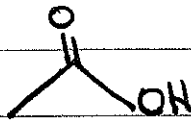
1.) $LiAlH_4$, ether
2.) H_3O^+

1.) DIBALH, toulene
2.) H_3O^+

1.) $LiAlH_4$, ether
2.) H_3O^+

O_2 → on H_2O_2 → on $Cr(VI)$, H_3O^+ → on $KMnO_4$, H_3O^+ → on

Ag_2O, NH_3 → on $AgNO_3$, NH_3

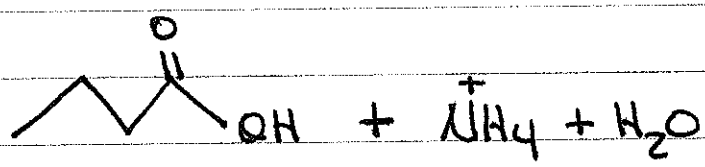


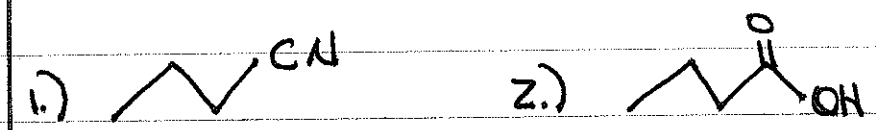
+ CH_3CH_2OH

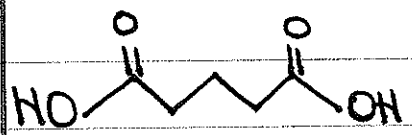
NH_3 →

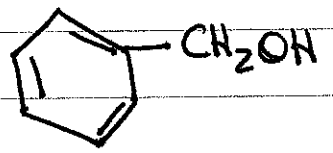
1.) $2\,CH_3MgBr$, ether
2.) H_3O^+

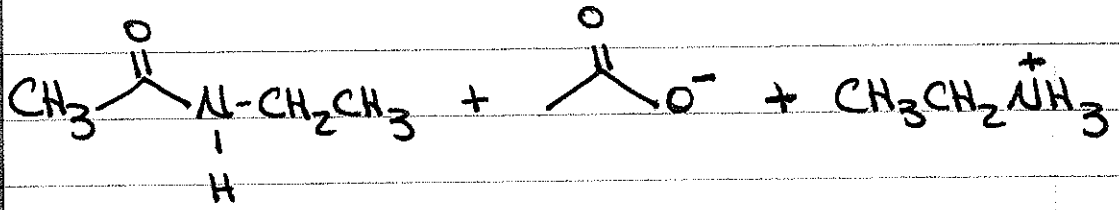
$2\,NH_3$ →

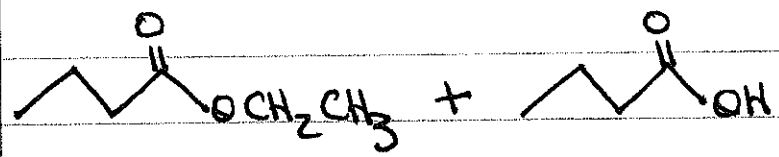


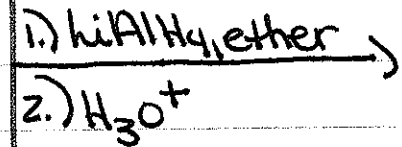


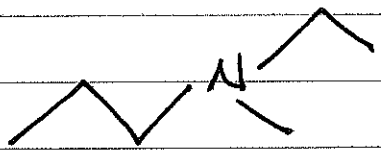


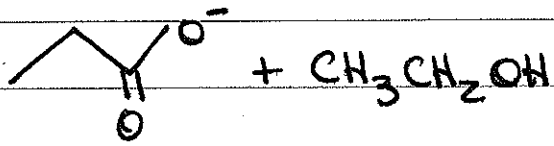


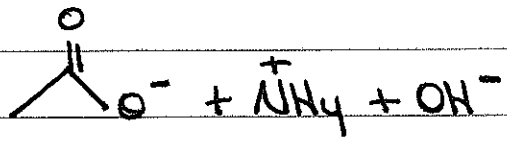


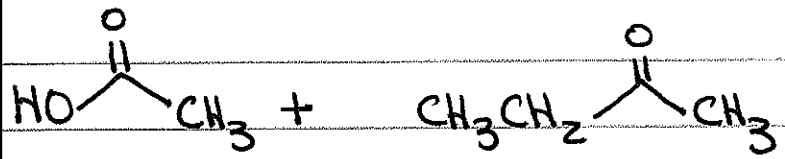












$CO_2 + CH_3COOH$