CH 237-LC Summer 2010 Exam-I June 15, 2010

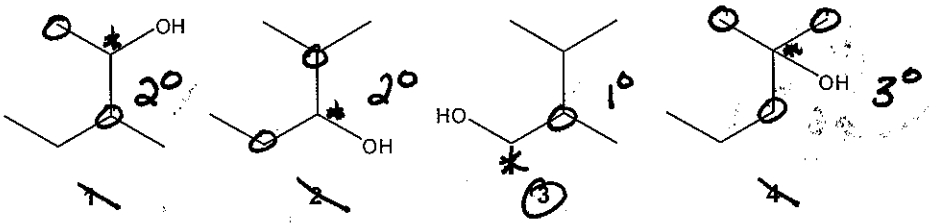
Name Key
(Last) (First)

BOO#

This exam is divided up into two parts, multiple choice and short answer questions. All work must be shown in order to receive full credit. Please turn off all electronic communication devices.

Multiple choice questions: Choose the correct answer and record it on the scantron provided (2 points each).

1. Which of the following is/are primary (1°) alcohols?



(a) only **1** (b) only **3** (c) only **1** and **3** (d) only **2**, **3** and **4**

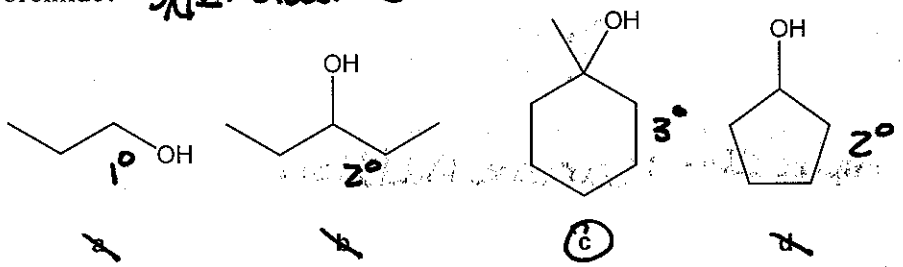
2. Which of the following has the highest boiling point?

(a) 1-butanol (b) 2-butanol (c) *tert*-butyl alcohol (d) 1,4-butanediol most H-bonding

3. Which of the following alcohols reacts fastest with HBr to give the corresponding alkyl bromide? S_N1: stable C^+

(a) methanol (b) ethanol (c) 2-propanol (d) 2-methyl-2-propanol
1° 1° 2° 3°

4. Which of the following alcohols reacts fastest with HBr to give the corresponding alkyl bromide? S_N1: stable C^+



5. What type of reactive intermediate is formed in the reaction of *tert*-butyl alcohol with HCl to give *tert*-butyl chloride? S_N1: C^+

(a) *tert*-butyl radical (b) *tert*-butyl anion
(c) *tert*-butyl cation (d) *tert*-butoxide

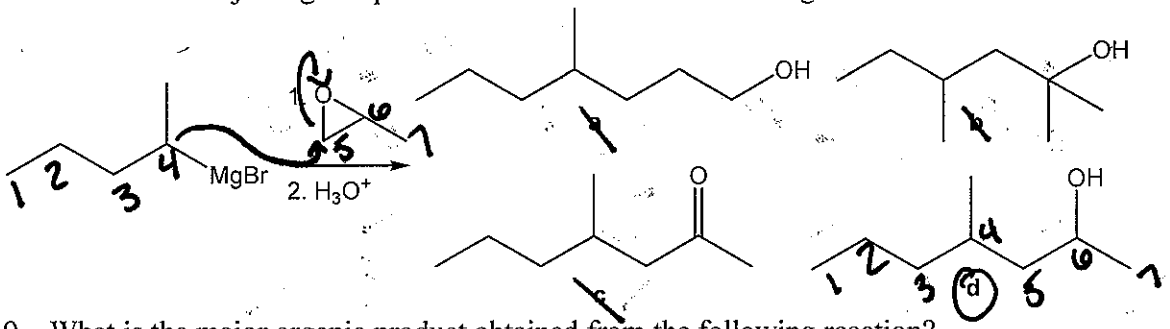
6. What is the major organic product obtained from the following reaction?

(a) (*E*) 2-iodo-2-butene (b) 1-iodo-2-methylpropene
(c) methylcyclopropane (d) (*E*) 2-butene

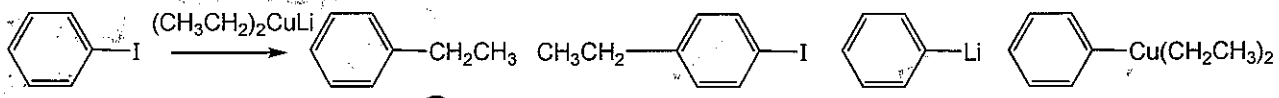
7. Which of the following is the best choice of solvent for the formation of phenylmagnesium bromide by the reaction of bromobenzene with magnesium? No removable H w/ Grignard

(a) water (b) methanol (c) diethyl ether (d) acetic acid

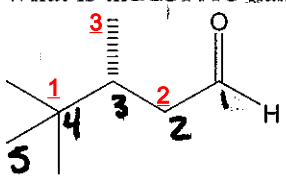
8. What is the major organic product obtained from the following reaction?



9. What is the major organic product obtained from the following reaction?



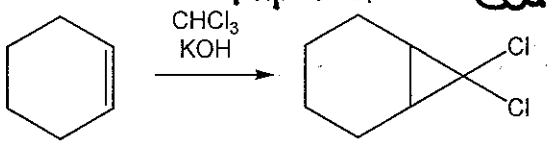
10. What is the IUPAC name of the following compound?



(a) (*S*)-3,4,4-trimethylpentanal (b) (*R*)-3,4,4-trimethylpentanal
(c) (*R*)-3-*tert*-butyl-3-methylpropanal (d) (*R*)-3-*tert*-butylbutanal

11. What reactive intermediates are involved in the following reaction?

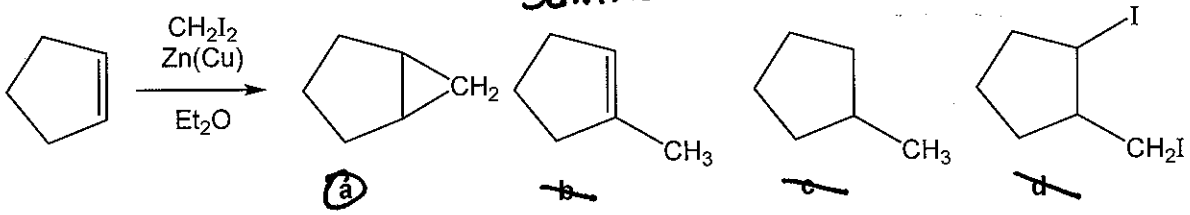
Alpha Elim: Carbene Addition



(a) dichlorocarbene (Cl_2C:)
(b) the trichloromethyl cation (Cl_3C^+)
(c) the cyclohexyl carbocation
(d) the cyclic chloronium ion derived from cyclohexene

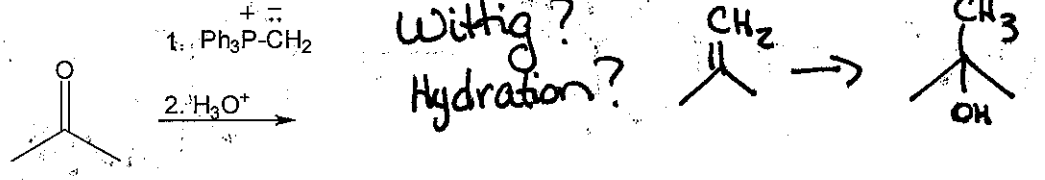
12. What is the major organic product obtained from the following reaction?

Simmons Smith: Carbene Addition



13. What is the major organic product obtained from the following reaction?

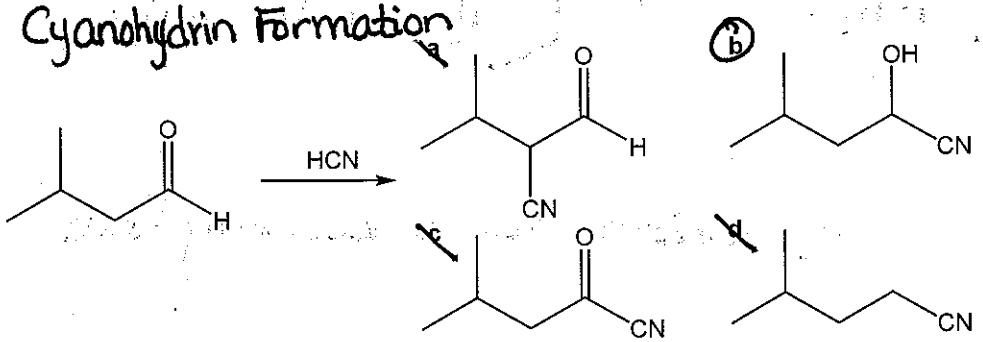
* Asking Dr. Velu



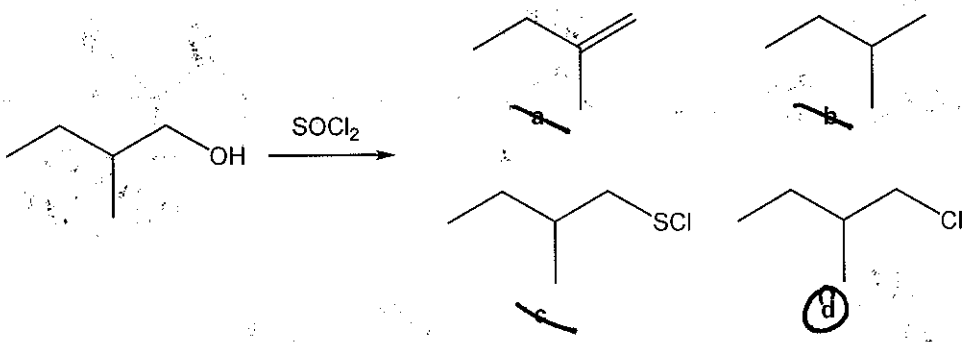
(a) 1-butene (b) 2-butene (c) 2-methylpropene (d) 2-methyl-1-propanol

14. What is the major organic product obtained from the following reaction?

Cyanohydrin Formation

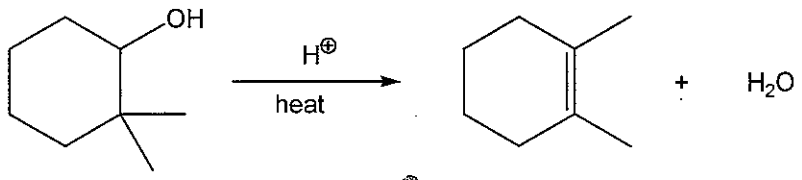


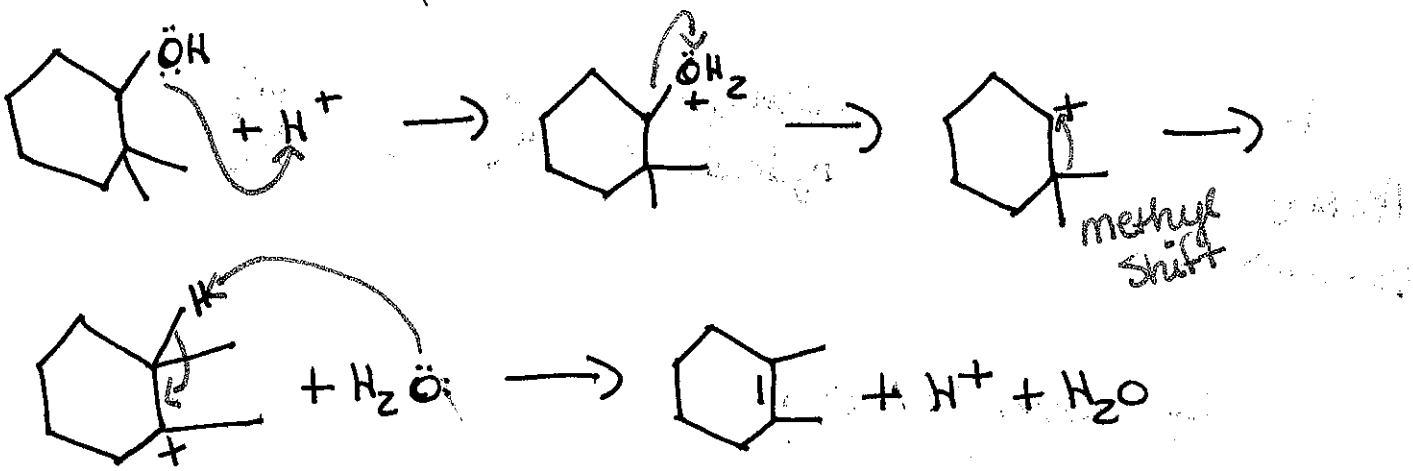
15. What is the major organic product obtained from the following reaction?



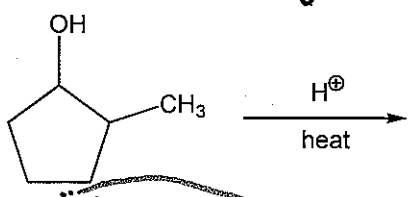
Short answer questions.

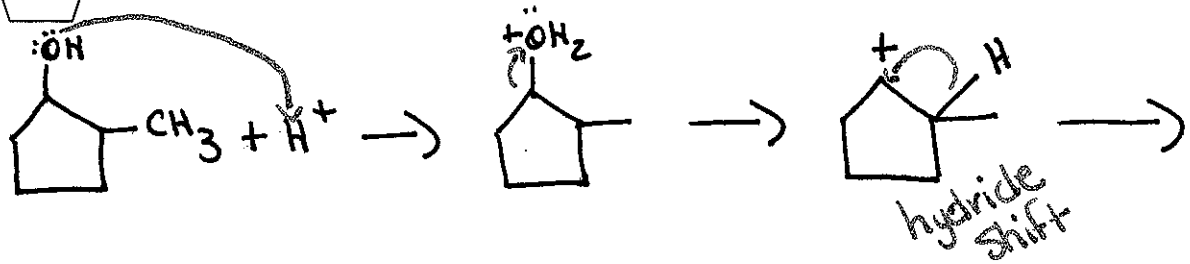
1. Propose a mechanism to account for this acid catalyzed dehydration. All electron movement must be indicated by arrows (10 points).

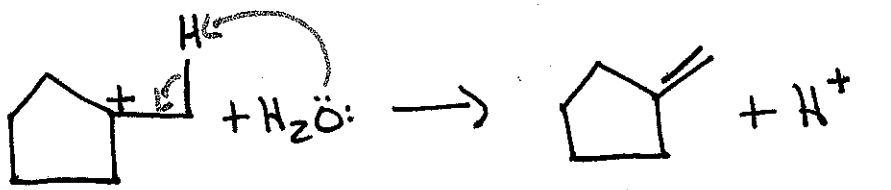


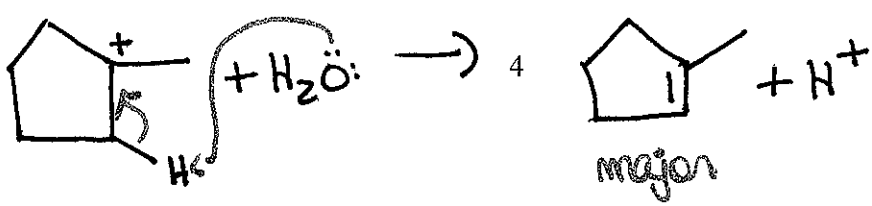


2. Draw the structural formulas for the alkenes formed on acid catalyzed dehydration of 2-methylcyclopentanol. Identify the major product and give reasons for this being the major product (10 points).







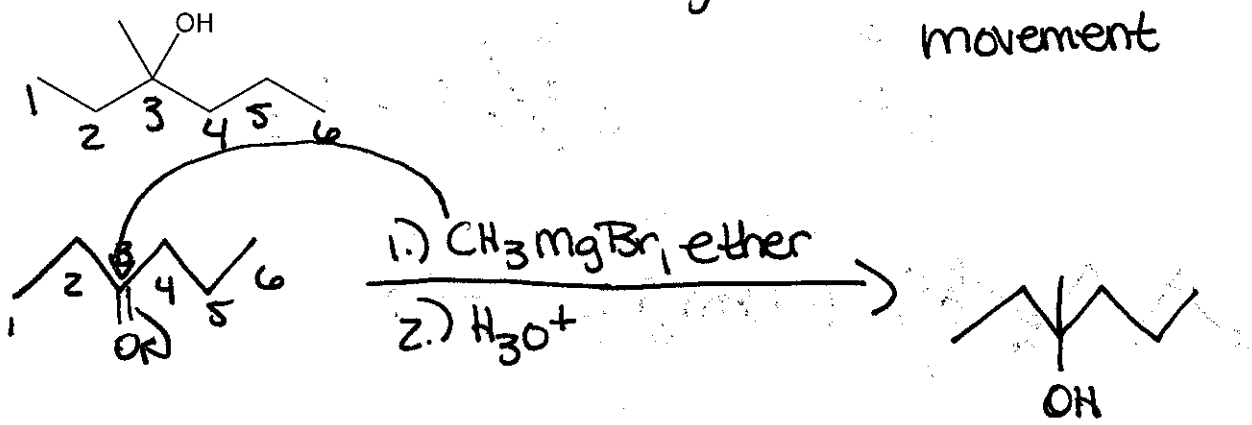


Mechanism was unnecessary here

Zaitsev's Rule: internal C=C are more stable than external C=C

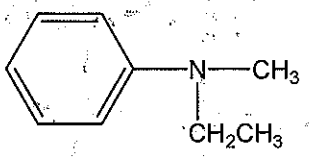
3. Suggest a synthesis for the following tertiary alcohol starting from a ketone and Grignard reagent (10 points).

Synthesis = No e⁻ movement



→ No e⁻ movement

4. Propose a synthesis of the following tertiary amine using a reductive amination reaction (10 points).

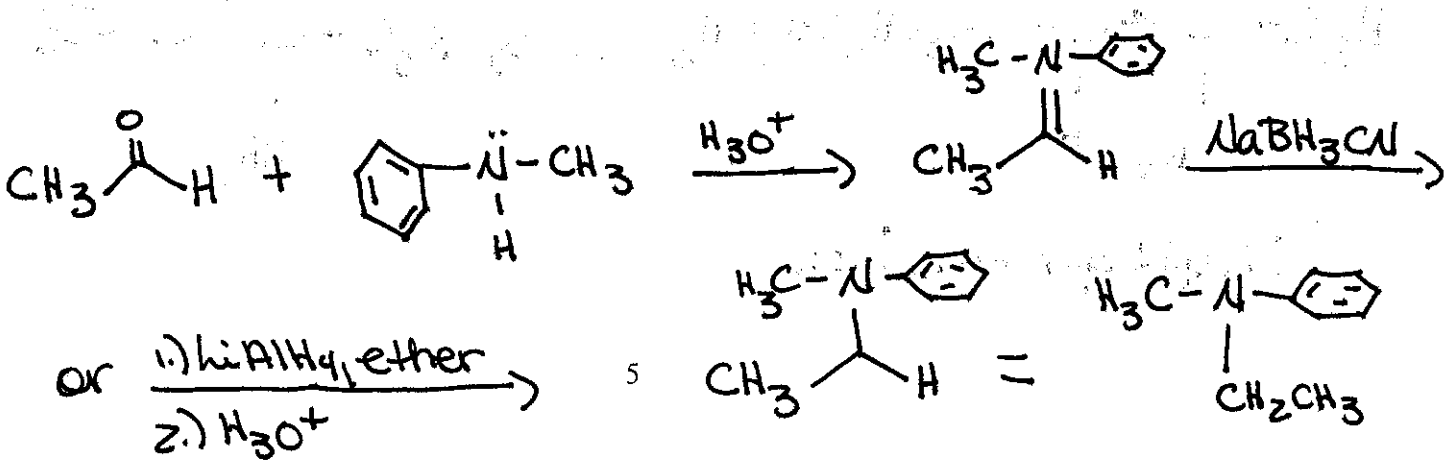


1 way to make a 3° amine at this point

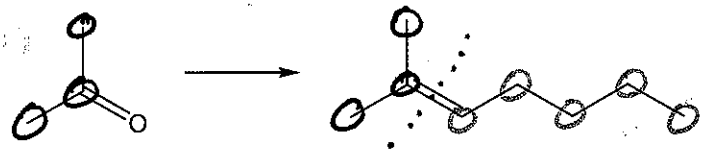
Reduce Enamine

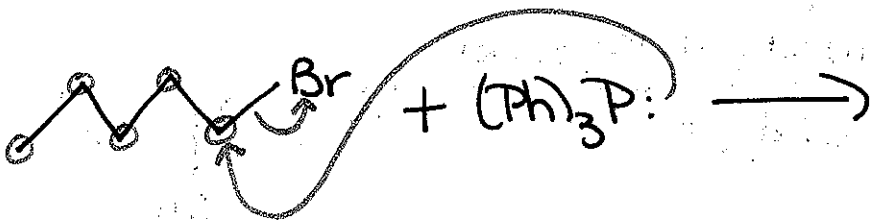
1 way to make enamine

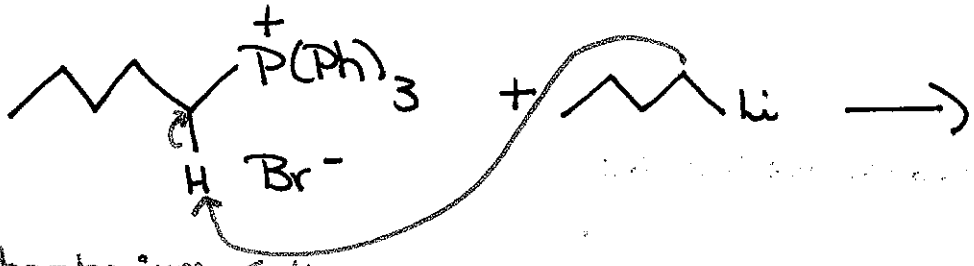
Ketone or Aldehyde + 2° Amine



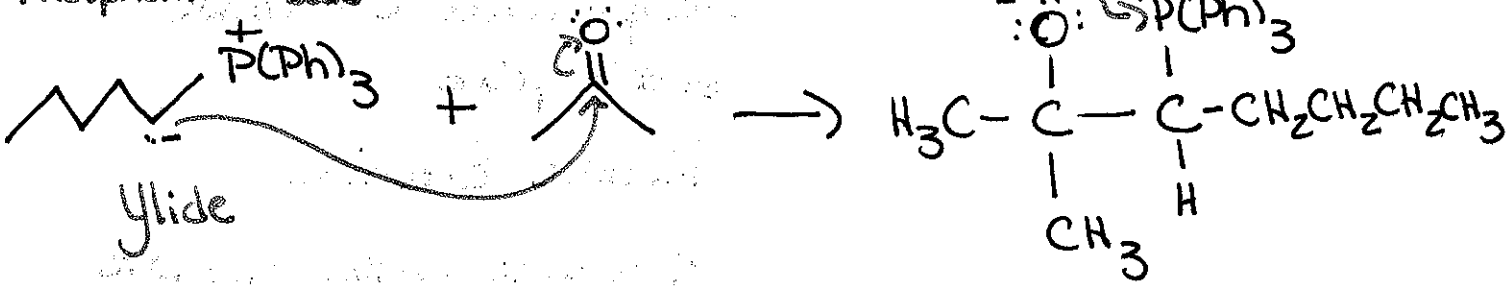
5. Show how to bring about the following conversion using a Wittig reaction (10 points). (Formation of Phosphonium salt and Ylide as intermediate products must be clearly shown).



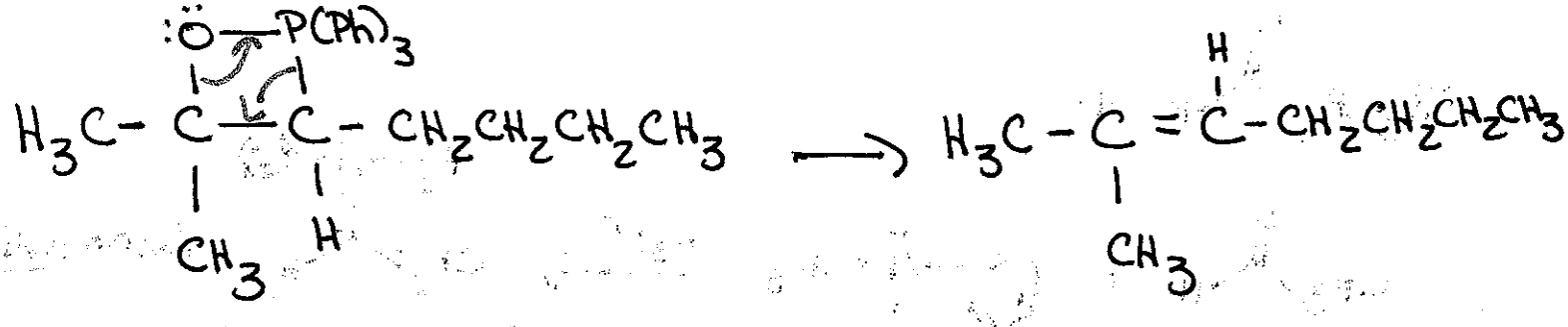




Phosphonium Salt

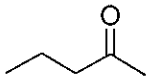
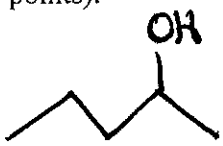


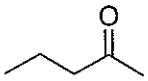
Betaine int.

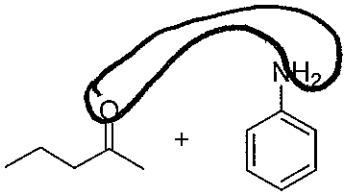
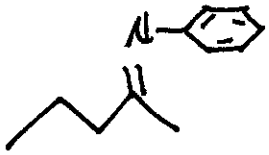


Oxaphosphetane int.

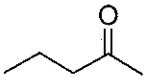
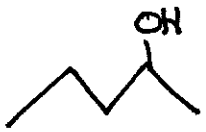
6. Give the major product for the following reactions (20 points).

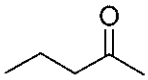
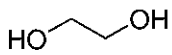
(a)  $\xrightarrow[2.\ H_3O^+]{1.\ LiAlH_4}$ 

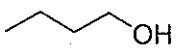
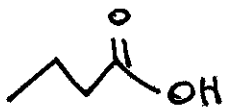
(b)  $\xrightarrow{Zn(Hg)/HCl}$ 

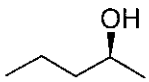
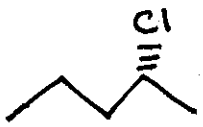
(c)  $\xrightarrow{H^+}$ 

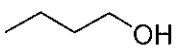
1° Amine

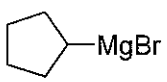
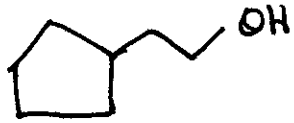
(d)  $\xrightarrow[2.\ H_3O^+]{1.\ NaBH_4}$ 

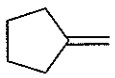
(e)  +  $\xrightarrow{H^+}$ 

(f)  $\xrightarrow{H_2CrO_4}$ 

(g)  $\xrightarrow{SOCl_2}$ 

(h)  $\xrightarrow{PCC}$ 

(i)  $\xrightarrow[2.\ H_3O^+]{1.}$ 

(j)  + CH_2I_2 $\xrightarrow{Zn(Cu)}$