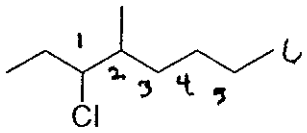
Exam II: Organic Chemistry I Alfred State College _____/100 pts
Monday 14 Nov 2016

Your Name: _____ 1 pt

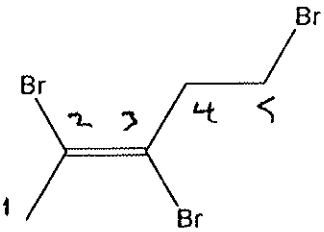
1. Names and Structures (1 pts each/8 points total)
Provide the correct name or structure below. Use IUPAC rules unless otherwise indicated.

a)



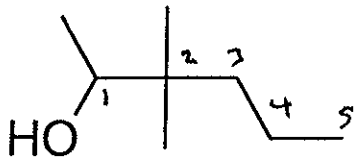
1-ethyl-2-methylhexyl chloride
functional group form

b)



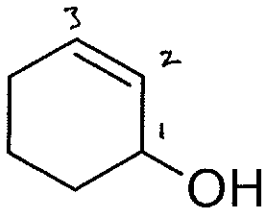
E-2,3,5-tribromo-2-pentene
IUPAC (include E,Z if pertinent)

c)



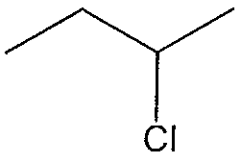
1,2,2-trimethylpentyl alcohol
functional group form

d)



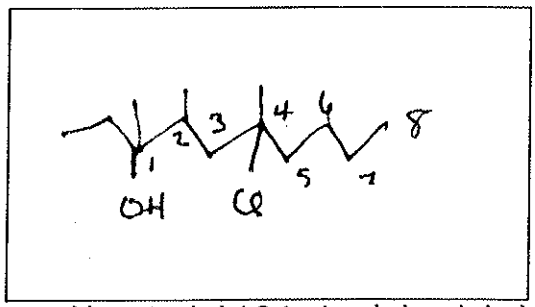
2-cyclohexenol
IUPAC

e)

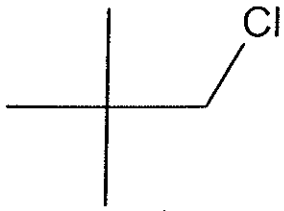


sec-butyl chloride
common name

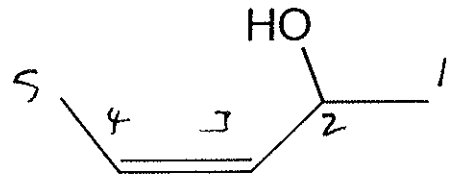
f)



4-chloro-1-ethyl-1,2,4-trimethyloctyl alcohol



neopentyl chloride
Common name



Z-3-penten-2-ol
IUPAC (include E,Z if pertinent)

____/9 (includes name)

2. Reactions to and from Alkyl Halides: Basic Facts and Vocabulary (11 pts)

a) Name of the crucial intermediate formed in an S_N1 substitution carbocation:

b) What is the critical species that must form before either S_N1 or S_N2 substitution proceeds ?
protonated alcohol

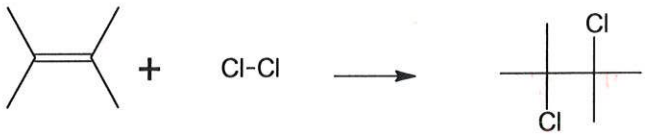
c)When addition of HBr across a double bond adds Br to the side containing the smaller groups=>
ant: - Markovnikoff addition.

c) Name of the transition state at the top of the activation diagram for an S_N2 substitution:
5-coordinated, activated complex

d) Whose (variously spelled Russian) rule decides which is the most likely alkene formed from alkyl halides ? Saytsev (Zaitsev)

e) Which mechanism works best with mildly polar, aprotic solvents ? S_N2

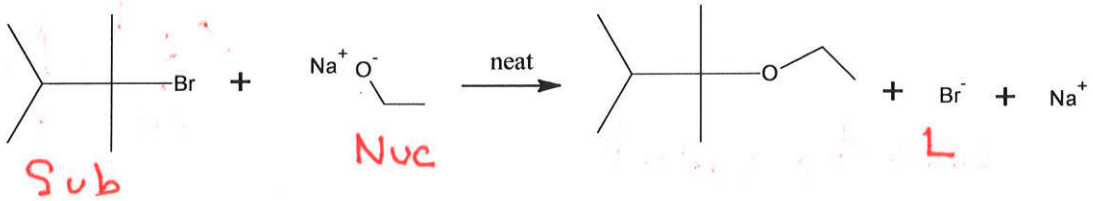
f) What solvent is commonly employed in the reaction shown below: CCl_4 (dry)



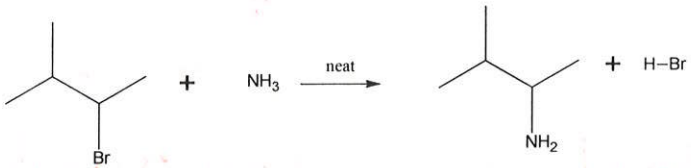
g) The reaction shown to the left is an example of what class of reactions ?
Elimination

h) Term used to describe when a left handed alcohol is converted to a mixture of left and right-handed chlorides racemic (racemize)

i) In the reaction below, clearly identify the substrate (Sub), nucleophile (Nuc) and leaving group (L): (1 pt)



k)) What reaction class is illustrated by the reaction below ?
Substitution



I. Mechanisms: Just the Facts (14 pts total)

In each pair, circle the outcome associated with S_N1 halogenation of alcohols (6 pts)

a)	rate of reaction increases with non-protic polar solvents	rate of reaction increases with polar protic solvents
b)	works only on 1° alcohols	works on 2° and 3° alcohols
c)	rate varies sharply with attacking halogen	rate is indifferent to halogen
d)	rearrangements don't occur	rearrangements occur
e)	both alcohol and halide affect rate	only alcohol affects rate
f)	rate limiting step involves 5-coordinate complex	rate limiting step involves 3-coordinate intermediate

In each pair, circle the outcome associated with S_N2 halogenation of alcohols (7 pts)

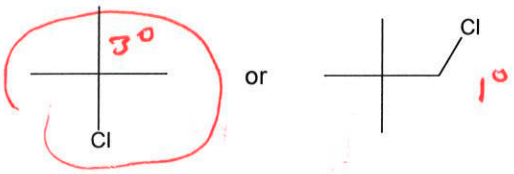
d)	rate indifferent to H+ concentration	rate increases with H+ concentration
e)	unimolecular	bimolecular
f)	requires reflux	reflux unncesssary
g)	activated complex is 3-coordinated	activated complex is 5-coordinated
h)	rearrangements occur	rearrangements don't occur
a)	products are racemized	product is inverted vs initial alcohol
b)	rate increases in polar, protic solvent	rate increases in weakly-polar,non-protic solvent
c)	rate indifferent to Br^- concentration	rate increases with Br^- concentration

IV. Mechanistic Sooth-Saying (1 pt each/9 pts total)

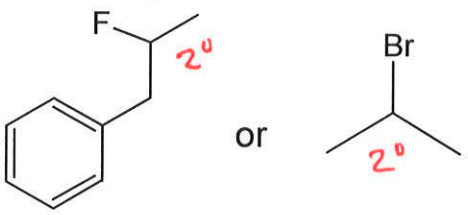
On speed (1 pt each/4 pts total)

Which will react faster assuming HBr/ aqueous w/reflux is applied in each case ?

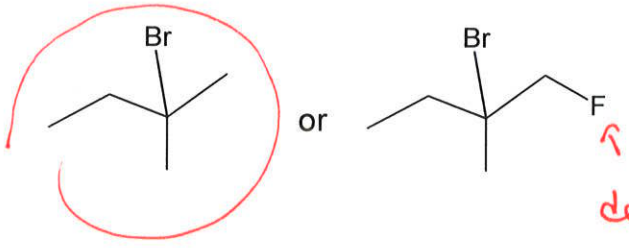
a) 1° n-butanol or sec-butanol 2° **or ~ same**

b) 

or ~same

c) 

or ~same

d) 

or ~same

destabilizing

___/18

Matchmaking (1 pt ea/5 pts total)

Match the mechanism to the acronym — **acronym**

Match from list

a) Mechanism for conversion of methyl bromide to an methyl alcohol S_N2 — S_n1

b) Mechanism for bromination of an alkane: Rad — E1 (elimination)

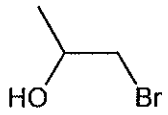
c) Mechanism for conversion of t-butanol to t-butyl bromide: S_N1 — S_n2

d) Mechanism for conversion of ctclohexanol to cyclohexene : E1 — RAD(free radical)

e) Mechanism involving formation of a racemic product ~~S_N2~~ S_N1

V. Trivial Pursuit fill-in (1 pt each/5 pts total)

a) $NH(CH_3)_2$ an example of a(n) amine

b) 

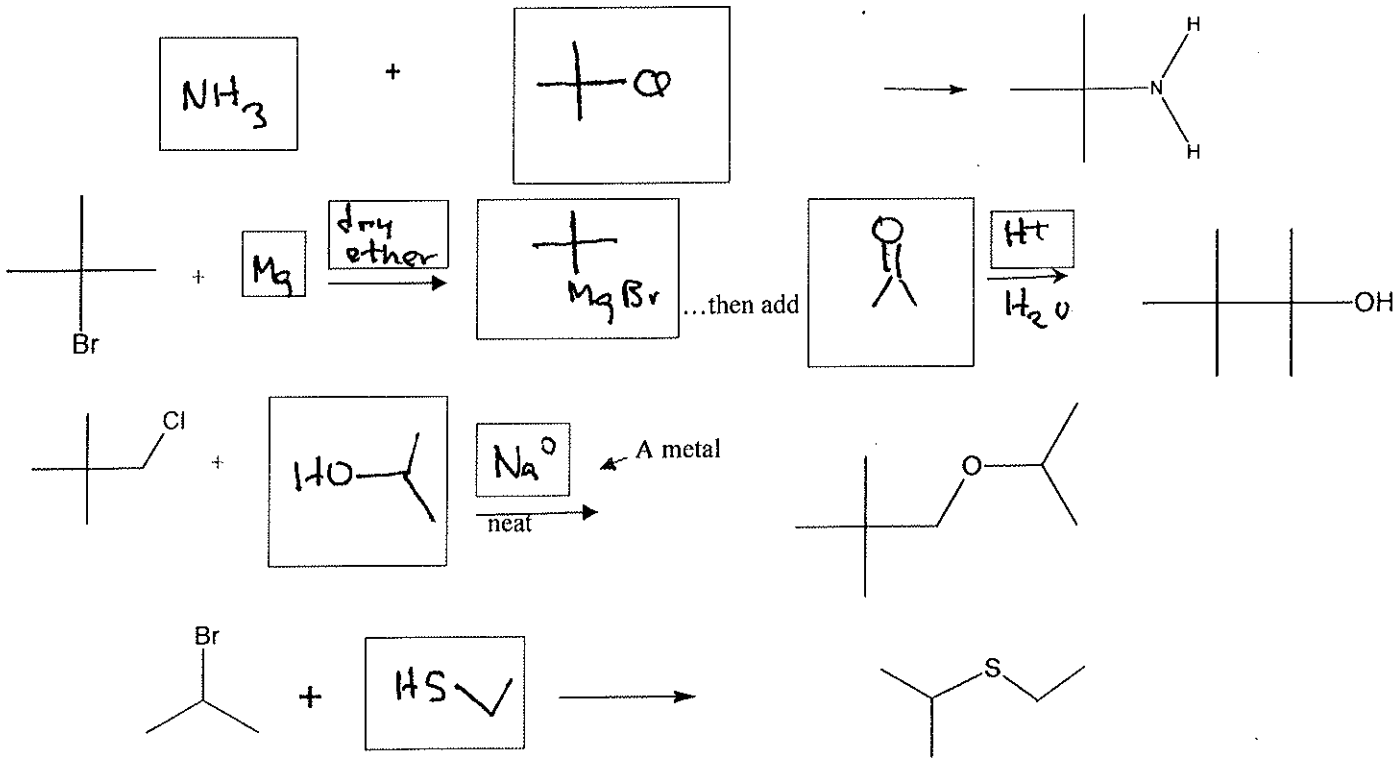
What is my class name ? halohydrin
(hint: has an angelic component)

c) Entgegen is the German word for against or opposed

d) Name of synthetic route that leads to bigger alkanes Corey-House

e) Reaction using Mg, dry ether and carbonyls to bigger ROH: Grignard

VI) Little Boxes (42 pts)



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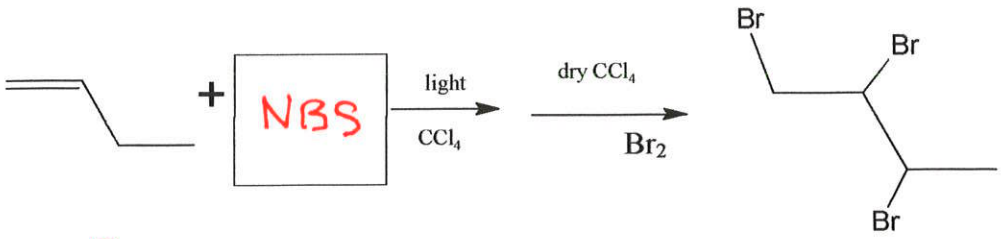
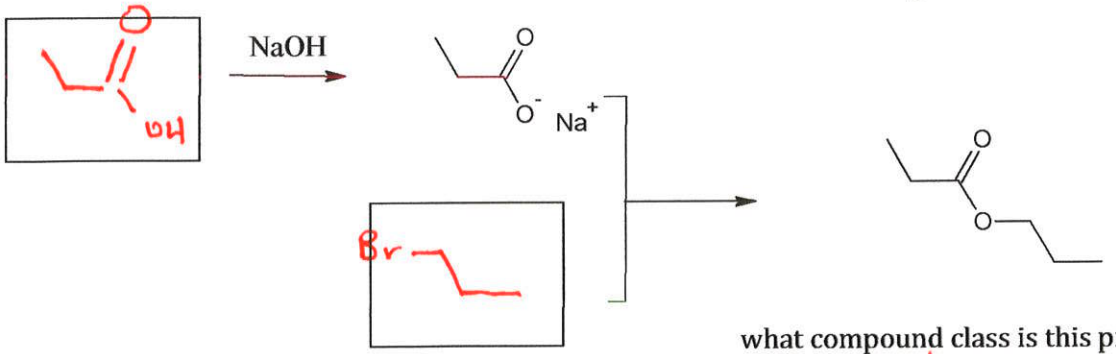
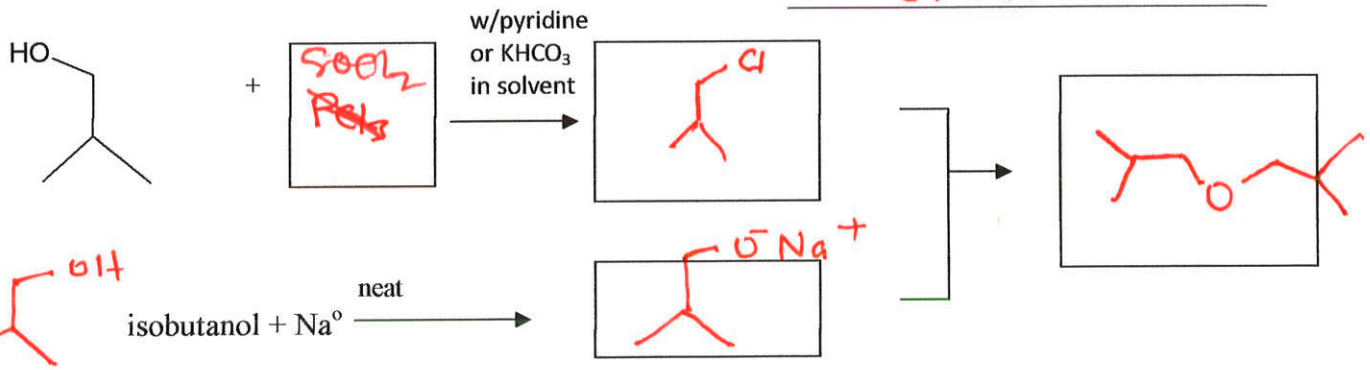
VI) little boxes (continued)

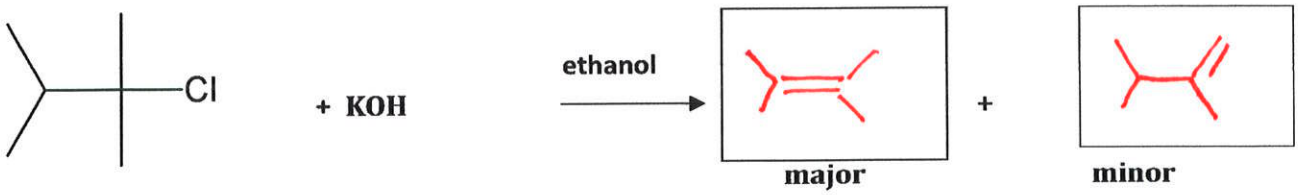


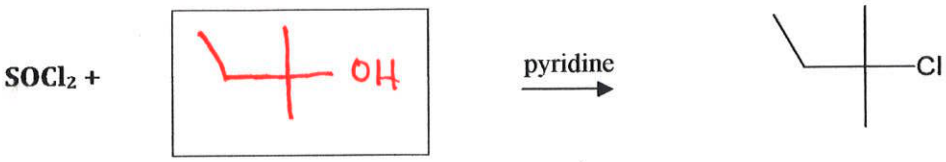


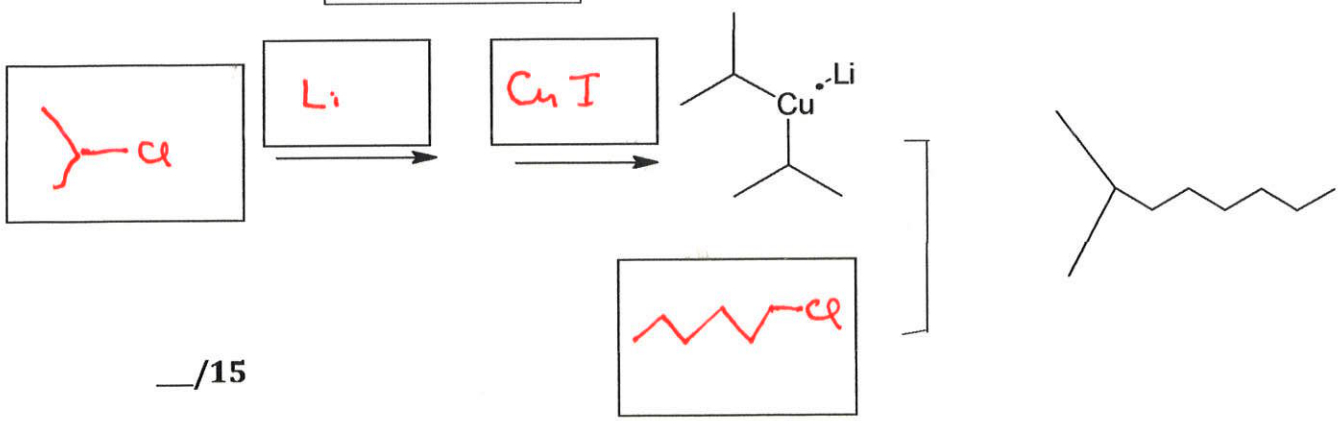
what compound class is this product ?

ester









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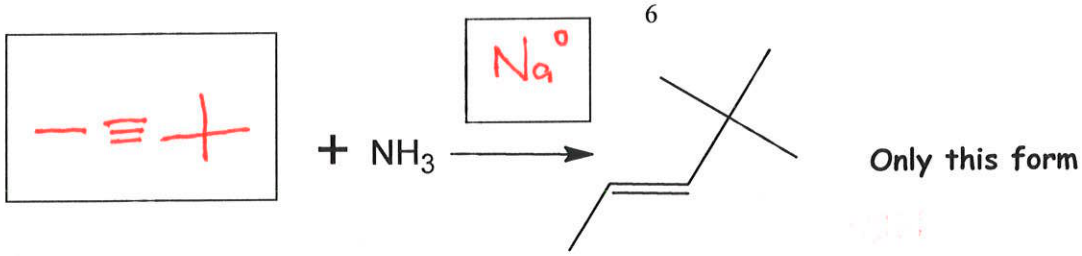
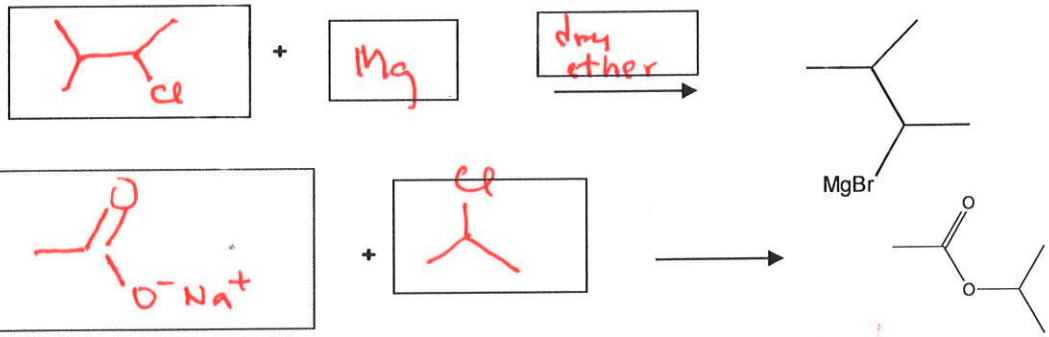
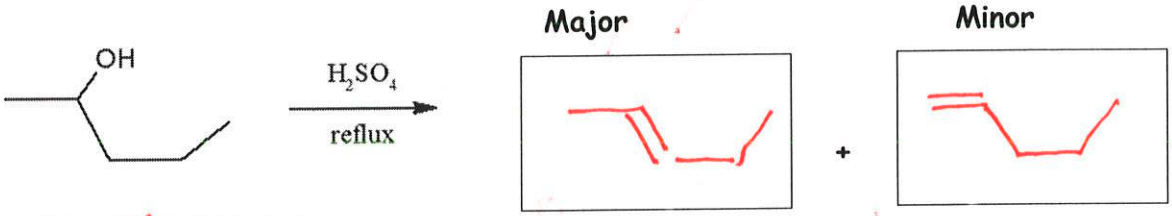
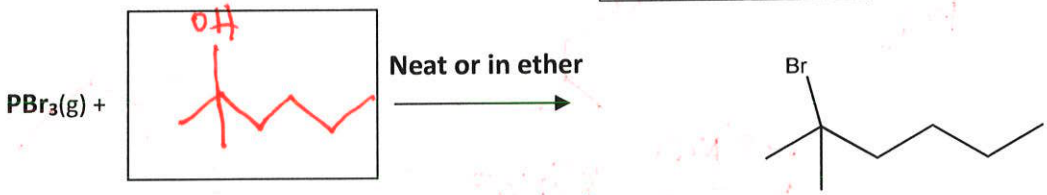
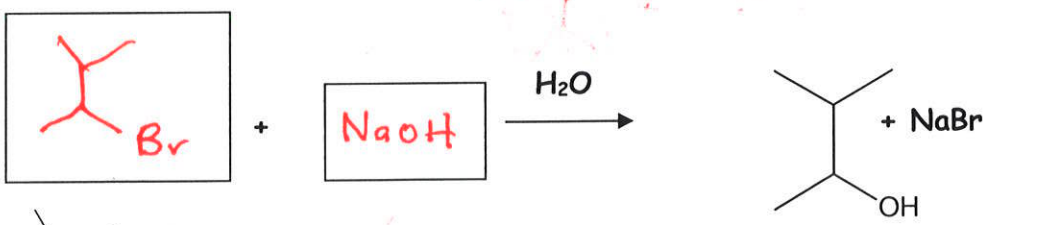
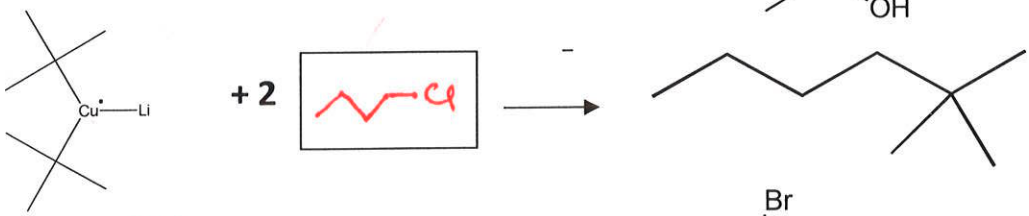

Na°
+ NH3
Only this form

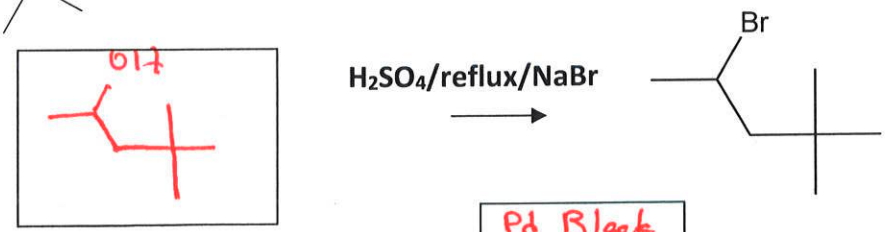

Cl
+
Mg
dry ether
MgBr
O⁻ Na⁺
+
Cl
O
O

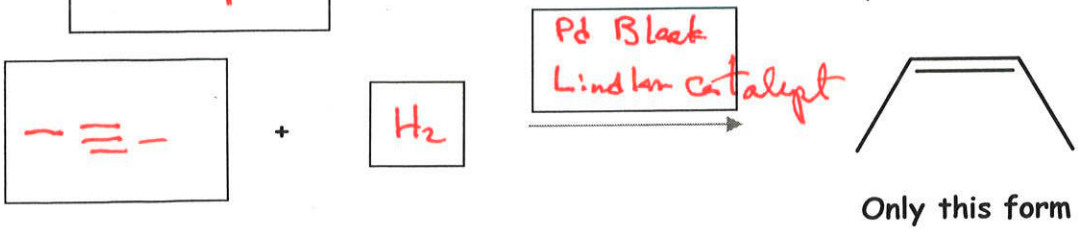

OH
H2SO4
reflux
Major
Minor
+


PBr3(g) +
OH
Neat or in ether
Br


Br
+
NaOH
H2O
+ NaBr
OH


Cu
Li
+ 2
Cl


OH
H2SO4/reflux/NaBr
Br


+
H2
Pd Black
Lindlar catalyst
Only this form

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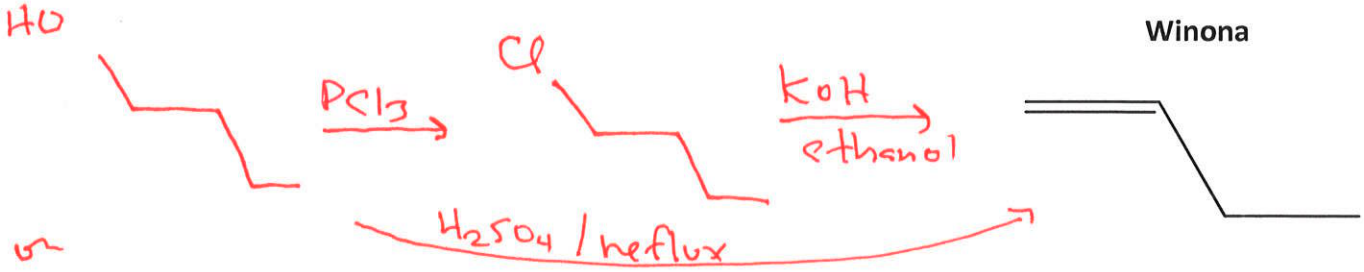
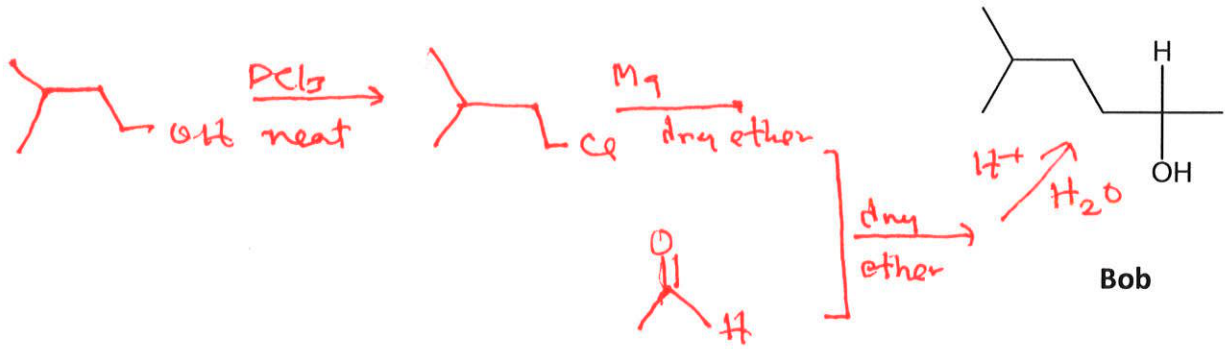
VII. Willie Nelson Time: On the Road again (10 pts)

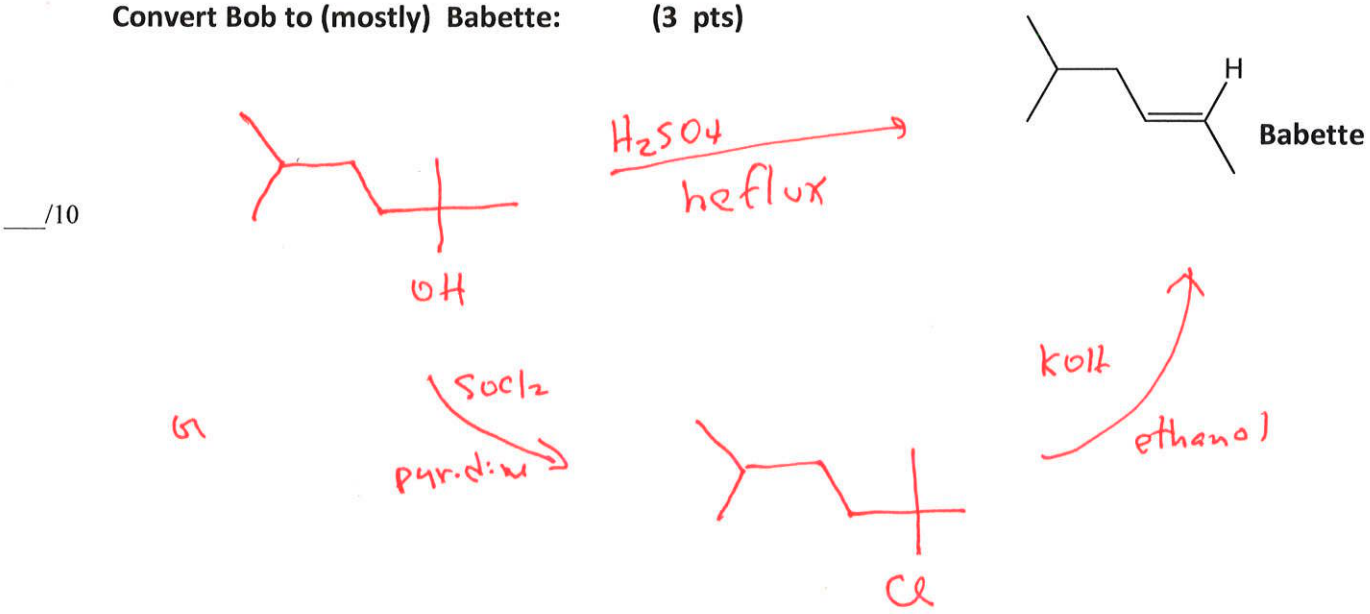
Starting with any 4 carbon alcohol, suggest a route to Winona: (3 pts)



Starting with any 5 carbon alcohol and either ketones or aldehydes, suggest a route to Bob: (4 pts)



Convert Bob to (mostly) Babette: (3 pts)



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