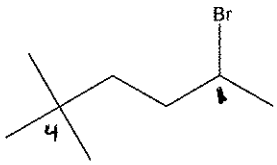
Exam II: Organic Chemistry I Alfred State College _____/100 pts
Wednesday 18 Nov 2015

Your Name: Answers

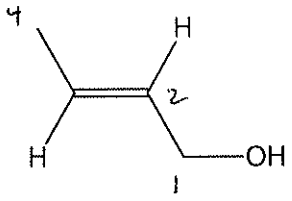
1. Names and Structures (1 pts each/8 points total)
Provide the correct name or structure below. Use IUPAC rules unless otherwise indicated.

a)



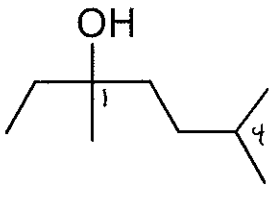
1,4,4-trimethylpentyl bromide
functional group form

b)



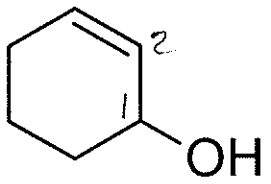
E-2-buten-1-ol
IUPAC (include E,Z if pertinent)

c)



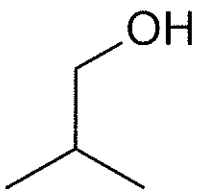
1-ethyl-1,4-dimethylpentyl alcohol
functional group form

d)



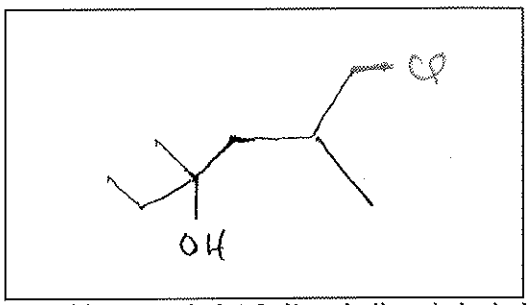
2-cyclohexenol
IUPAC

e)

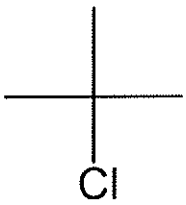


isobutyl alcohol
common name

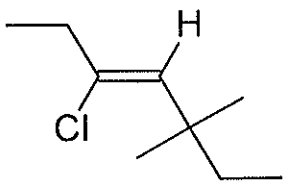
f)



4-chloro-1-ethyl-1,3-dimethylbutyl alcohol



tert-butyl chloride
Common name



(Z)-3-chloro-5,5-dimethyl-3-heptene *
IUPAC (include E,Z if pertinent)

* or ..... hept-3-ene.

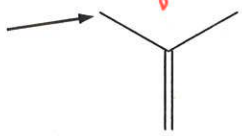
____/8

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

1) For both S_N1 and S_N2 substitution of halogens on ROH, write below the common initial reaction?:

$ROH + H^+ \rightleftharpoons ROH_2^+$ (protonation of alcohol)

2) What name/term is used to describe the position shown here



allylic

3) When addition of HBr across a double bond adds Br to the side containing the larger groups=> Markovnikoff addition.

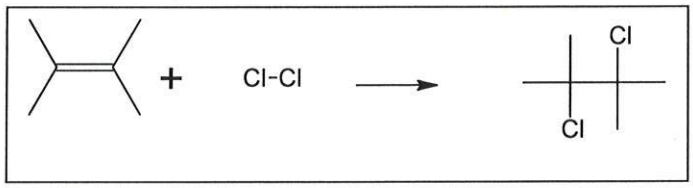
4) What is the order of reactivity for F^-, Cl^-, Br^-, I^- when substituting the OH on 1° alcohols ?

$I^- > Br^- > Cl^- > F^-$

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

6) In the modern, solution phase reaction of alcohols to alkyl chlorides using pyridine, the common chloride source is the compound: $SOCl_2$

7) What solvent is commonly employed in the reaction shown below: CCl_4

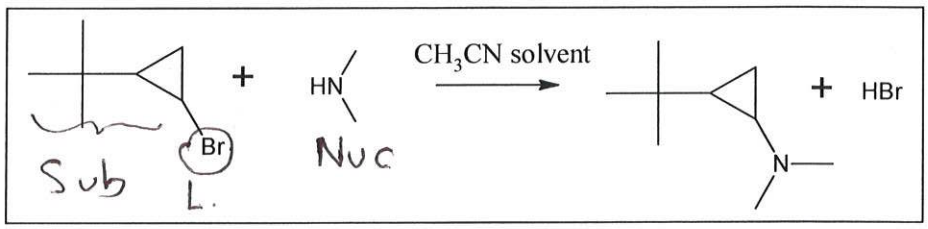


8) The reaction of KOH in ethanol with 1-bromobutane to form an alkene is what class of reaction ?

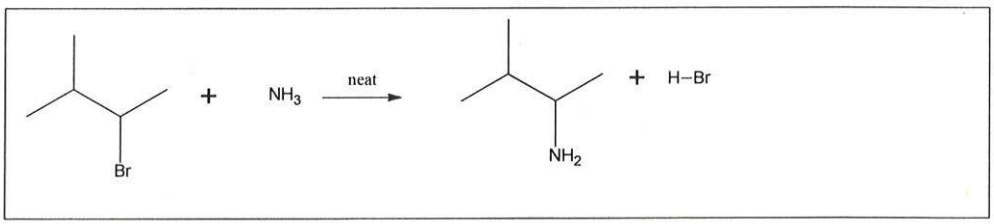
elimination

9) Term used to describe when a left handed alcohol is converted to a mixture of left and right-handed chlorides racemized (racemization)

10) In the reaction below, clearly identify the substrate (Sub), nucleophile (Nuc) and leaving group (L): (3 pts)



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



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

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

a)	product is inverted vs initial alcohol	products are racemized
b)	rate increases in polar, protic solvent	rate increases in weakly-polar,non-protic solvent
c)	rate increases with Br^- concentration	rate indifferent to Br^- concentration
d)	rate increases with H+ concentration	rate indifferent to 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

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

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

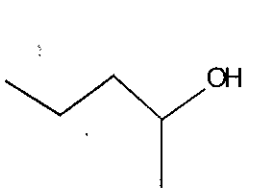
IV. Mechanistic Sooth-Saying (1 pt each/9 pts total)

On speed (1 pt each/4 pts total)

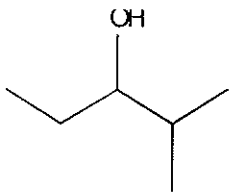
Which will react faster assuming HBr/ aqueous w/reflux is applied in each case ?

a) t-butanol or sec-butanol **or ~ same**

b)

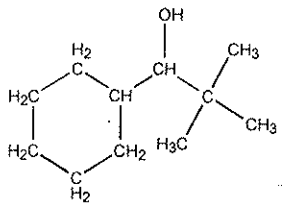


or

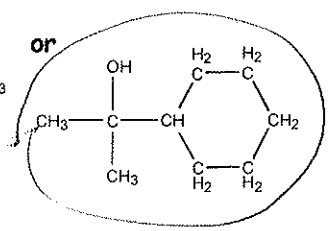


or ~same

c)

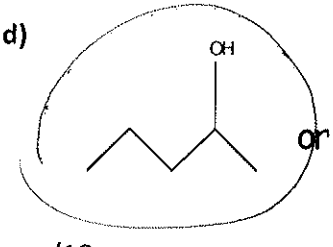


or

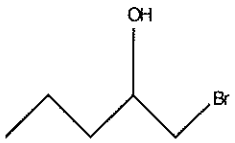


or ~same

d)



or



or ~same

Matchmaking (1 pt ea/5 pts total)

Match the mechanism to the acronym

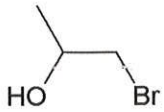
Match from list

a) Mechanism for conversion of ethyl bromide to an ethene E2
b) Mechanism for conversion of CH_3Br to CH_3NH_2: S_N2
c) Mechanism for bromination of an alkane: RAD
d) Mechanism for bromination of a 3° alcohol: S_N1
e) Mechanism involving formation of a inverted product S_N2

acronym

S_n1
S_n2
E2 (elimination)
RAD(free radical)

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

a) CH_3SH is an example of a(n) thiol
b) 

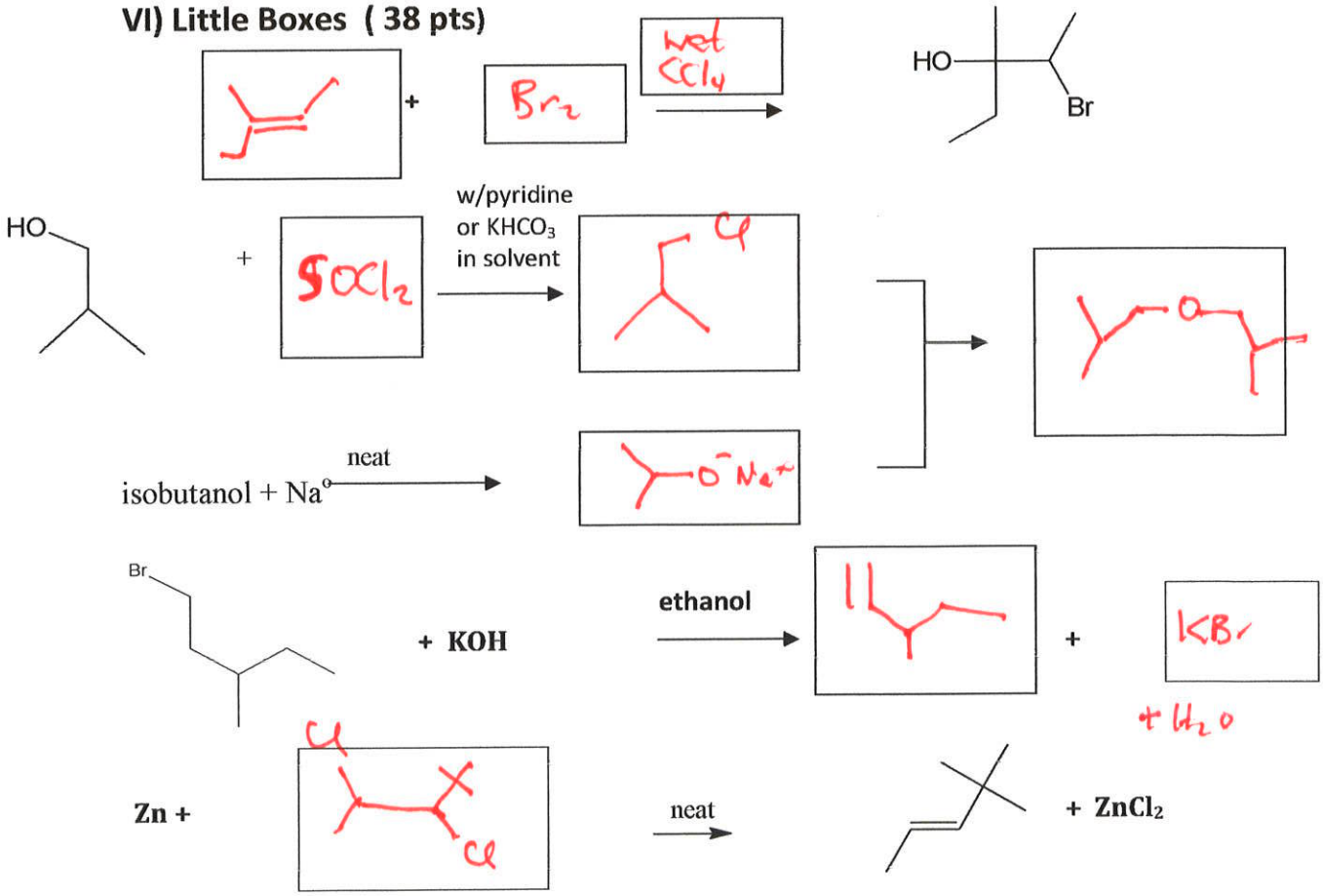
What is my class name ? halohydrin
(hint: has an angelic component)

c) Zusammen is the German word for together

d) Name of synthetic route that leads to bigger alcohols Grignard

e) Gilman reactions to larger alkanes are also called: Corey-House reactions.

VI) Little Boxes (38 pts)



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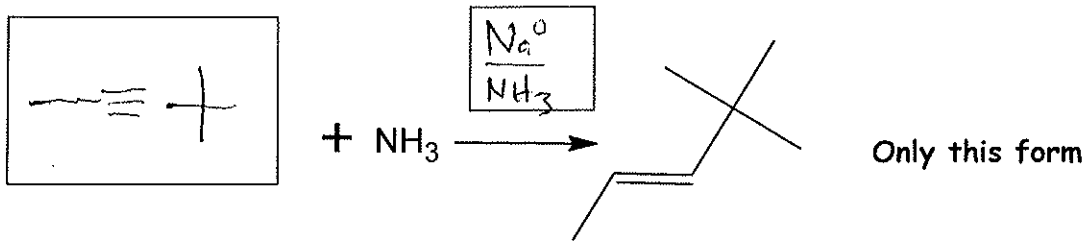

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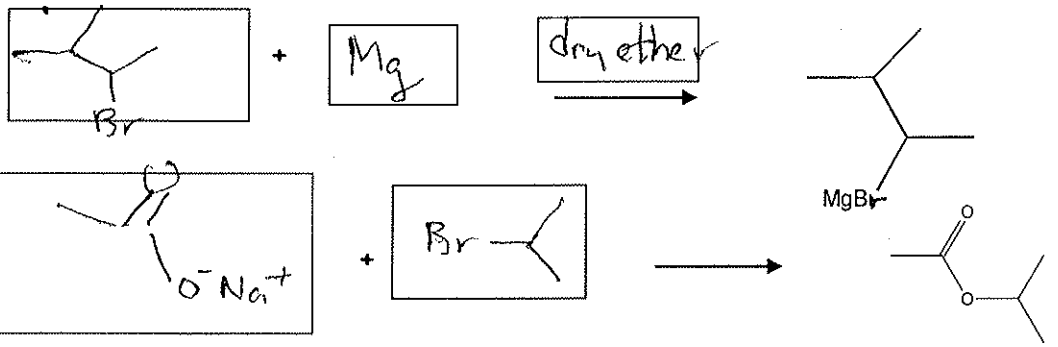
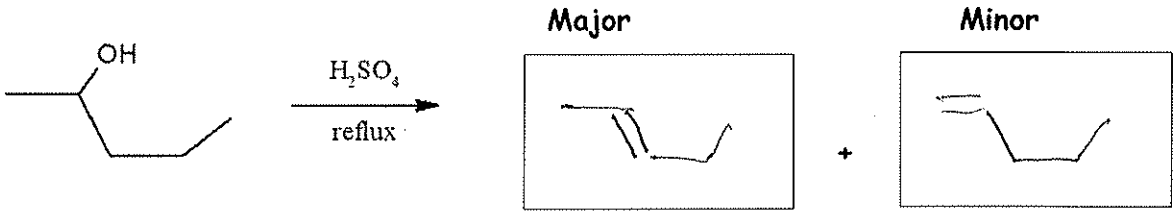
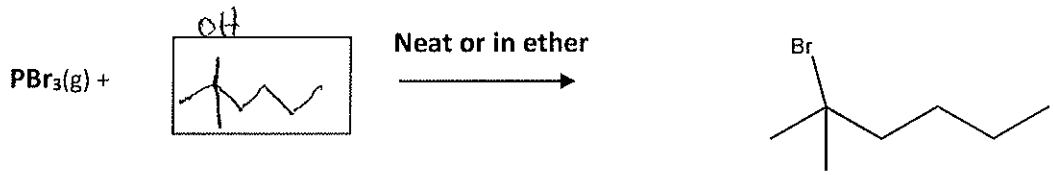
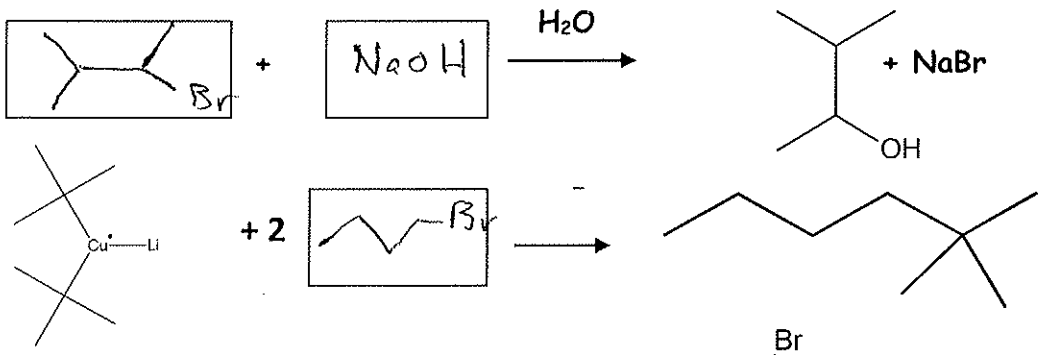


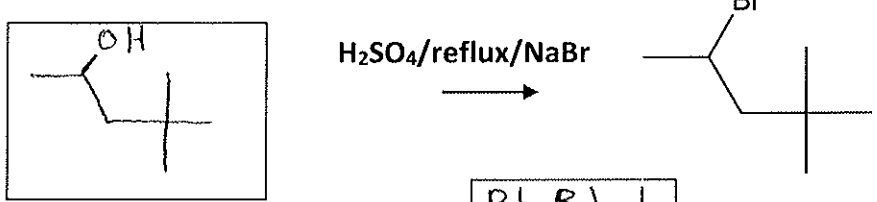


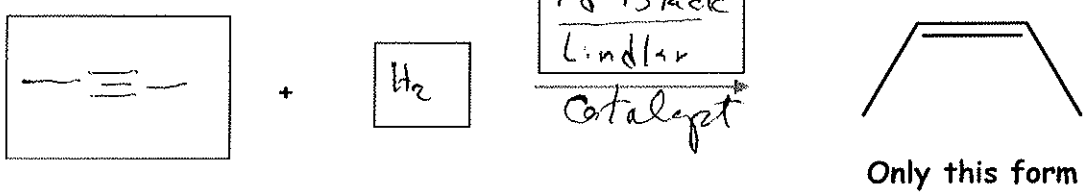
Major

Minor









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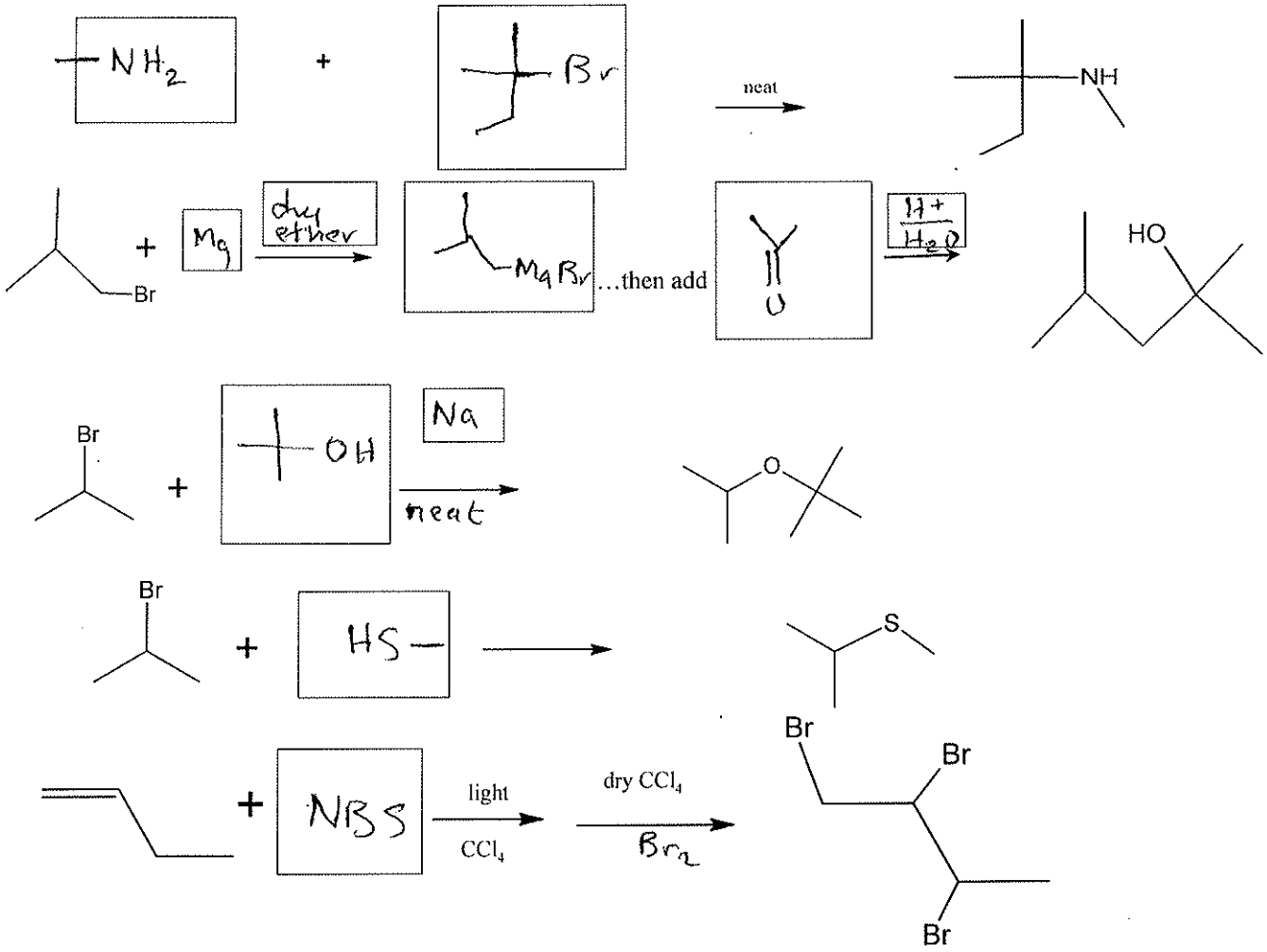
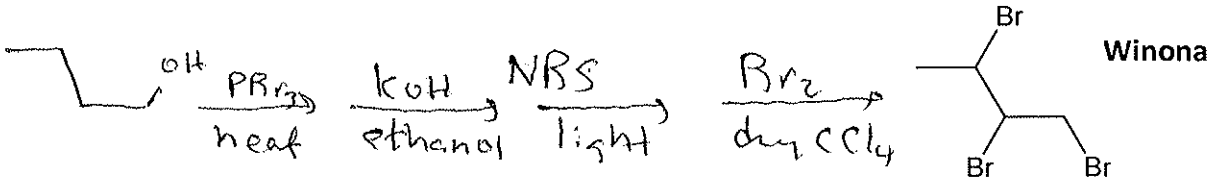


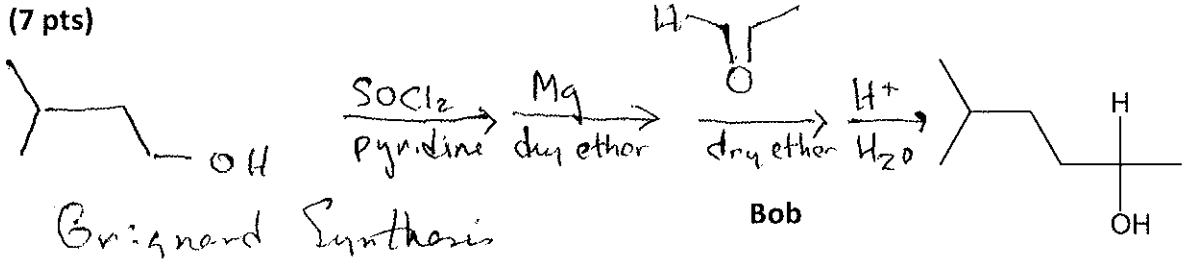
VII. Willie Nelson Time: On the Road again (15 pts)

Starting with any 4 carbon alcohol, suggest a route to Winona: (5 pts)



Winona

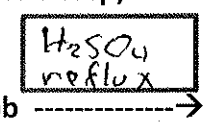
Starting with any 5 carbon alcohol and either ketones or aldehydes,suggest a route to Bob: (7 pts)



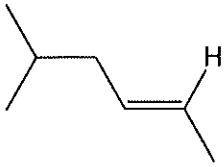
Grignard Synthesis

Bob

In one step, convert Bob to (mostly) Babbette: (2 pts)



Bob ----------→ **Babbette**



Babbette