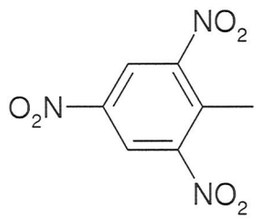
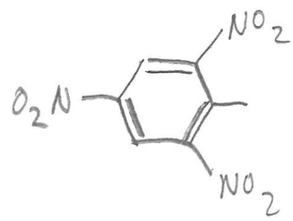
/101 = _____ %

Name:_____

SCH 4U – Organic Chemistry Test Part #2

1. Show the alternate resonance structure for (i.e. the other resonance structure)





2-Methyl-1,3,5-trinitrobenzene
(A.K.A. 2,4,6-Trinitrotoluene or TNT)

What effect does the fact that alternate resonance structures are possible for have on the carbon bonds within the six membered carbon ring? Answer point form with respect to:

length:	between single & double bond //
strength:	between single & double bond //
reactivity:	greatly reduced compared to alkene ✓

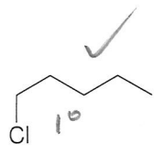
How quickly can the double bonds move from one resonance structure to the other?

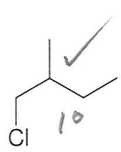
millions of times per second //

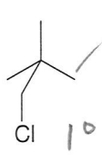
/9

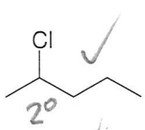
2. All possible five carbon alkyl halides are shown below. Under each structure, write the degree (i.e. 1°, 2°, 3°) for the carbon to which the chlorine atom is attached (i.e. the degree of the alkyl halide). Now redrawn this list according to their potential relative reactivity. Place the most reactive compound at the beginning of the list and the least reactive at the end of the list. If you think any are a tie, place them together. Use > and >> signs to organize your work. What is the name of the concept that you are using?

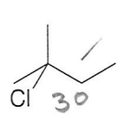
Concept = steric hinderance ✓

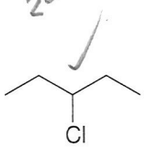


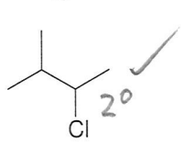


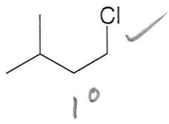












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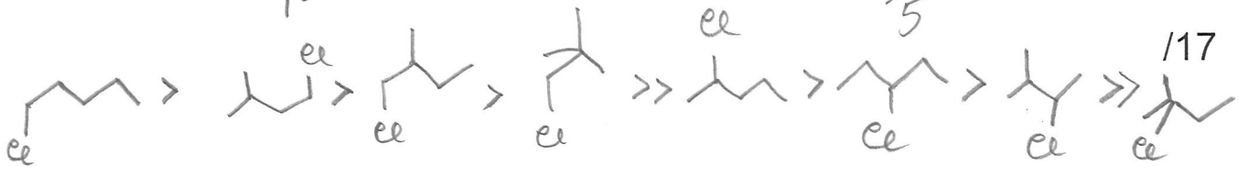

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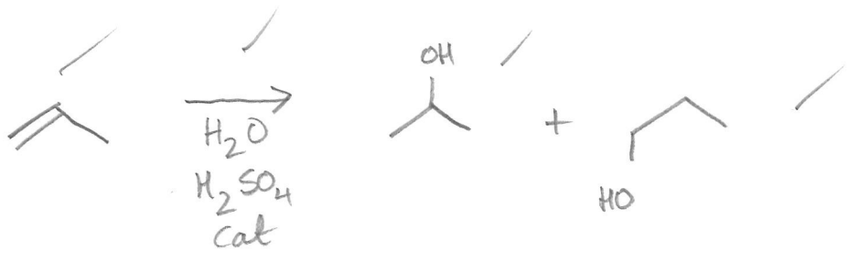
3. Addition reactions to Alkenes can result in more than one product. Give an example of an alkene that can produce more than one product through addition hydration. Write a descriptive organic equation for the addition hydration reaction and show the multiple products. Next, show a structure for an alkene that is not capable of producing more than one product. Explain in point form why this is the case.



eg 

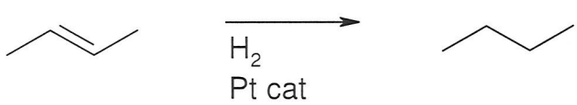
all examples are symmetrical about the double bond

/7

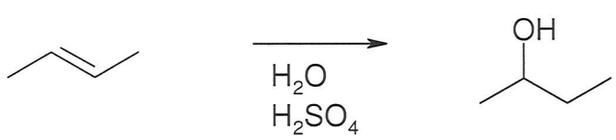
4. In organic chemistry, define oxidation and reduction with respect to the gain or loss of hydrogen and oxygen. Use this table to simplify your answer.

	HYDROGENS	OXYGENS
OXIDATION	loss	gain
REDUCTION	gain	lose

Now consider the addition reactions shown below. Does the reaction represent an oxidation or a reduction? Explain as fully as may be necessary.



reduction ✓ - two hydrogens gained ✓

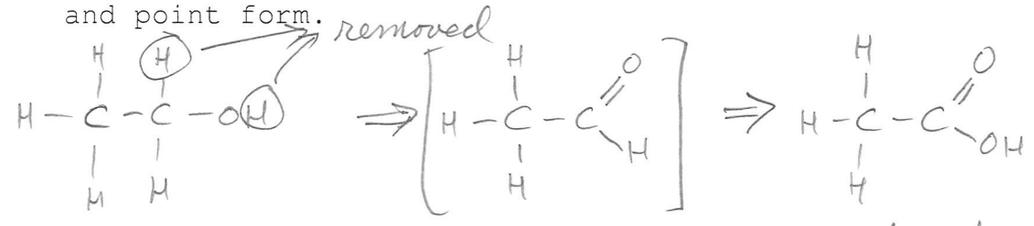


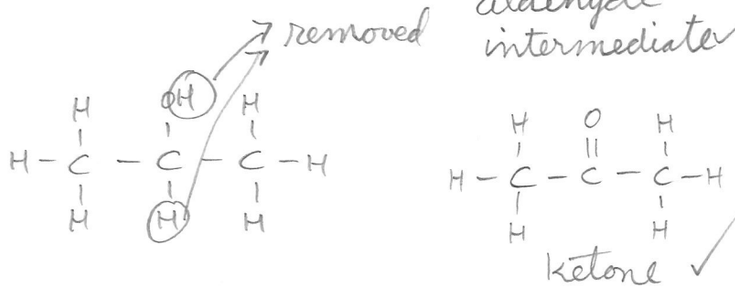
/6

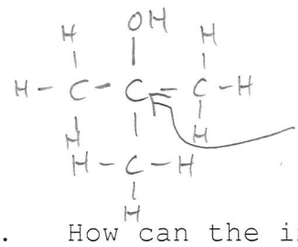
oxidation - one oxygen gained ∴ oxidation ✓
- two hydrogens gained ∴ reduction ✓
- oxygen is more significant than hydrogen
∴ overall oxidation

/13

5. Outline the oxidation reactions that can happen with alcohols. Be sure to include information on 1°, 2° and 3° alcohols. Include the class of compounds that result plus any other important considerations. Answer using structures and point form.







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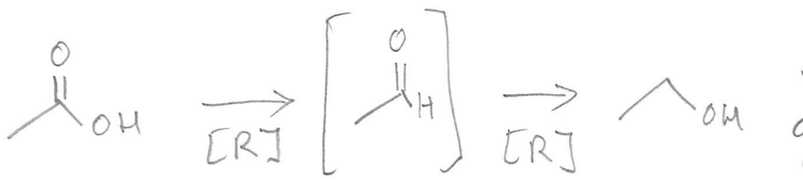
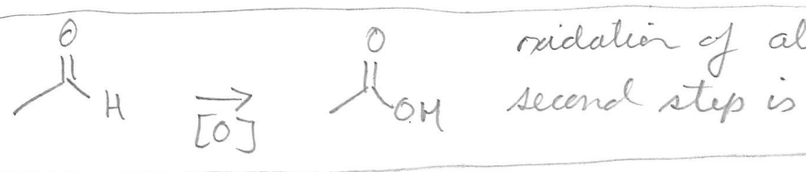
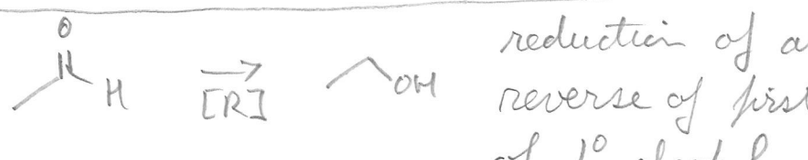
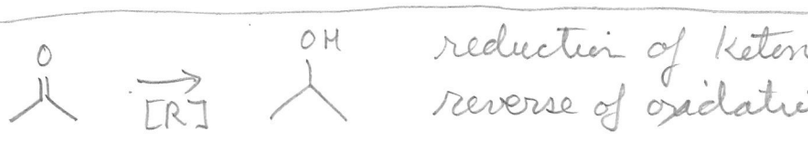
6. How can the information in the above question be used to help remember reduction reactions for three different classes of organic compounds. Be precise. Answer using structures and point form.









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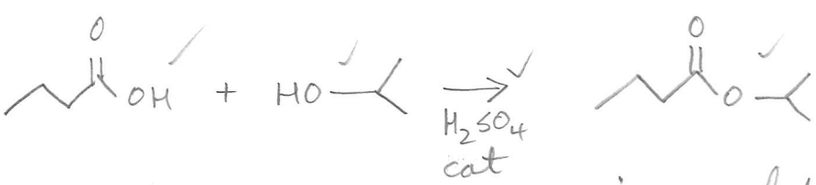
7. Show a descriptive organic equation for the esterification reaction between butanoic acid and isopropyl alcohol. Provide the required reaction conditions under the reaction arrow. Provide the name of the reaction product.



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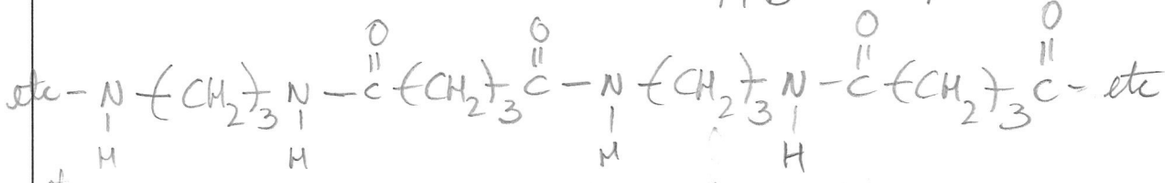
8. For each of the follow polymerization reactions:
   a) state the type of polymerization reaction
   b) draw a good representation of predicted product that shows at least four monomers combined together and uses etc. at the ends!
   c) include either required reaction conditions or bi-products as appropriate

type: condensation

HBr bi-product



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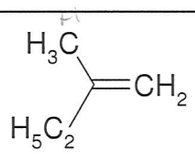
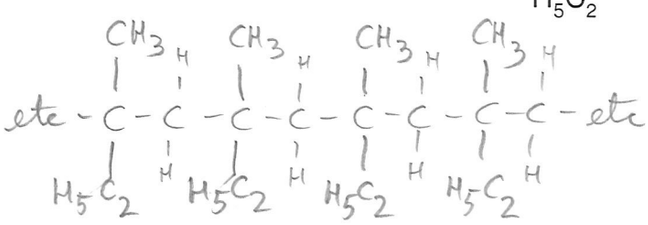
type: addition



free radical initiator



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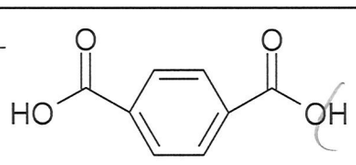
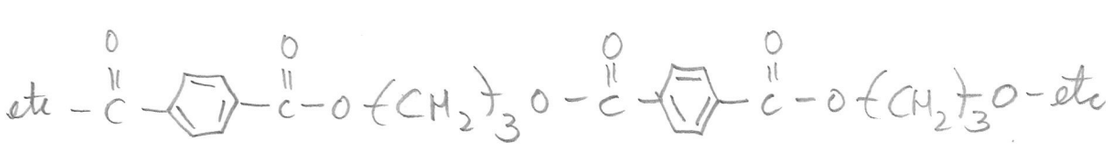
type: condensation



+ H_2O bi-product



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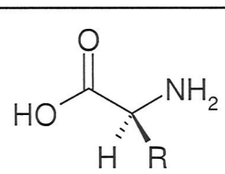
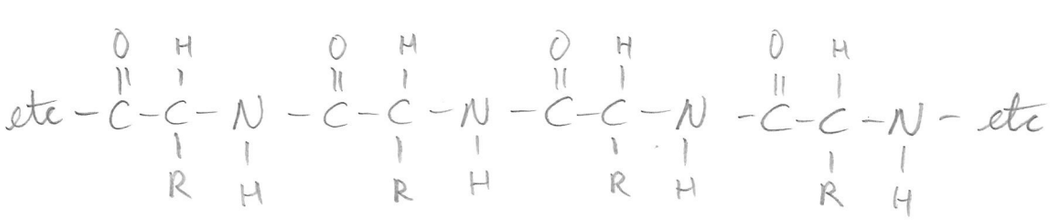
type: condensation





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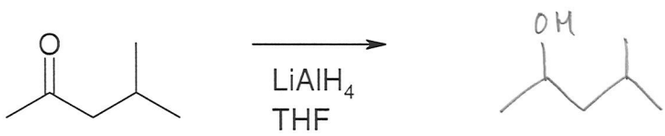
9. For each of the following complete the descriptive organic reactions as necessary. This could mean to add products, deduce and add reactants, deduce and add reaction conditions and consider multiple step reactions. You do not need to include any description as to the type of reactions involved.



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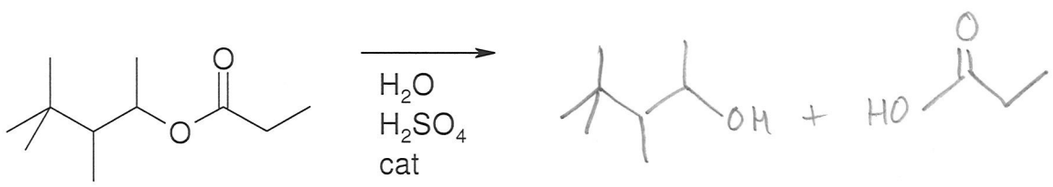

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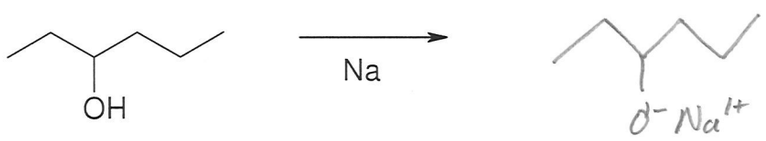

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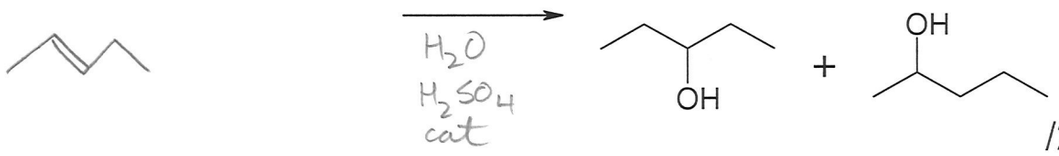

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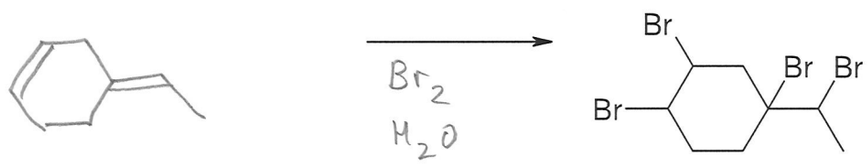

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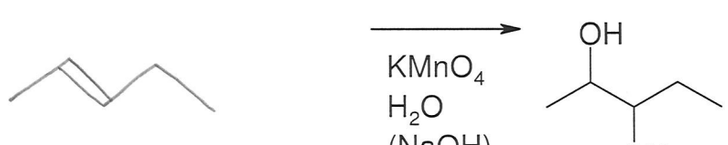

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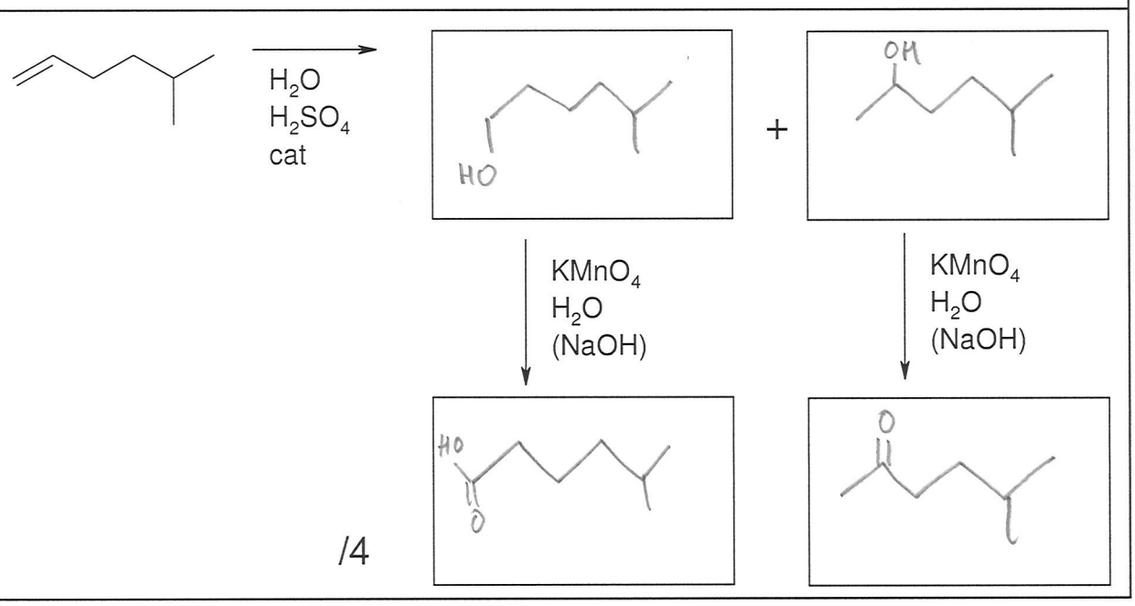

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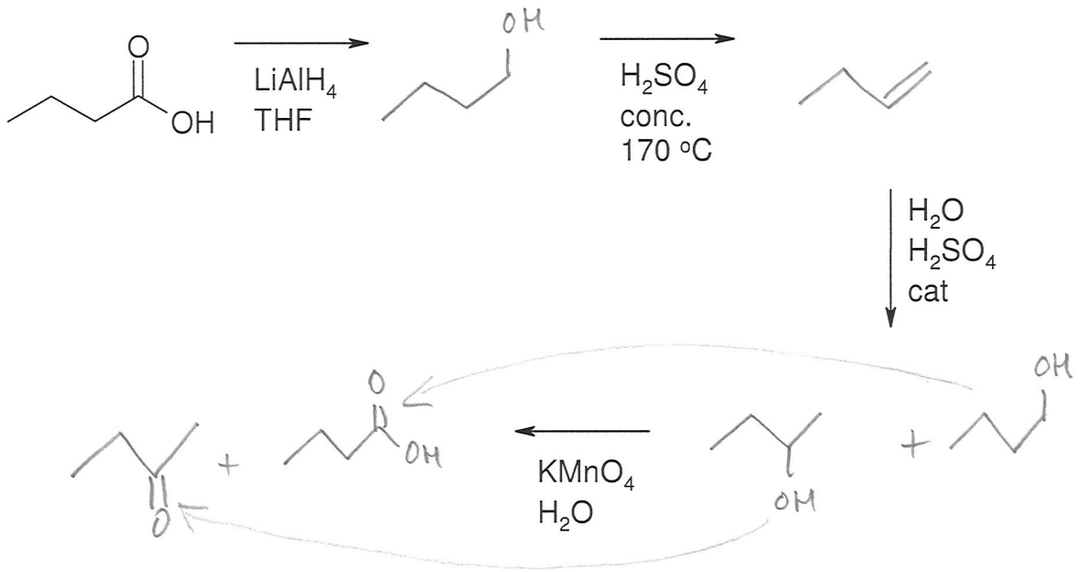
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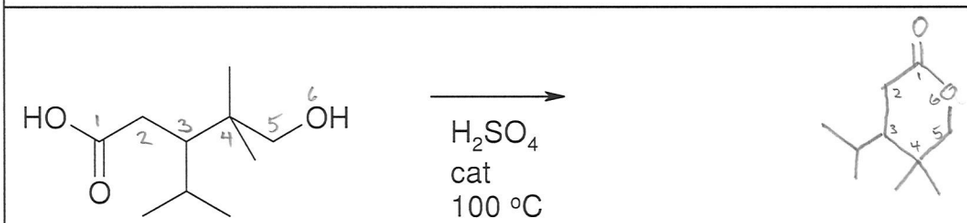
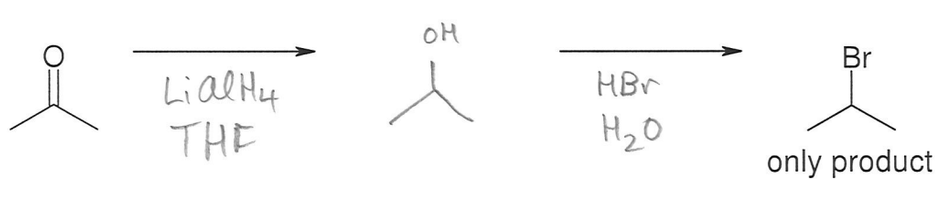
THF
H2SO4
conc.
170 °C
H2O
H2SO4
cat
KMnO4
H2O

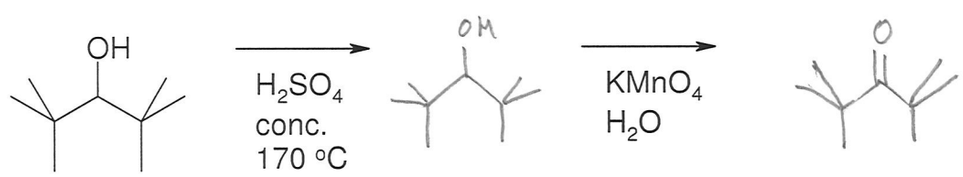
/6


HO
OH
H2SO4
cat
100 °C

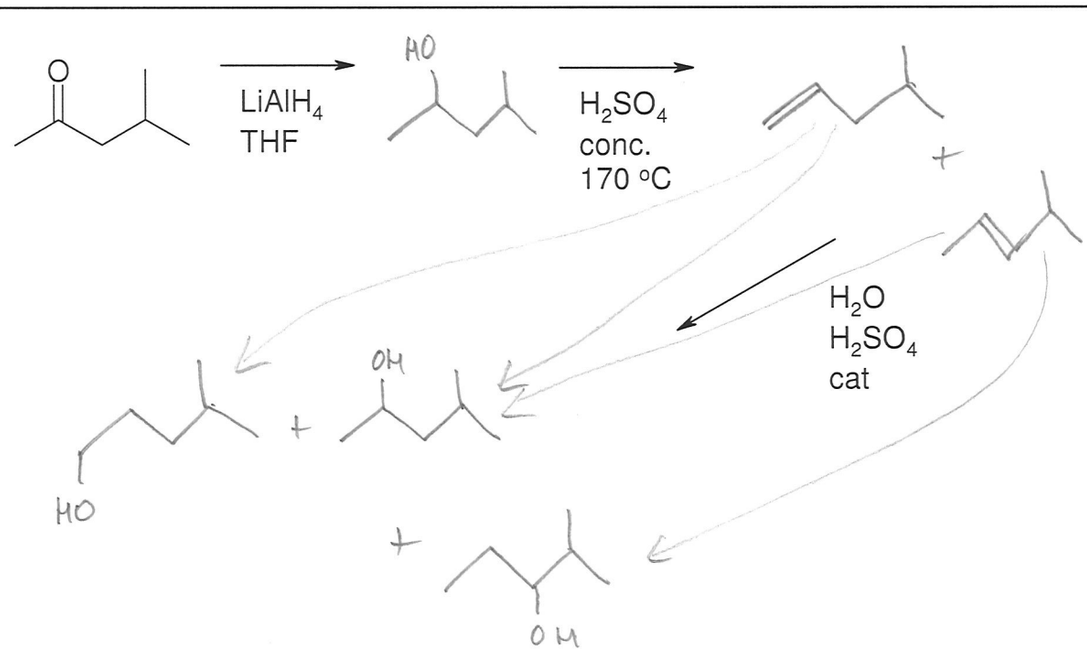
/1


LiAlH4
THF
HBr
H2O
Br
only product

/3


OH
H2SO4
conc.
170 °C
KMnO4
H2O

/2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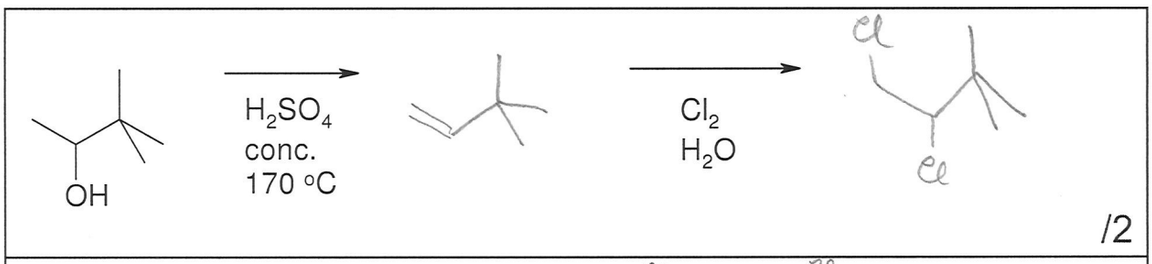
THF
H2SO4
conc.
170 °C
H2O
H2SO4
cat

/6

/18



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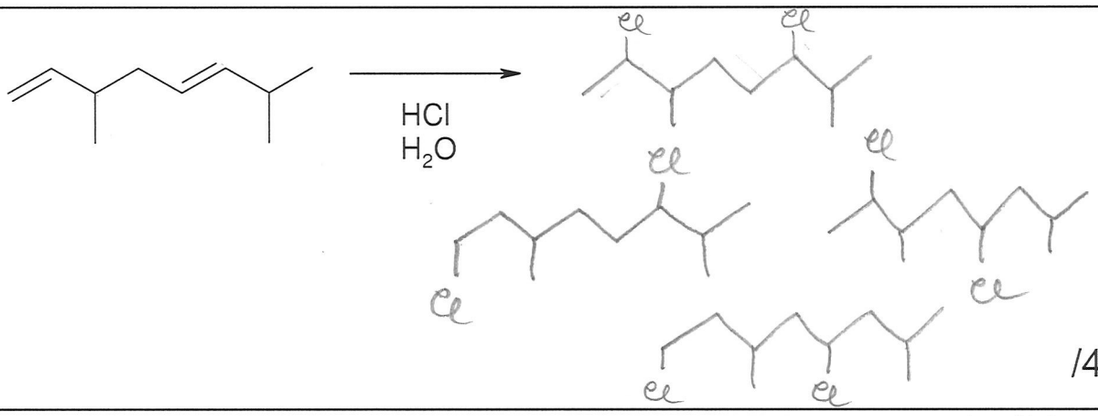

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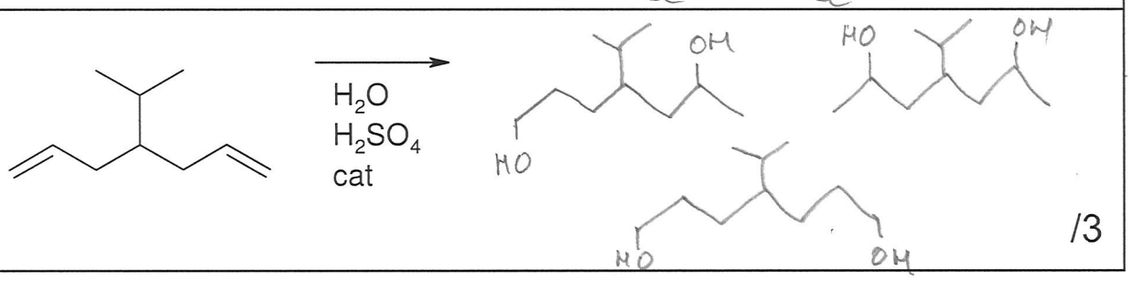

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