77 = %

Name: _____

**SCH 4U Organic Test #2**

1. Briefing explain what each of the following mean:

| | |
|---|---|
| conjugated double bond ring system | alternate double bonds arranged in a ring  |
| electronic resonance | π bonds (double) change location on a σ bond (single) framework - double bonds flip position |
| resonance stability | e⁻ become more stable (lower energy) due to electronic resonance (less reactive) |
| delocalized electrons | e⁻ that can move from one place to another |

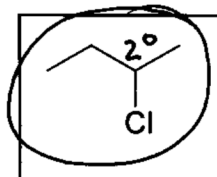
/4

What effect does the above have on the relative reactivity of aromatic ring compounds? Why?

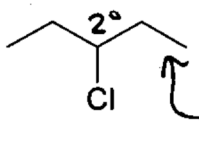
- lower reactivity
- not true double bonds (more like bond and a half)

/2

2. For each pair of compounds, which compound would react faster in a substitution reaction and why. Circle the faster reacting substance. What concept is at work here? steric hinderance /1
Give details to the reasons behind your choice.

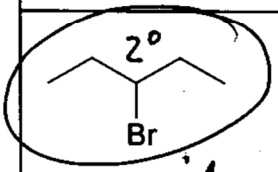



vs

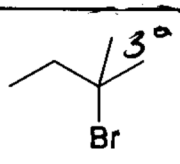



longer chain here improves blocking of reactive site ∴ slower to react

/3




vs

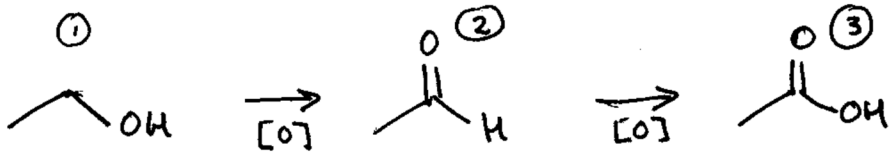



3° reactive site has much greater blocking than 2° site ∴ slower to react / degree is more important than chain length

/3

/13

3. Explain how the complete reaction sequence for the oxidation of a primary alcohol can be used to help remember other reactions in this unit. Show an example reaction sequence from any primary alcohol to final product (include the intermediate). Use clear points to reference this reaction to explain three other reactions.




③ → ② → ① = reduction of carboxylic acid to primary alcohol

② → ③ = oxidation of aldehyde to carboxylic acid

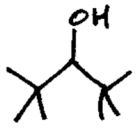
② → ① = reduction of aldehyde to primary alcohol

5

4. Oxidation of tertiary alcohols does not happen due to an absence of hydrogen on the alcohol carbon. A somewhat similar situation can arise for the dehydration of an alcohol to form a alkene, also leading to no reaction. ***Explain the problem for oxidation of a third degree alcohol.*** Alcohols normally undergo rapid dehydration to alkenes. ***Why then are some alcohols impossible to dehydrate? Give a structural example.***


- without removal of an H from the alcohol carbon a double bond (C=O) cannot form

4




- given dehydration requires removal of an H from a carbon beside the alcohol carbon, it is possible to have a structure where this cannot happen

9

5. Sulphuric acid is used in many places in organic chemistry. Which of the following statements is true?

a) concentrated sulphuric acid at high temperature will **always** dehydrate an alcohol to form an alkene (there is a bonus mark for providing a counter example - use the margin)
b) is the acid of choice to put the flavour into french fries
c) is needed to reduce primary alcohols to ketones
d) its function will depend on concentration and temperature
e) cannot perform asymmetric additions on alkenes

3

6. Aromatic compounds:

a) allow for the delocalization of $\pi$ electrons (the pair of electrons that produces the second bond in a double bond)
b) are not a part of normal biological systems
c) are more reactive than corresponding alkenes
d) were never mentioned in this course
e) undergo electronic resonance only at high temperatures

3

7. Which of the follow statements is true:

a) oxidations seldom if ever accompany a corresponding reduction
b) in a oxidation in organic chemistry, oxygen is gained and/or hydrogen is lost
c) in order to oxidize alcohols, one must use a reducing agent such as $LiAlH_4$ in THF
d) alcohols cannot be oxidized because they have already lost electrons
e) alcohols can be oxidized but only if they are third degree alcohols

3

8. An asymmetric addition will occur whenever the following conditions are met:

a) 2-pentene is treated with $H_2O$ and dilute catalytic quantities of $H_2SO_4$
b) 1-butene is treated with $H_2$ and Pt catalyst
c) 2-butene is treated with HCl in water
d) 1-cyclohexene is treated with $I_2$ in water
e) 2-butanol is treated with concentrated $H_2SO_4$ at high temperature

3

9. For the property of steric hindrance:

a) is identical for all first degree alcohols
b) depends more on length of blocking groups than the number of blocking groups (related to degree of reactive site)
c) one must consider both the length and the number of side chains adjacent to a reactive site
d) is never of concern in organic biological systems
e) the greater the steric hindrance, the more active the reactive site on the molecule

3

15

10. For the following monomers, write:
a) whether the monomer will undergo and addition of condensation polymerization
b) a polymer structure that is at least four monomer units long
c) necessary reaction condition for addition reactions
d) stable by-product for condensation reactions
It may be helpful to show all carbons and all hydrogens

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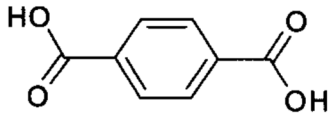
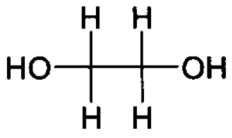
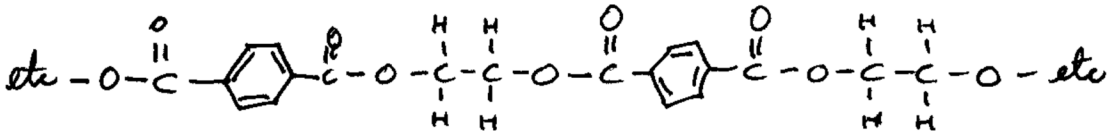




type: condensation

$H_2O$ bi-product

4



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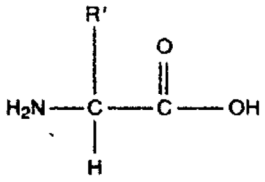
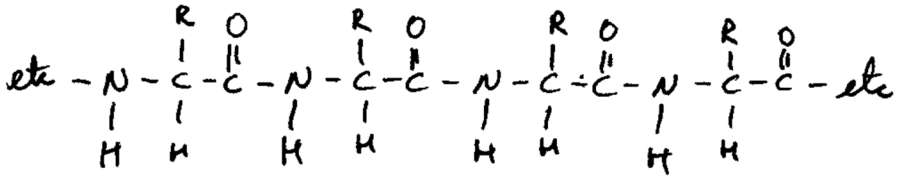


type: condensation

$H_2O$ bi-product

4



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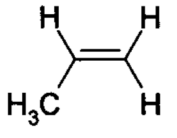
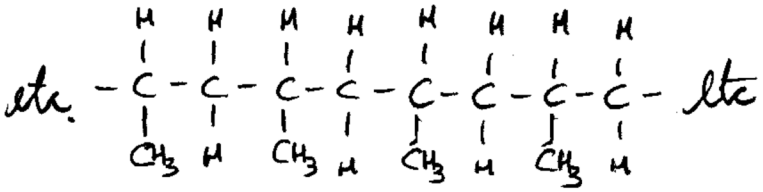
addition



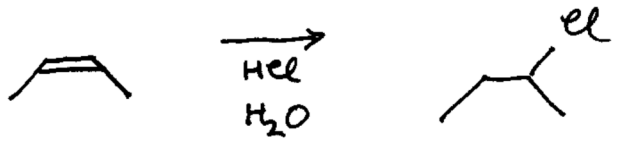
free radical initiation

4

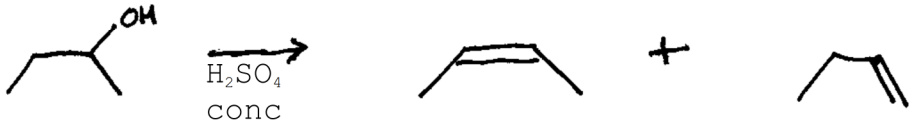


12

11. Complete each reaction sequence to the best of your ability. This includes reaction condition under the arrow if necessary. If more than one reactant or product is expected, include the alternatives. The marking scheme may help with this.




1

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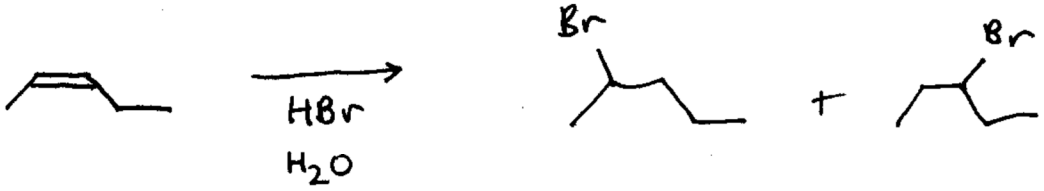


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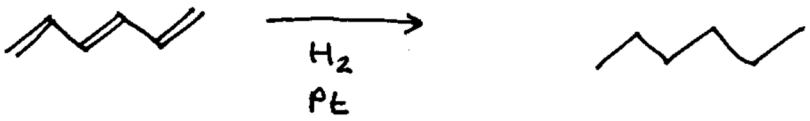


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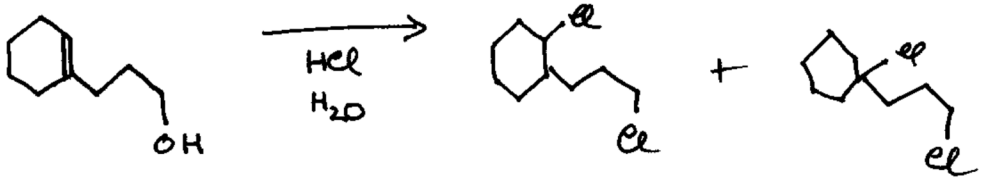


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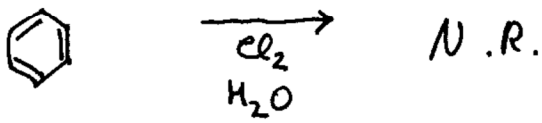
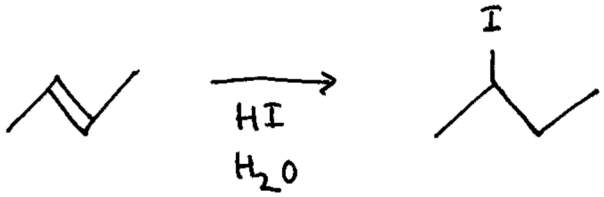
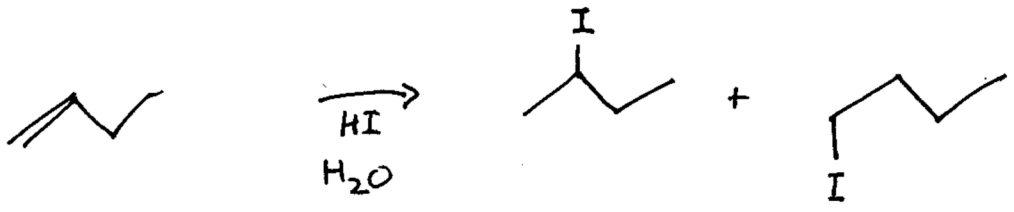



1

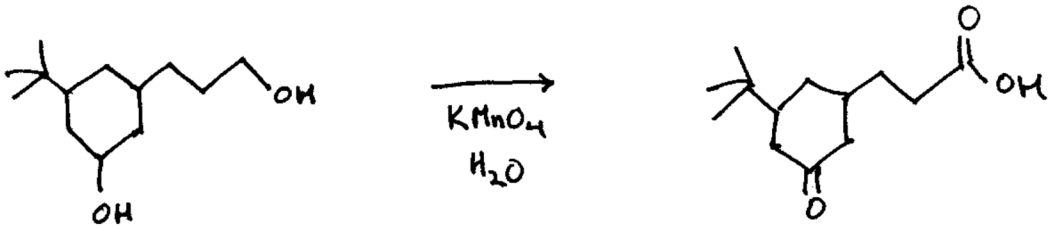
/10


I
HI
$H_2O$

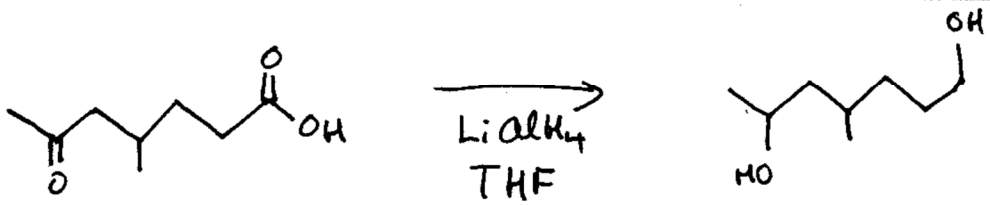
1


I
HI
$H_2O$
+
I

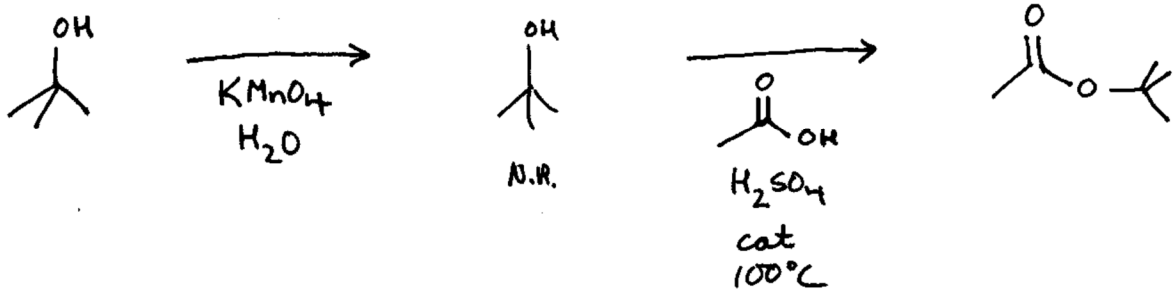
2


OH
OH
$KMnO_4$
$H_2O$
O
OH
O

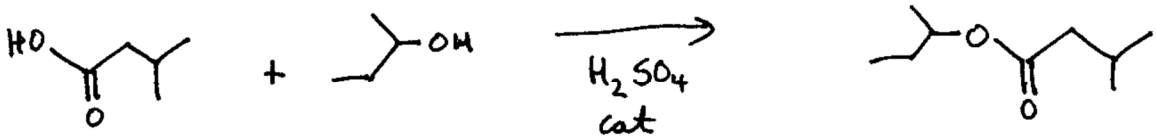
2


O
OH
O
$LiAlH_4$
THF
OH
HO

2

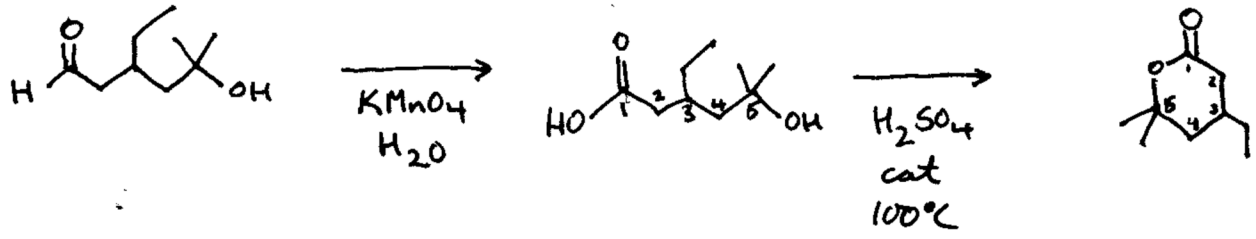

OH
$KMnO_4$
$H_2O$
OH
N.R.
O
OH
$H_2SO_4$
cat
100°C
O
O

2

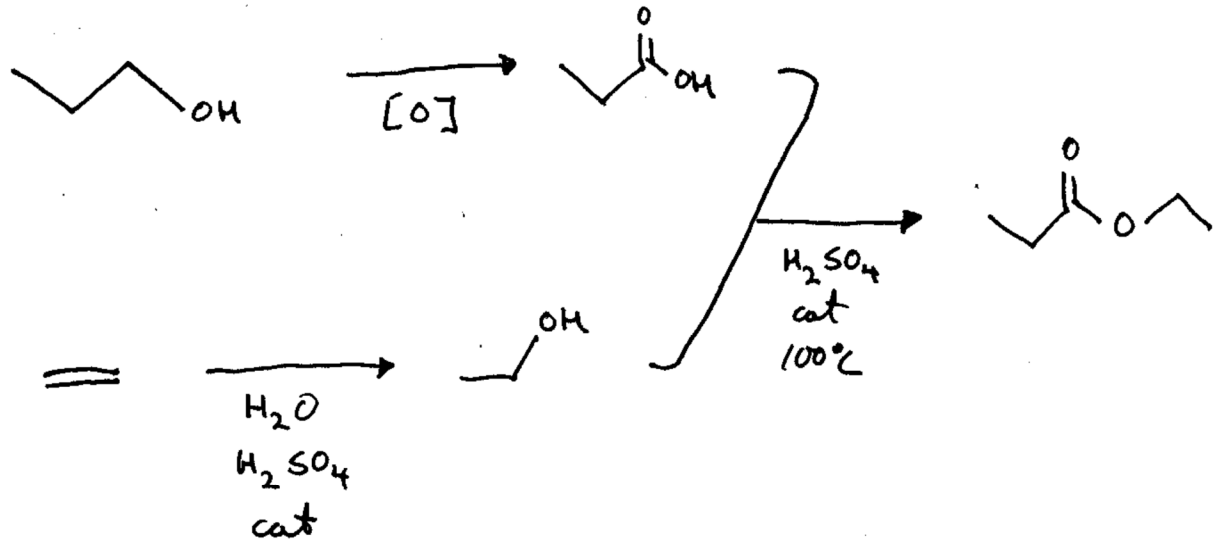

HO
O
+
OH
$H_2SO_4$
cat
100°C
O
O

1

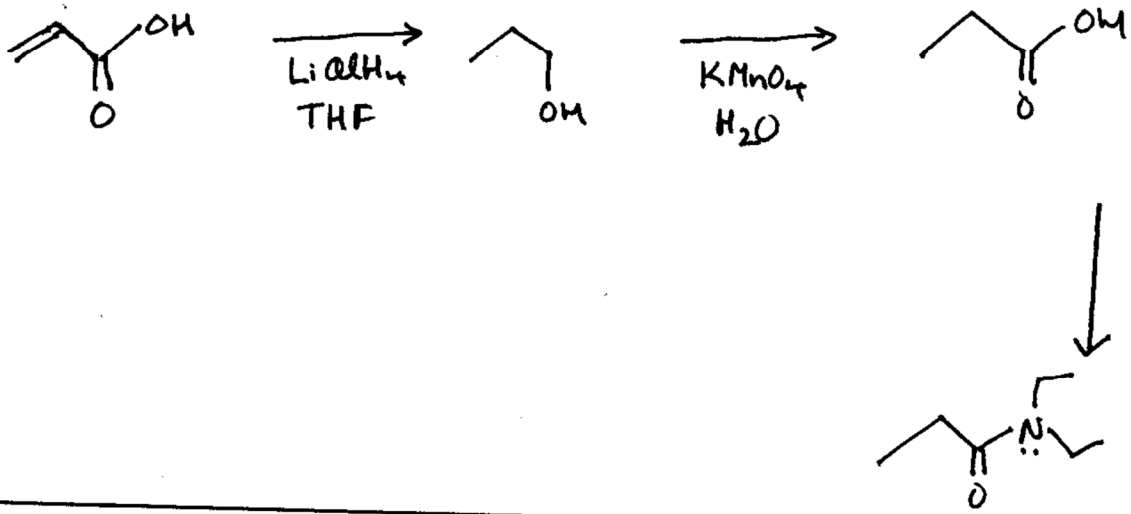
10


KMnO4
H2O
H2SO4
cat
100°C

/2


[O]
H2O
H2SO4
cat
H2SO4
cat
100°C

/3


LiAlH4
THF
KMnO4
H2O
NaOH
H2O

/3

/8