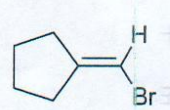
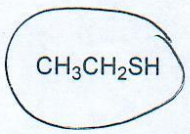
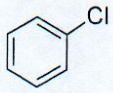
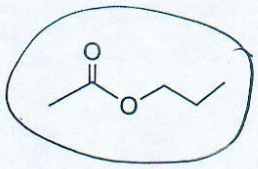
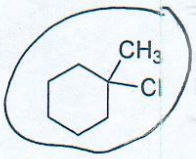
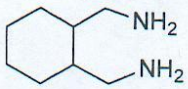
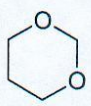
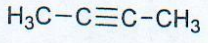
CHEM 260 FINAL 2011

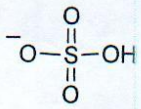
1. a) Circle **ALL** of the compounds below that would react with NaOH.

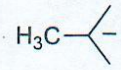
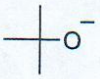
3pts
right minus wrong

b) Rank the structures below from the most basic (#1) to the least basic (#5). Put your assignments in the boxes below the structures.

3pts
-1 for each wrong answer

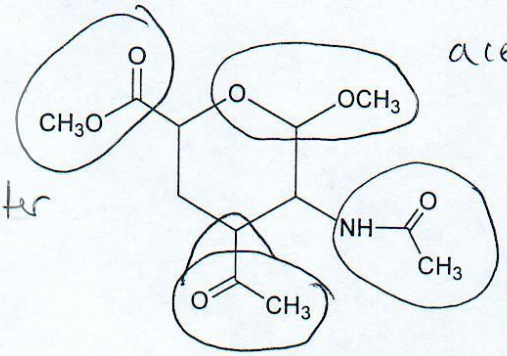


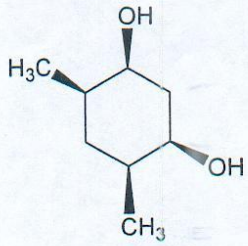

5 | 2 | 1 | 3 | 4

c) Circle **AND** name all of the functional groups in the molecule shown below.

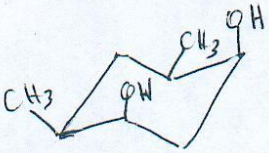
4pts



d) Redraw compound **1**, clearly showing it in its most stable conformation. If more than one structure is drawn please circle your final answer.



compound **1**

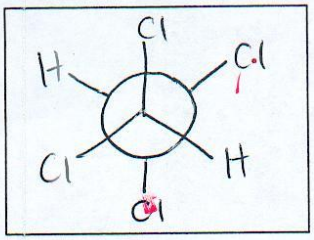


3pts

- many different ways of drawing answer but OH's must be axial and CH_3's must be equatorial (clearly!)
- 1½ pts if wrong conformation is shown (but correct molecule)

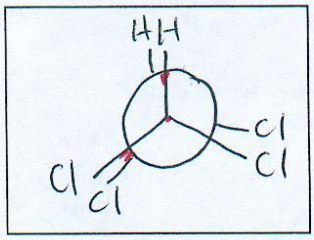
e) Draw Newman projections (view along C-C bond) showing 1,1,2,2-tetrachloroethane in its most stable and least stable conformations.

4pts



Newman projection of **most** stable conformation

1pt for showing incorrect staggered

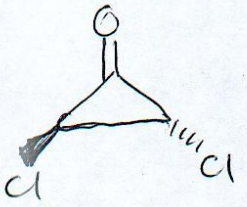


Newman projection of **least** stable conformation

1pt for showing incorrect eclipsed

f) Draw the structure of a <u>chiral ketone</u> with the molecular formula $C_3H_2Cl_2O$, clearly showing any important stereochemistry. You only need to draw one of the two possible enantiomers. If more than one structure is shown below, circle the one you want to be graded.

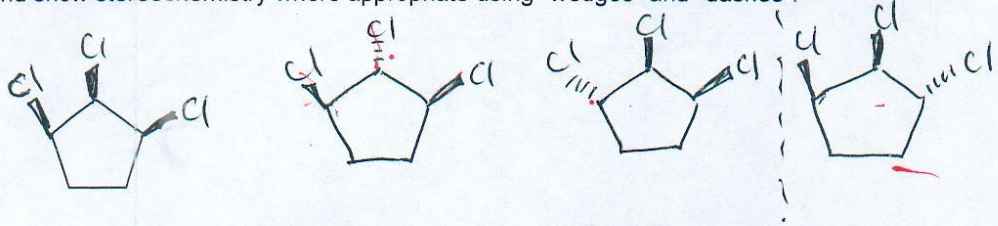
3pts



or enantiomer

1pt if Ketone is shown but answer is wrong

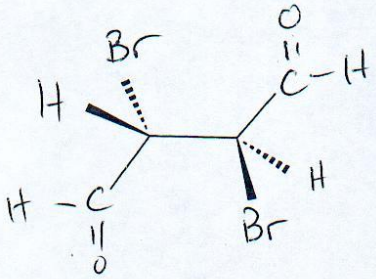
g) Draw <u>all of the stereoisomers</u> of 1,2,3-trichlorocyclopentane (note substitution pattern!). Start with the template below and redraw as necessary. <u>Draw each isomer only once</u> and show stereochemistry where appropriate using "wedges" and "dashes".



4pts

right minus wrong

h) Complete the structure below to show a <u>meso compound</u> with the formula $C_4H_4O_2Br_2$. <u>Show all atoms</u> (including hydrogens) in final answer.



3pts

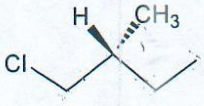
1½ pts. if wrong answer but meso is shown.

don't worry about alphabetical

2. Name the following compounds using IUPAC nomenclature, including as necessary designation of stereochemistry.

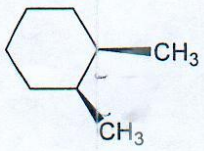
(10 pts) 2 pts each

-½ each mistake



(R)-1-chloro-2-methylbutane

-1 each mistake

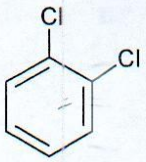


cis- 1,2-dimethylcyclohexane

-½ each mistake

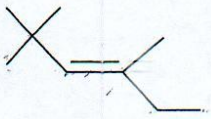
(R)-4,5-dimethyl-1-hexanol or hexan-1-ol

-1 each mistake



1,2 dichlorobenzene
or ortho-dichlorobenzene

-½ each mistake



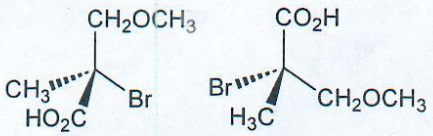
(E)-2,2,4-trimethyl-3-hexene

3. Shown below are a number of pairs of structural formulas. In the box below each pair, place the number (related to one of the terms listed below) that best describes the relationship between the two structures.

NOTE: Each term may be used more than once and not all of the terms need be used.

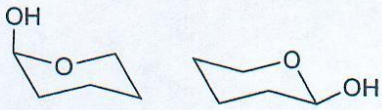
1. constitutional isomers
2. diastereomers
3. identical
4. enantiomers

(a)



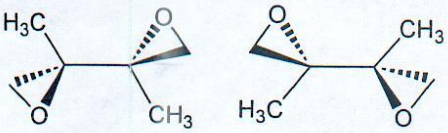
4

(b)



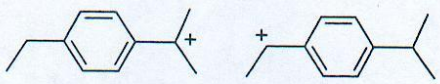
4

(c)



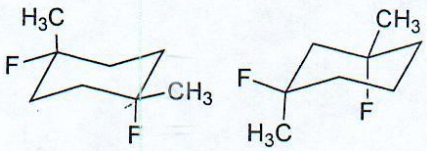
3

(d)



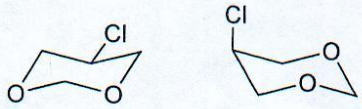
1

(e)



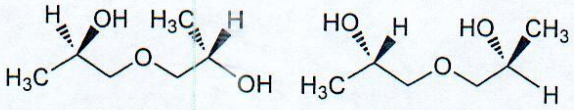
1

(f)



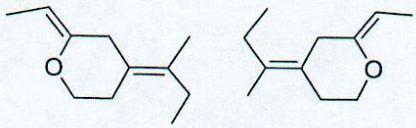
3

(g)



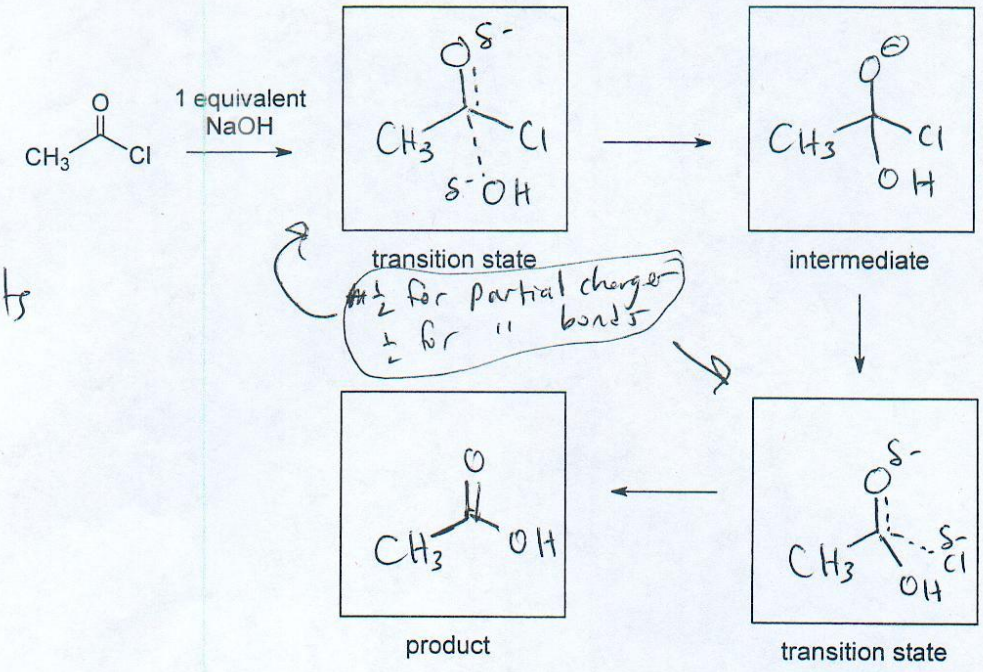
2

(h)



2

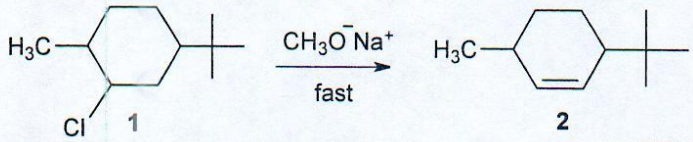
4 a) Complete the following scheme by filling in the boxes with the appropriate structures.



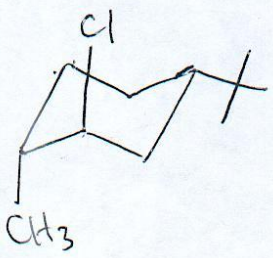
4 pts

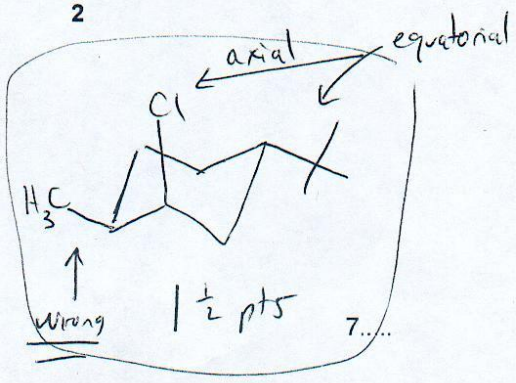
½ for partial charges
½ for " bonds

b) All of the different stereoisomers of 1-chloro-3-tert-butyl-5-methylcyclohexane were treated with sodium methoxide in separate reactions. Only one of these isomers, called compound **1**, underwent a rapid reaction to give compound **2** as the only product. Redraw compound **1** in a chair form showing the appropriate stereochemistry and conformation that would lead to the rapid formation of product **2** (you may draw either enantiomer of compound **1**).



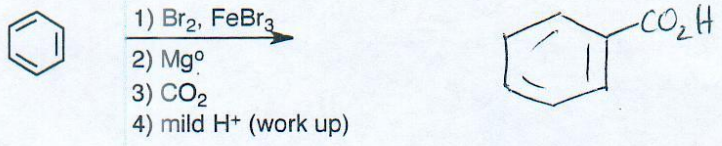
3pts



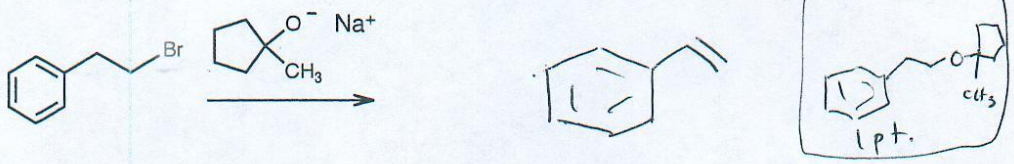


5. Show the product(s) formed in the following reactions. Be sure to clearly show stereochemistry (including enantiomers) of all major products where appropriate.

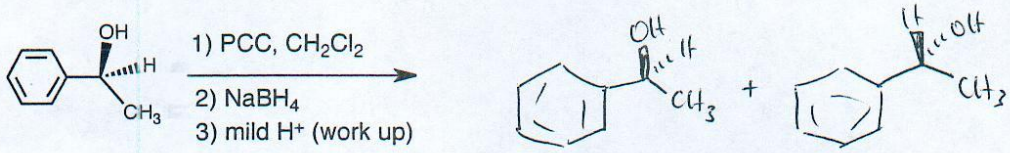
a)



b)

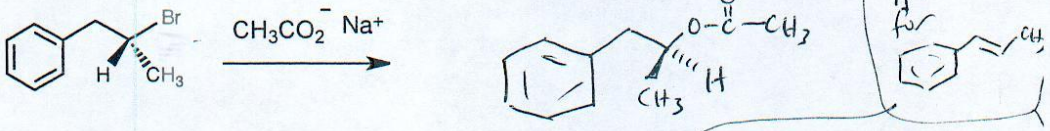


c) 2 pts each

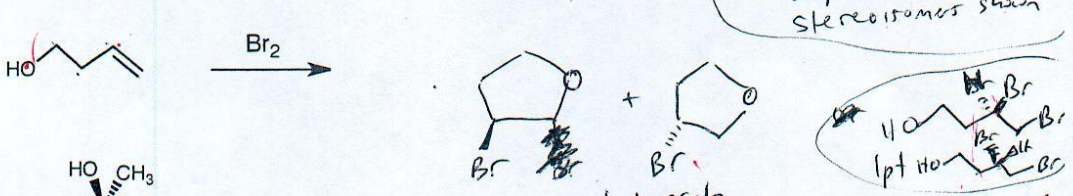


14 pts

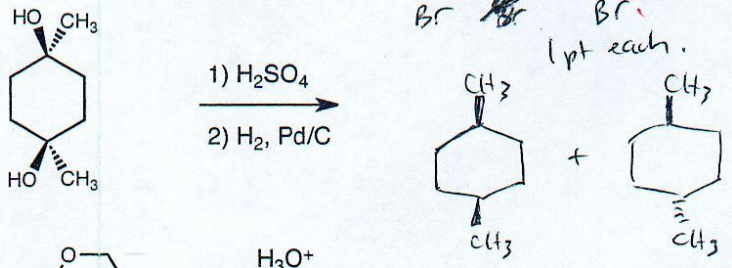
d)



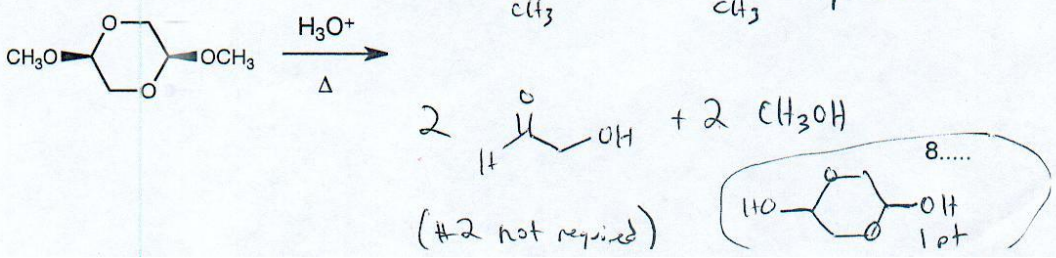
e)



f)

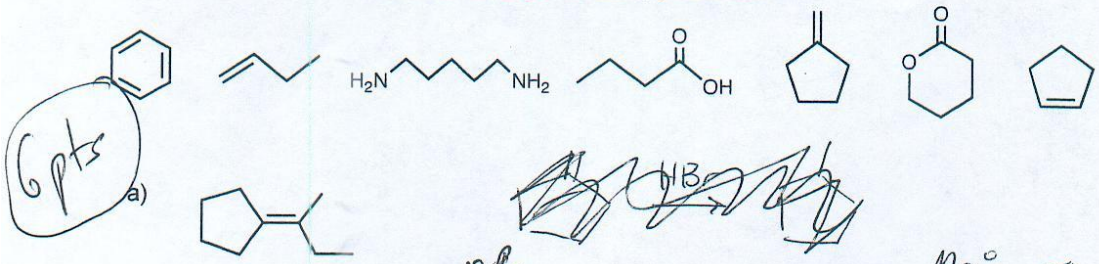


g)



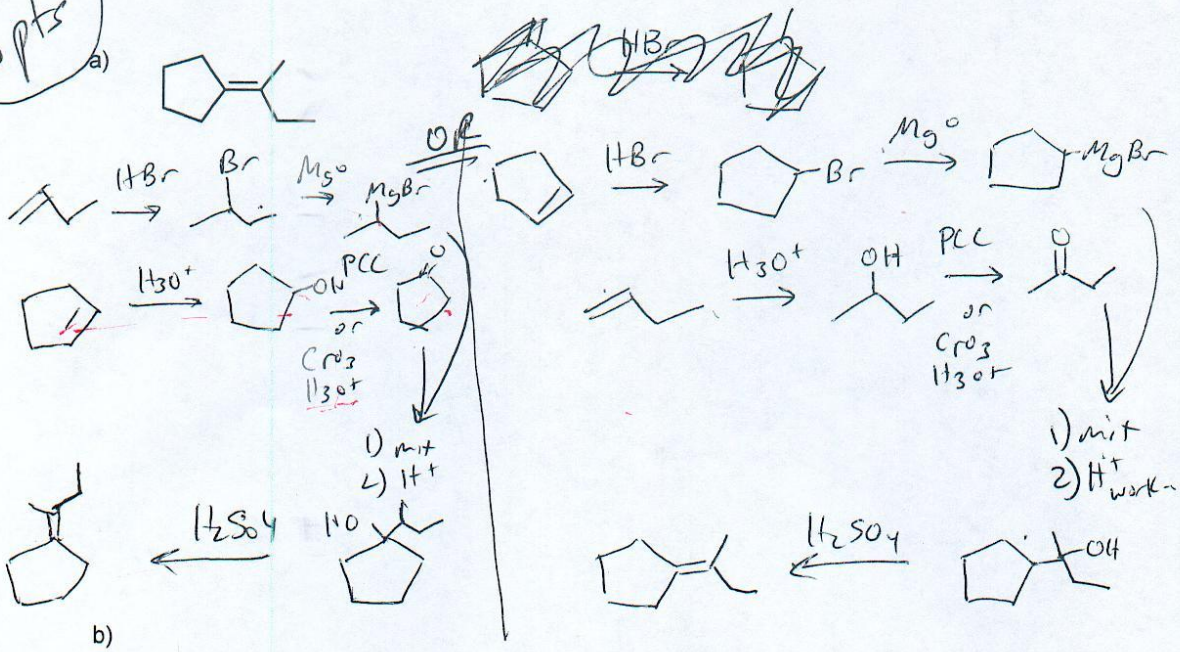
6. Using any of the starting materials shown below as the ONLY carbon sources, as well as any additional inorganic reagents you require, outline syntheses of the following compounds. No mechanistic information is required. There may be more than one correct answer in some cases.

Available Organic Starting Materials

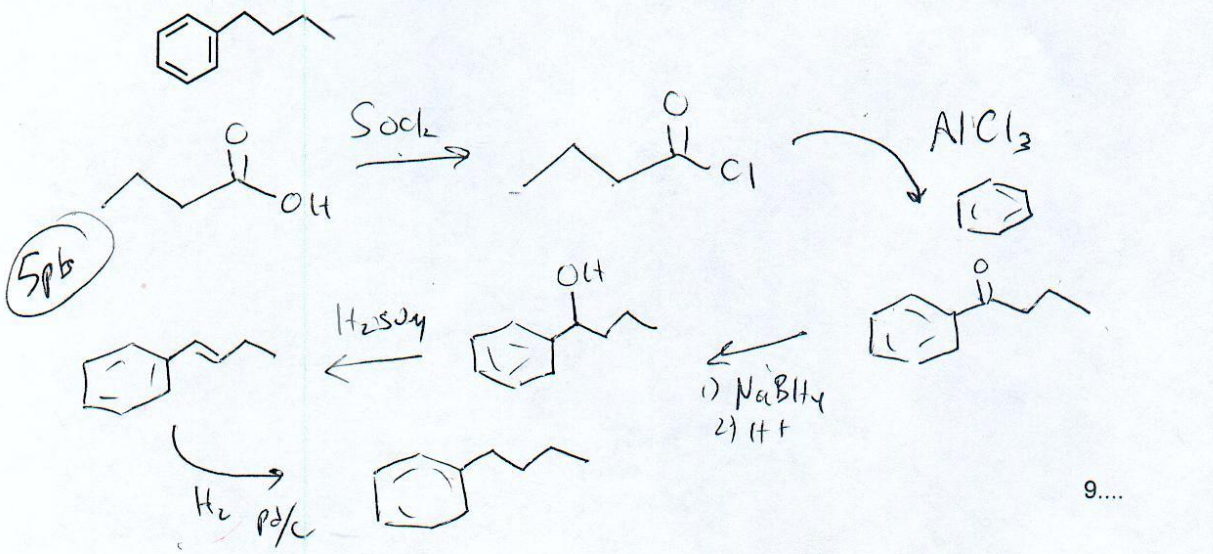


6 pts

a)

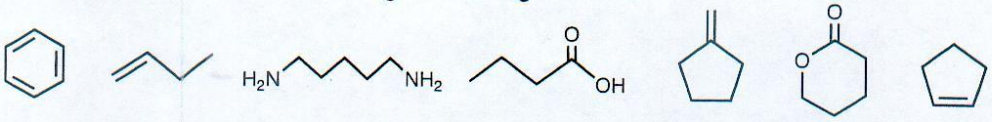


b)

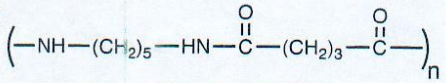


6. continued...

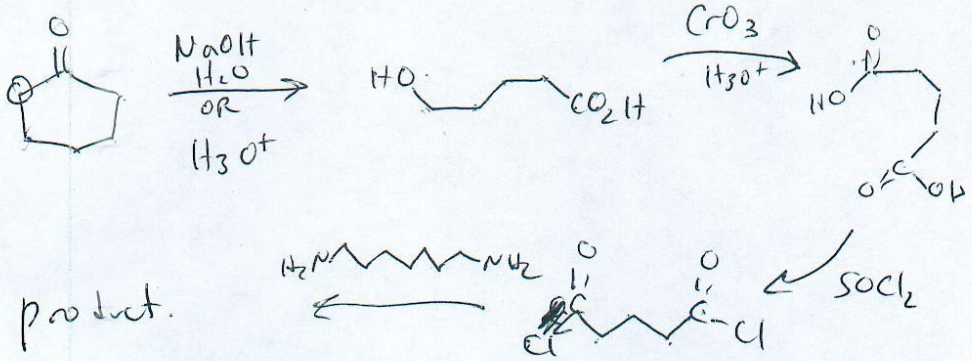
Available Organic Starting Materials



c)

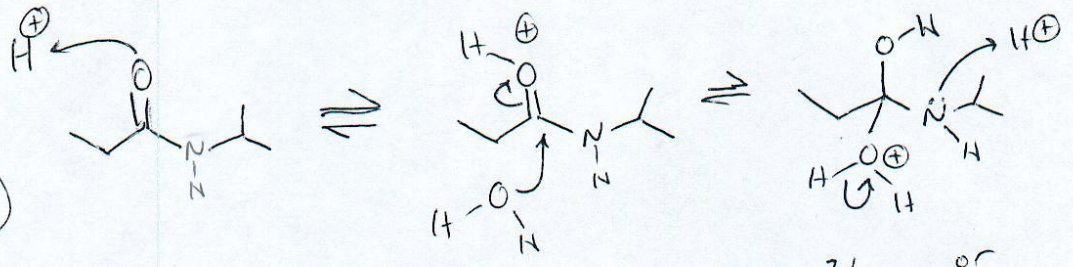


nylon 55 (a polyamide)

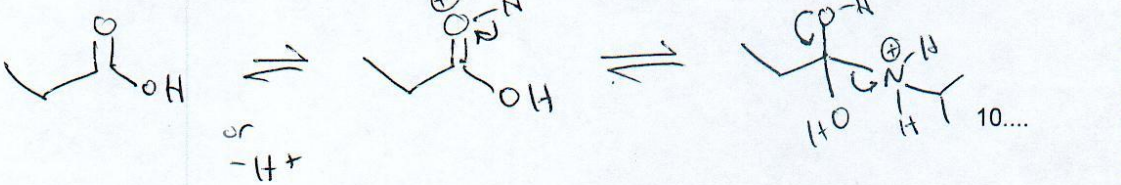


4pts

7. a) Draw a detailed mechanism for the reaction shown below. It is not necessary to show any transition states.



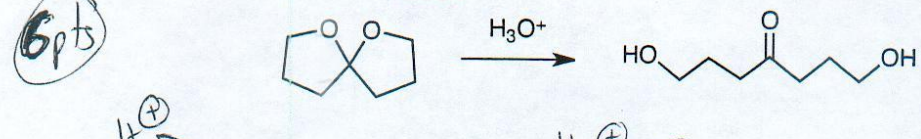
5pts

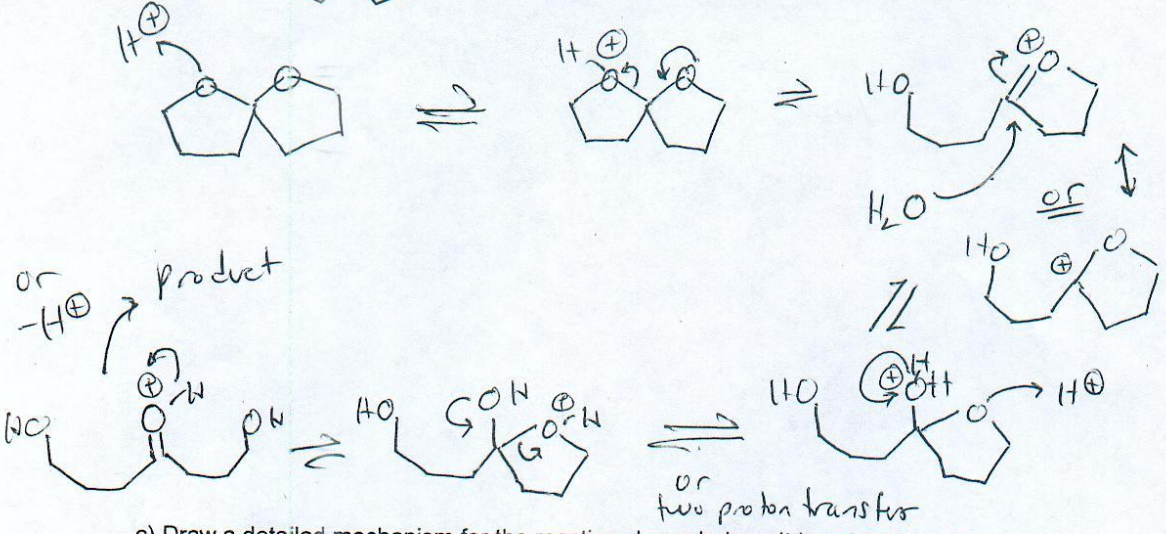


10....

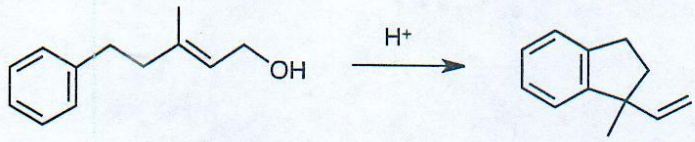
b) Draw a detailed mechanism for the reaction shown below. It is not necessary to show any transition states.

6pts

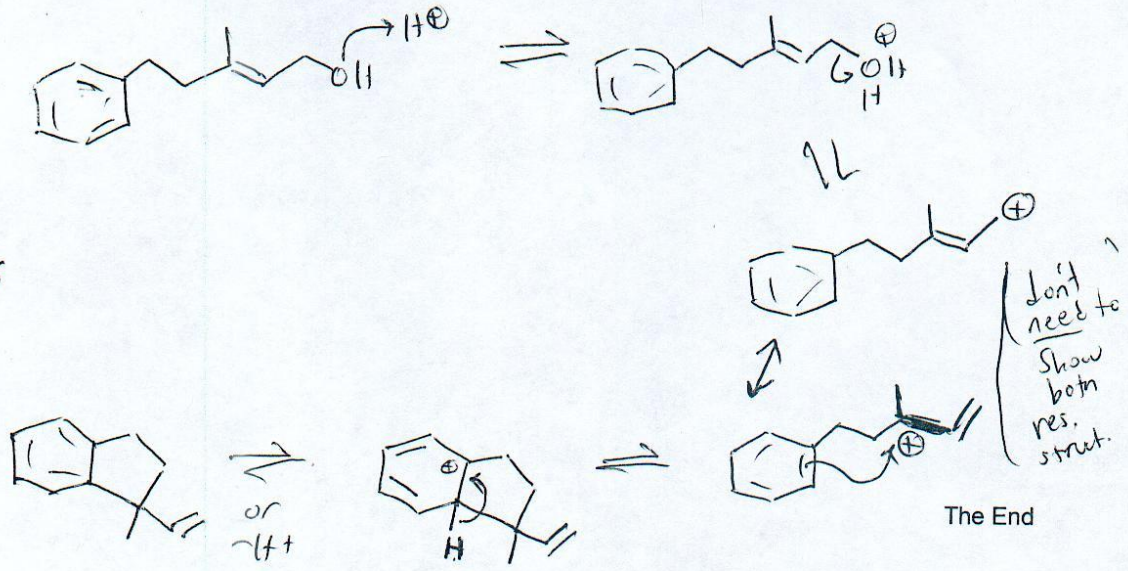




c) Draw a detailed mechanism for the reaction shown below. It is not necessary to show any transition states.



4pts



The End