

Chem 0130
Dennis P. Curran
April 1, 2005
Exam 3

NAME _____

SIGNATURE _____

Answer all questions on this exam. If you need more space than that provided, use the back of any page.

1. _____ (20 points)

2. _____ (20 points)

3. _____ (30 points)

4. _____ (10 points)

5. _____ (20 points)

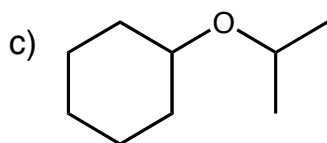
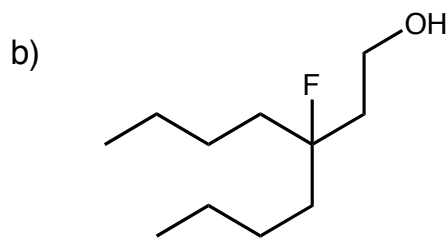
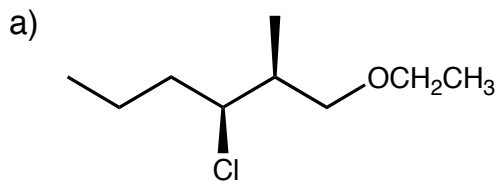
Total _____ (100 points)

The test has **7** pages (including this cover page) and **5** questions
The exam ends at 10:55 am sharp.

Good Luck !!!

1) Structures and Names (20 points)

a-c) Provide IUPAC names for the following compounds. Be sure to include *cis/trans*, *R/S*, if needed.



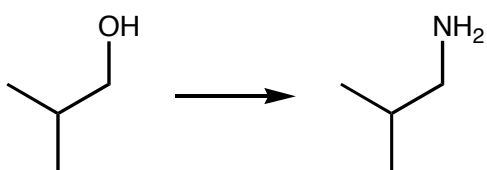
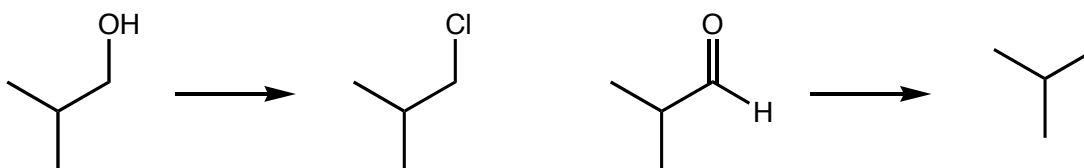
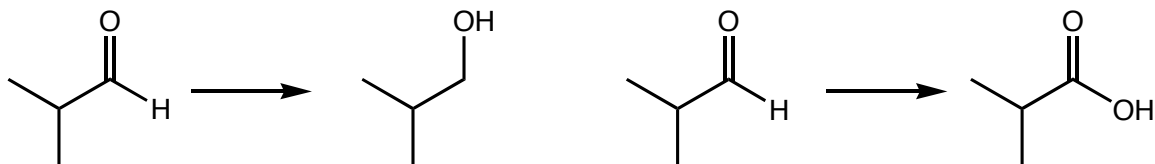
d-e) Provide clear structures for the following names. Be sure to show stereochemistry if relevant.

d) isobutyl ethyl ether

e) (3*S*)-1,1-dichloro-3-pentanol

2) Short Answer Questions (20 points)

a) Indicate whether each of the following transformations is an **oxidation**, a **reduction**, or **neither**.



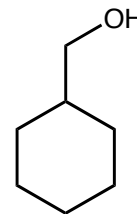
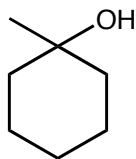
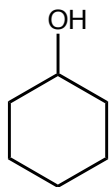
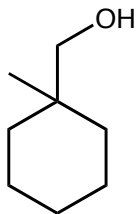
b) Provide an example of a **intramolecular** Williamson ether synthesis. Include the starting material(s), the product(s) and the reaction conditions.

c) Draw Lewis structures of the following two organometallic reagents.

i. sodium borohydride

ii. methyllithium complexed to three molecules of tetrahydrofuran (THF)

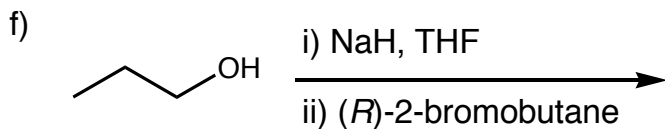
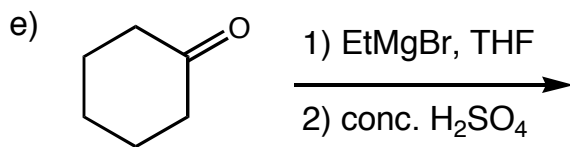
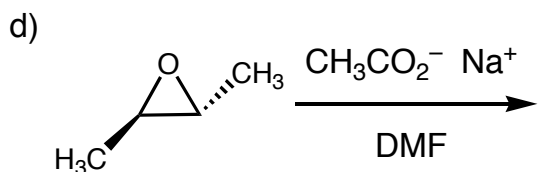
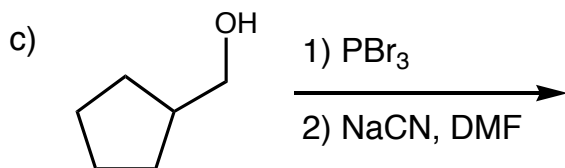
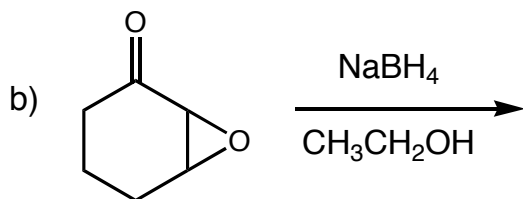
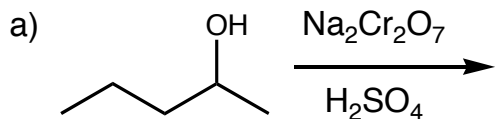
d) Rank the following alcohols in decreasing order of reactivity towards dehydration by conc. H_2SO_4 (most reactive first).



e) Draw the structure of a trans-disubstituted epoxide (oxacyclopropane).

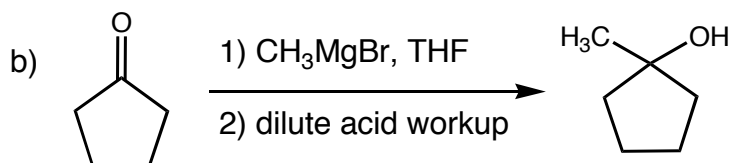
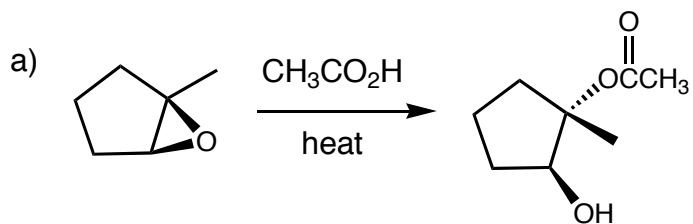
3) Reactions (30 points)

Show all expected products of the following reactions. Be sure to indicate stereochemistry, if relevant. NOTE: numbers "1), 2)" mean two separate reactions with workup in between. Letters "i), ii)" mean two parts of the same reaction with no workup in between.



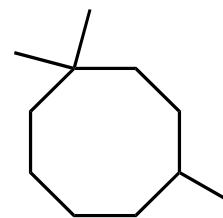
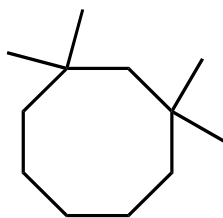
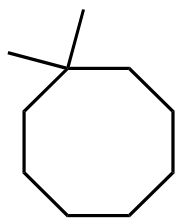
4) Mechanisms (10 points)

Show detailed mechanisms for each of the following two reactions. Show all individual steps, included acid/base reactions. Use arrows to track electron flow.

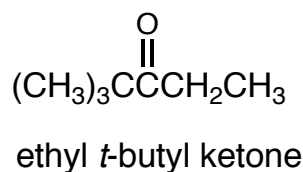


5) NMR (20 points)

a) Indicate the number of resonances (peaks) expected in the broadband (proton) decoupled ^{13}C NMR spectra of the following cyclooctane derivatives (6 points).



b) Indicate the expected multiplicities (splittings) for all the protons in ethyl *t*-butyl ketone (6 points).



c) Below are listed the ^1H and ^{13}C spectral data for isobutyl methyl ether. Assign each resonance to the relevant proton or carbon atoms (8 points). See the chemical shift Tables on the next page.

^1H NMR δ 3.5 (d, 2H), 3.3 (s, 3H), 1.9 (septet, 1H), 1.1 (d, 6H)

^{13}C NMR, broadband decoupled, all singlets
 δ 81, 54, 29, 19

