

Third Exam
CHEM 256 – Organic Chemistry II
Prof. Bastin
Spring 2016

Name

Key

Section

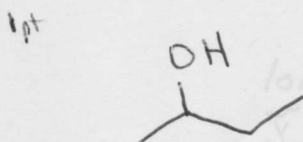
1. DO NOT START this exam until you are instructed to begin.
2. There are FOURTEEN pages including this cover sheet and the IR frequency and NMR chemical shift tables - make sure they are all here!
3. Provide *CLEAR, CONCISE* answers using unambiguous, carefully drawn structures and mechanisms for the appropriate questions. *Be sure to read each question VERY CAREFULLY.*
4. Do not provide mechanisms for synthesis and product prediction problems.
5. You may only use a pen or pencil and the materials provided in this packet on this exam.
6. If you have papers and/or books with you, they are to be left on the floor **AT THE FRONT OF THE ROOM**. If you need scrap paper please ask.
7. Cell phones must be **OFF** and placed on the table at the **FRONT** of the **ROOM**.

- Clarify integration & splitting for #4

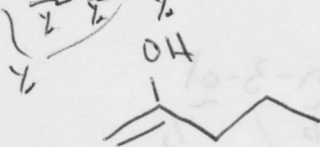
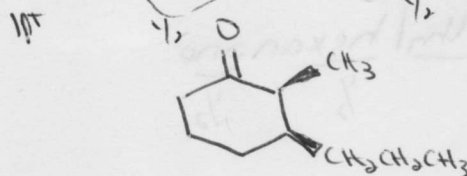
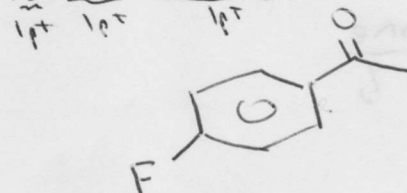
- correct 7c

Bastin - Third Exam

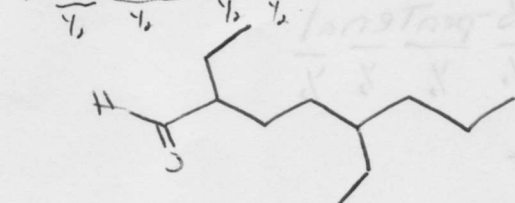
1) (15 pts) Provide structures for the following compounds.

a) *sec*-butyl alcohol

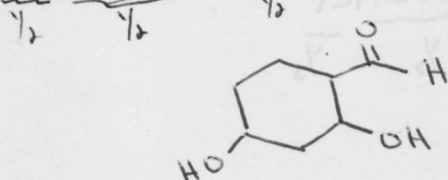
b) 1-penten-2-ol

c) *cis*-2-methyl-3-propyl-1-cyclohexanoned) *p*-fluoroacetophenone

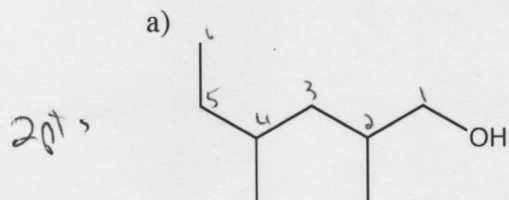
e) 2,5-diethyloctanal



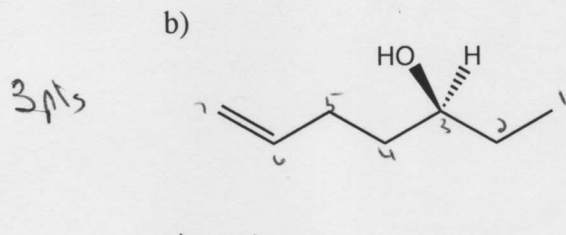
f) 2,4-dihydroxycyclohexane carbaldehyde



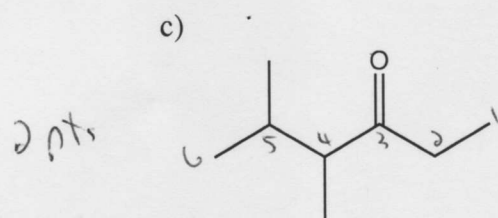
2) (14 pts) Provide either common or IUPAC names for the following compounds.



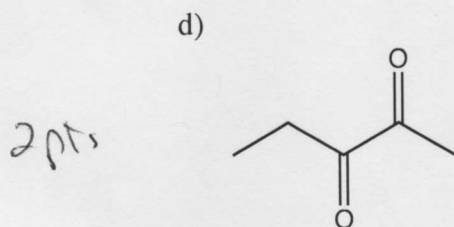
2,4-dimethyl-hexanol
 $\frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2}$



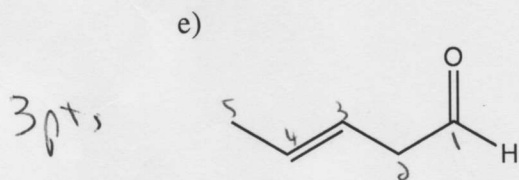
(S)-hept-6-en-3-ol
 $1 \text{ pt} \quad \frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2}$



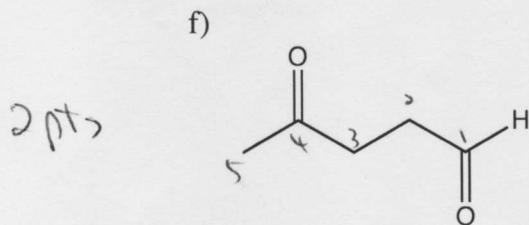
4,5-dimethyl-3-hexanone
 $\frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2}$



2,3-pentanedione
 $\frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2}$

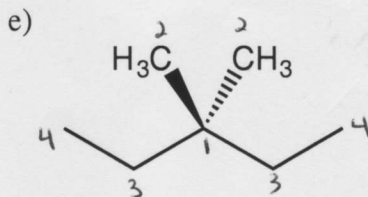
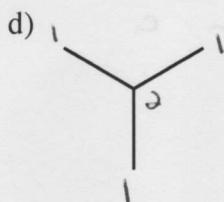
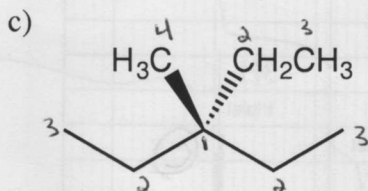
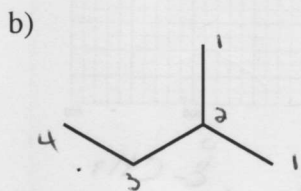
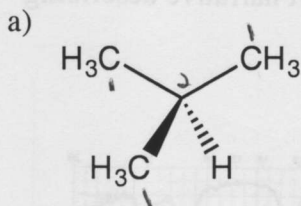


trans-3-pentenal
 $\text{or } \frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2}$
(E)

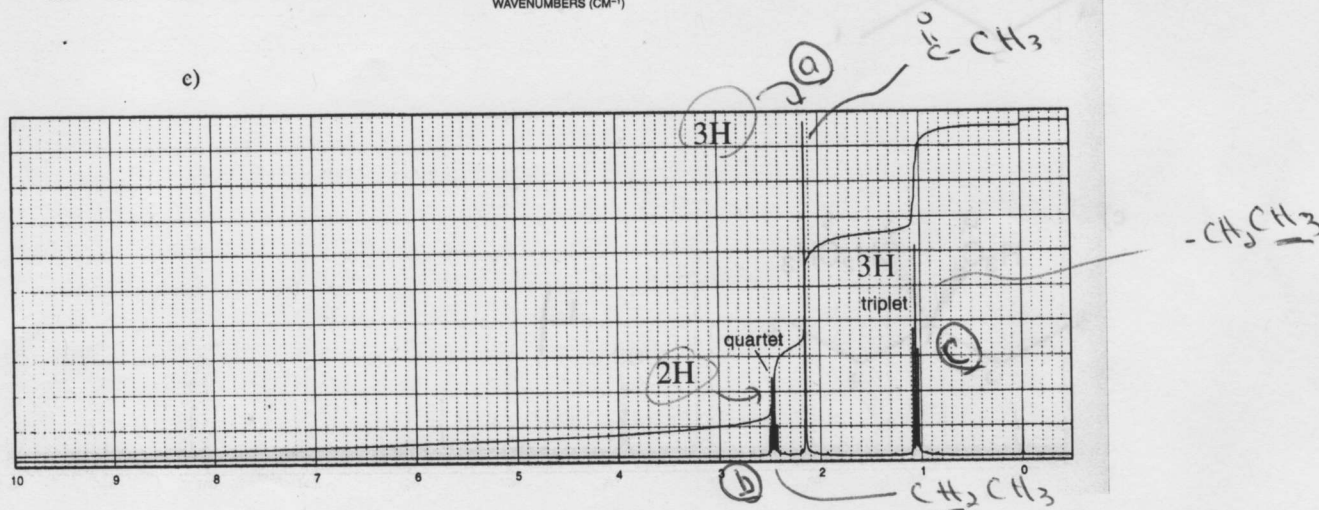
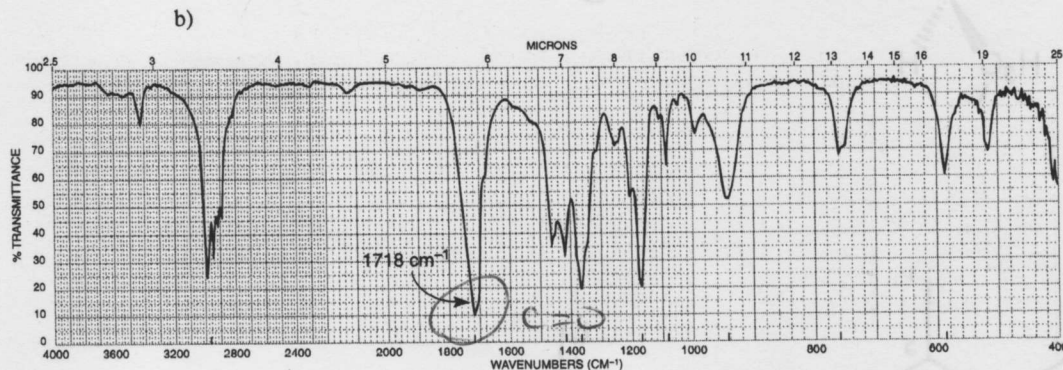


4-oxopentanal
 $\frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2} \quad \frac{1}{2}$

- 3) (10 pts) Indicate the number of peaks that a ^{13}C -NMR spectrum of each of the following molecules would contain?

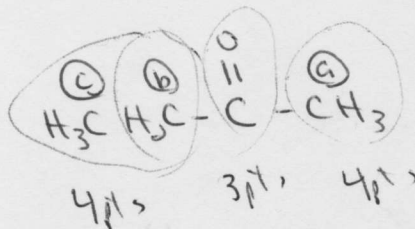


- 4) (11 pts) Propose a structural formula for compound A, C_4H_8O , consistent with the following 1H -NMR and IR spectra. To receive credit you must justify your structure by assigning ALL the appropriate peaks in the IR and NMR spectra and provide a short narrative describing what structural information each piece of data provided.

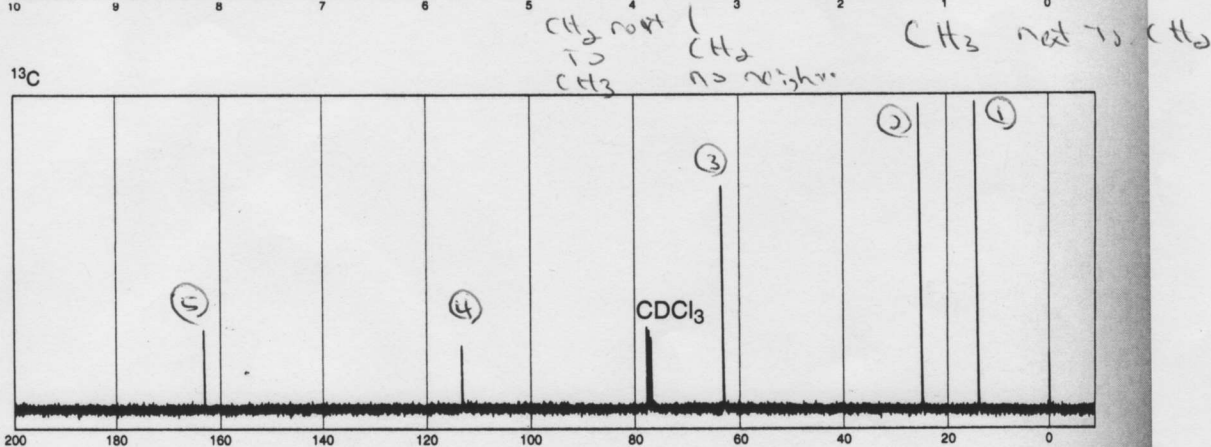
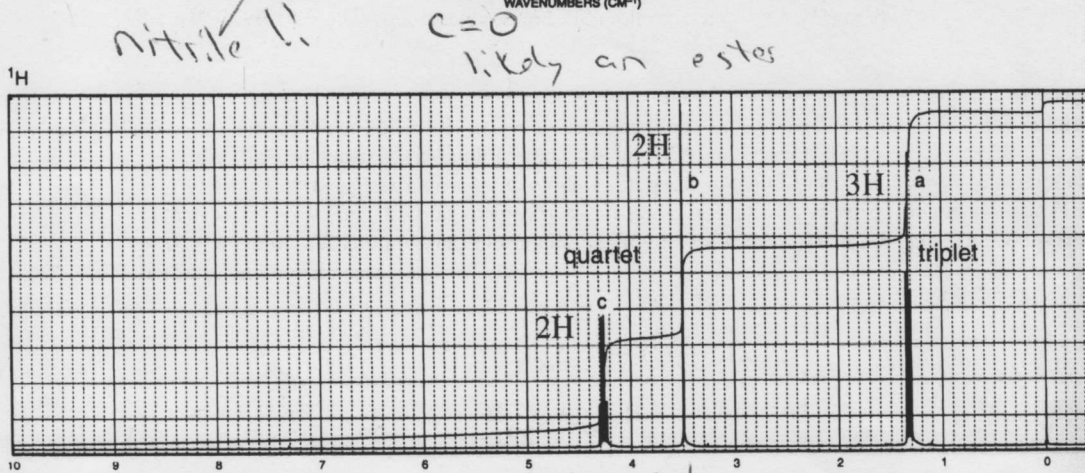
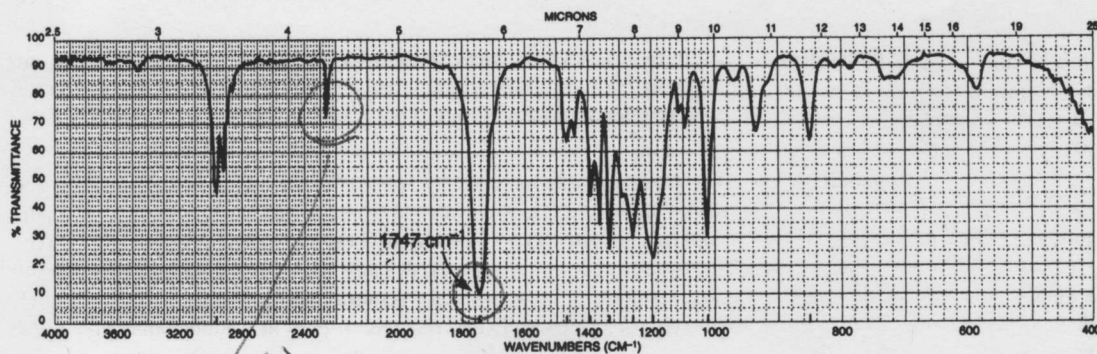


$$DU = 4 - \frac{8}{2} + 1 = 1$$

based on IR DU is from a carbonyl



- 5) (12 pts) Provide the structure of a compound with the molecular formula $C_5H_7NO_2$ using the IR, 1H -NMR, and ^{13}C -NMR provided below. To receive credit you must justify your structure by assigning ALL the appropriate peaks in the IR and NMR spectra and provide a short narrative describing what structural information each piece of data provided.

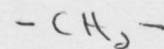
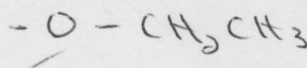
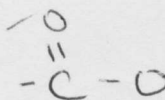
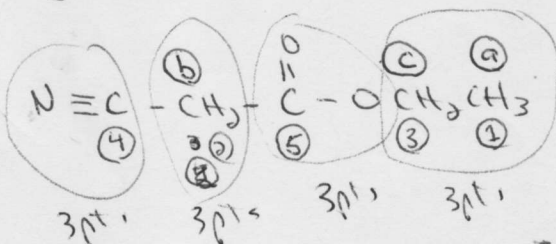


5 carbons
 $\Rightarrow$ no
 symmetry

$$DU = 5 - \frac{7}{2} + \frac{1}{2} + 1 = 3$$

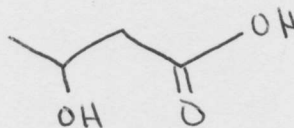
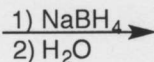
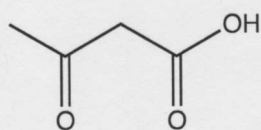
nitrile + carbonyl

$-C \equiv N$



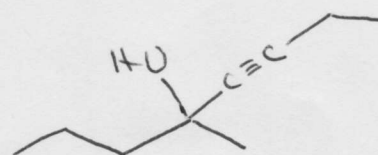
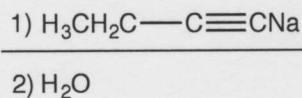
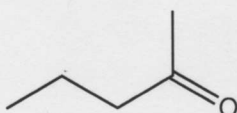
- 3 →
each
- 6) (12 pts) Draw the major product(s), if any, of the following reactions. Indicate stereochemistry where relevant.

a)



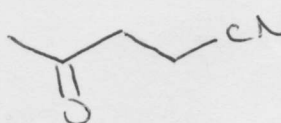
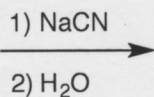
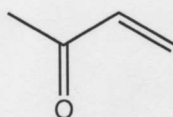
Reduction
selective for ketone

b)



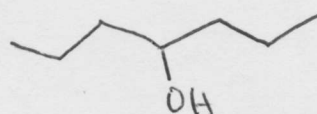
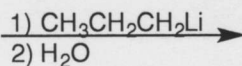
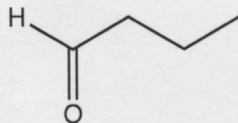
- OH
- ~~carbon length~~ Nu addition
- carbon length

c)



Nu addition
conjugate addition
No OH

d)

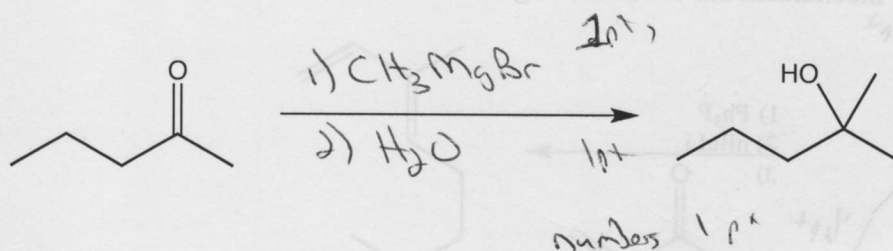


Nu addition
carbon length
OH

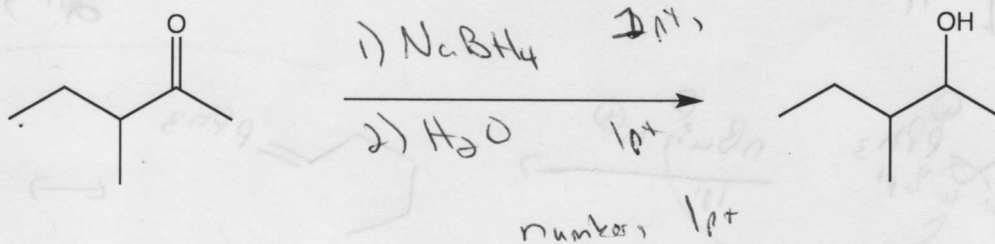
7) (12 pts) Provide the reagent(s) needed to bring about the following transformations.

3pts
each

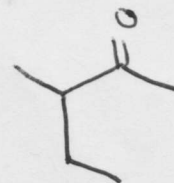
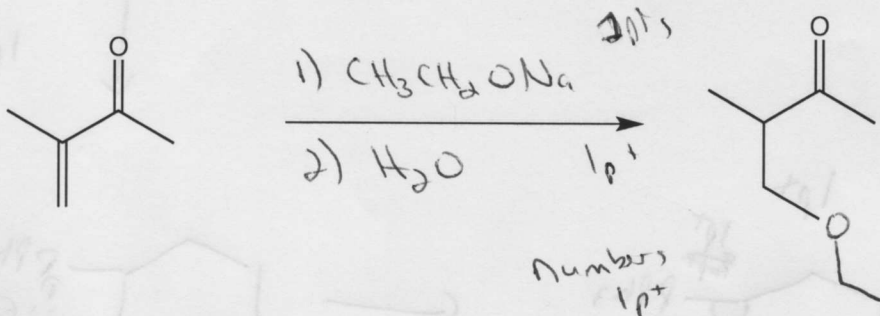
a)

+1 for H₂O
not HCl

b)

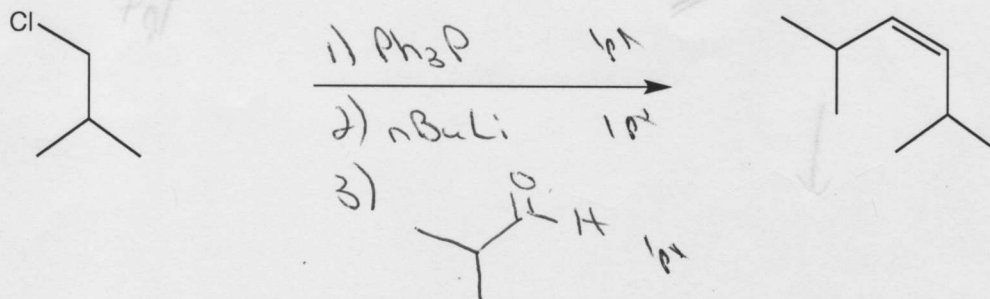
+1 for NaBH₄
not LiAlH₄

c)



3pts E.C.

d)



8) (14 pts) Provide a mechanism for the following reaction.

