Third Practice Exam
CHEM 256 – Organic Chemistry II
Prof. Bastin
Spring 2015

Name Key

Provide clear, concise answers using unambiquous, carefully drawn structures (where appropriate) for all of the questions. Good luck and enjoy!

1) _____/12 pts

2) _____/12 pts

3) _____/8 pts

4) _____/6 pts

Total: _____/100 pts

5) _____/10 pts

6) _____/12 pts

7) _____/12 pts

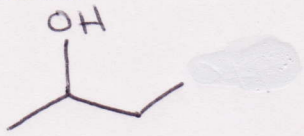
8) _____/8 pts

9) _____/6 pts

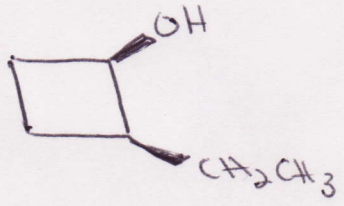
10) _____/14 pts

1) (12 pts) Provide structures for the following compounds.

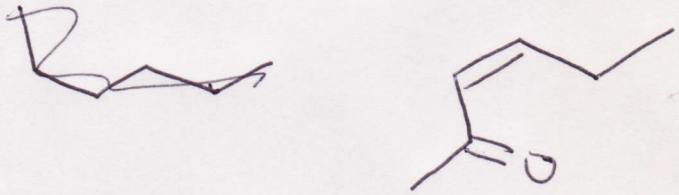
a) sec-butyl alcohol



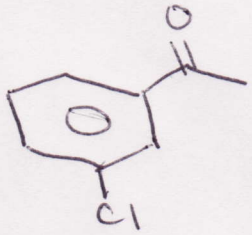
b) *cis*-2-ethylcyclobutanol



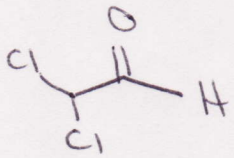
c) (Z)-hex-3-en-2-one



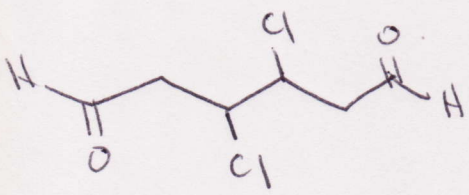
d) *m*-chloroacetophenone



e) dichloroacetaldehyde

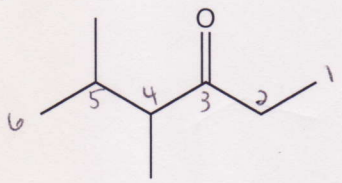


f) 3,4-dichlorohexandial



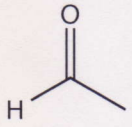
2) (12 pts) Provide either common or IUPAC names for the following compounds.

a)



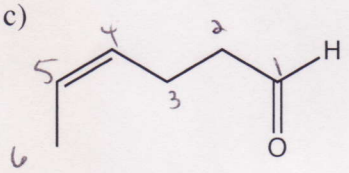
4,5-dimethyl-3-hexanone

b)



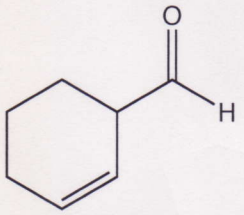
acetaldehyde or ethanal

c)



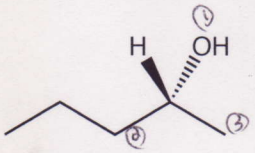
(Z)-4-hexenal
or
(Z)-hex-4-enal

d)



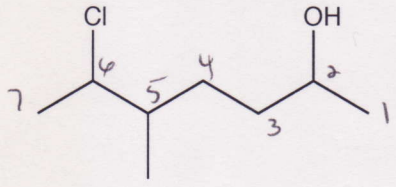
2-cyclohexene carbaldehyde

e)



(R)-2-pentanol

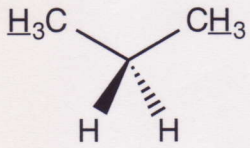
f)



6-chloro-5-methyl-2-heptanol

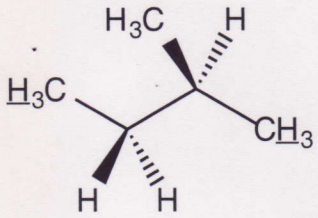
3) (8 pts) Identify the symmetrical relationship (homotopic, enantiotopic, diastereotopic) of the underlined atoms in the following molecules.

a)



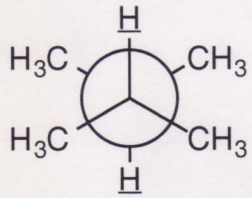
homotopic

b)



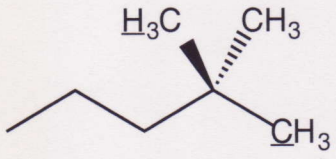
diastereotopic

c)



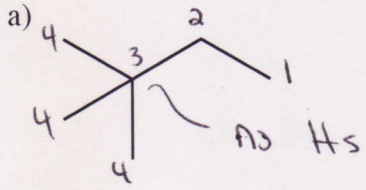
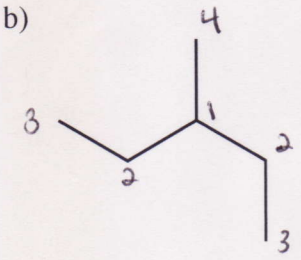
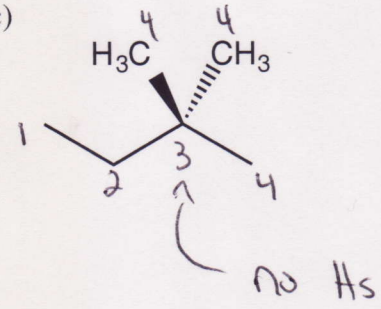
homotopic

d)

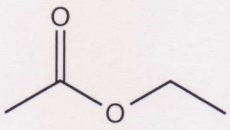


homotopic

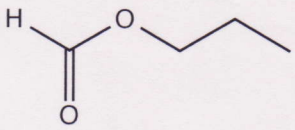
4) (6 pts) Indicate the number of peaks that a (a) ^{13}C-NMR spectrum and (b) ^{1}H-NMR spectrum of each of the following molecules would contain?

	^{13}C-NMR	^{1}H-NMR
a) 	4	3
b) 	4	4
c) 	4	3

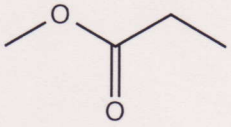
5) (10 pts) Following are three compounds with the molecular formula $C_4H_8O_2$ and three ^{1}H-NMR spectra. Assign each compound its correct spectrum and assign all signals to their corresponding hydrogens.



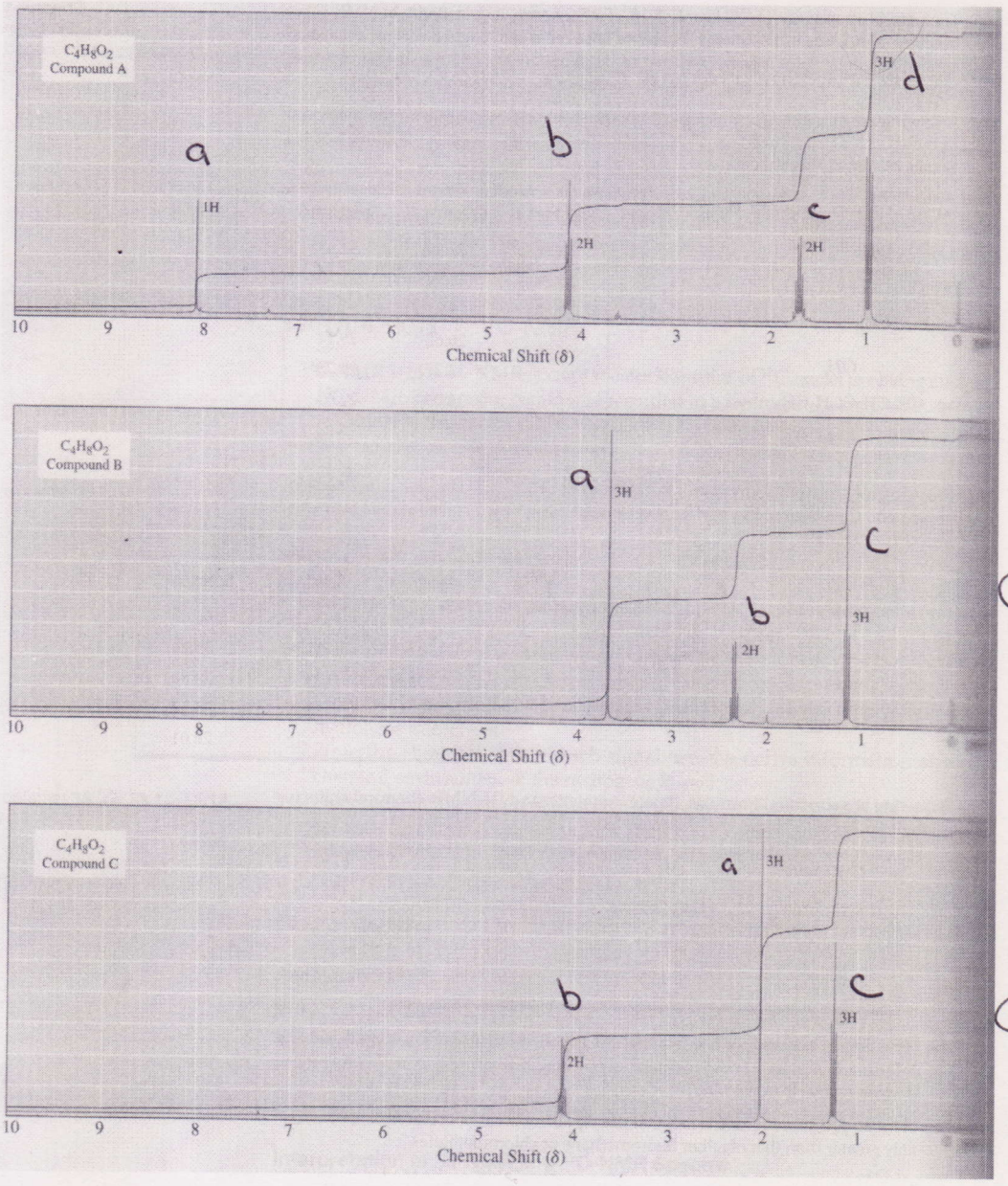
(1)

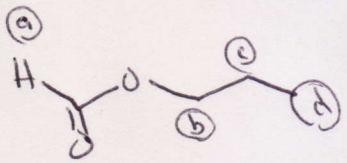


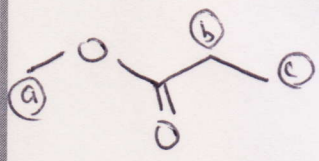
(2)

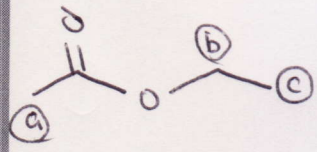


(3)





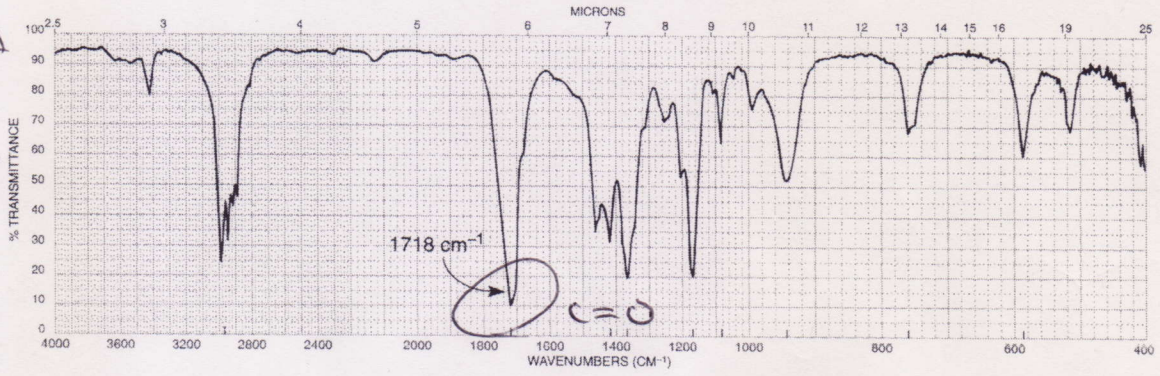




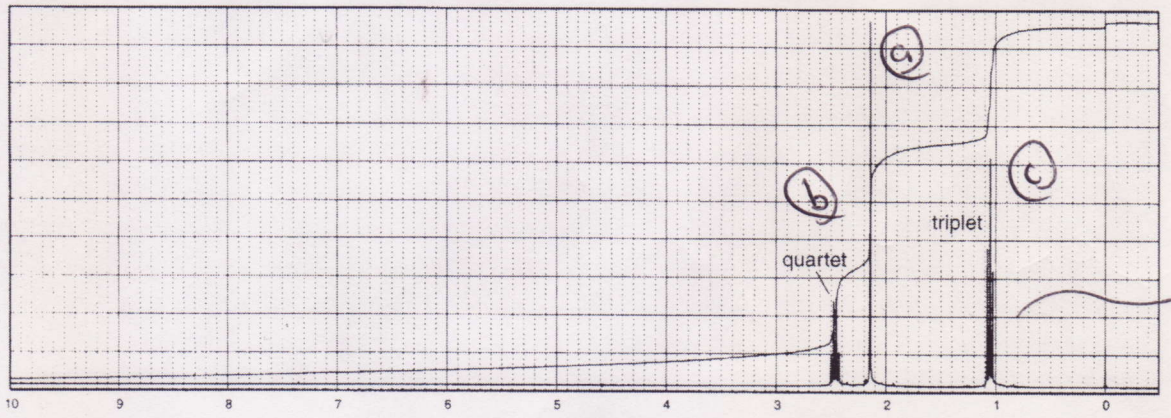
6) (12 pts) Provide the structure of a compound with the molecular formula C_4H_8O using the IR and ^{1}H-NMR provided below. Justify your structure by assigning ALL the appropriate peaks in the IR and NMR spectra and with a short narrative describing what structural information each piece of data provided.

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

since a C=O is present, no C=C or rings. Also no C≡C or aromatic



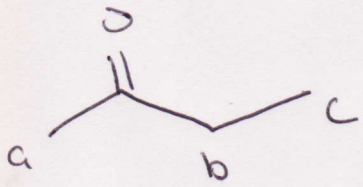
c)



Integration 2H 3H 3H

↳ CH_3 next to C=O

CH_2 next to C=O & CH_3

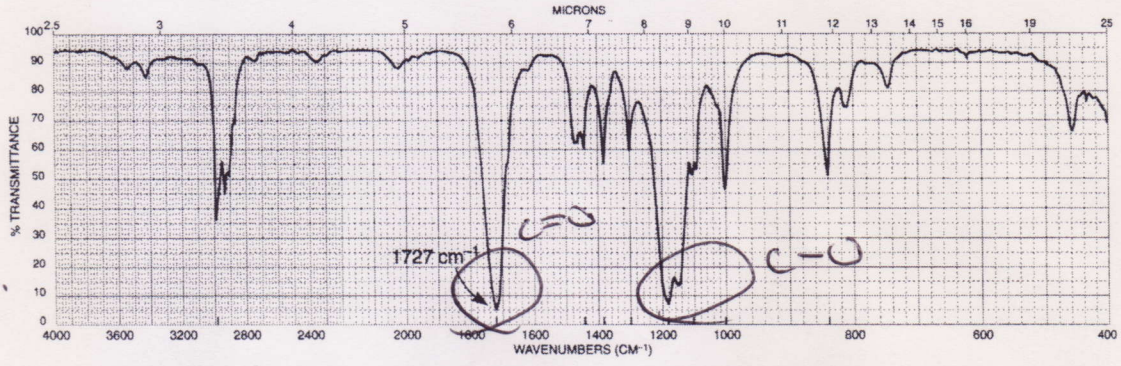


You would write a narrative!

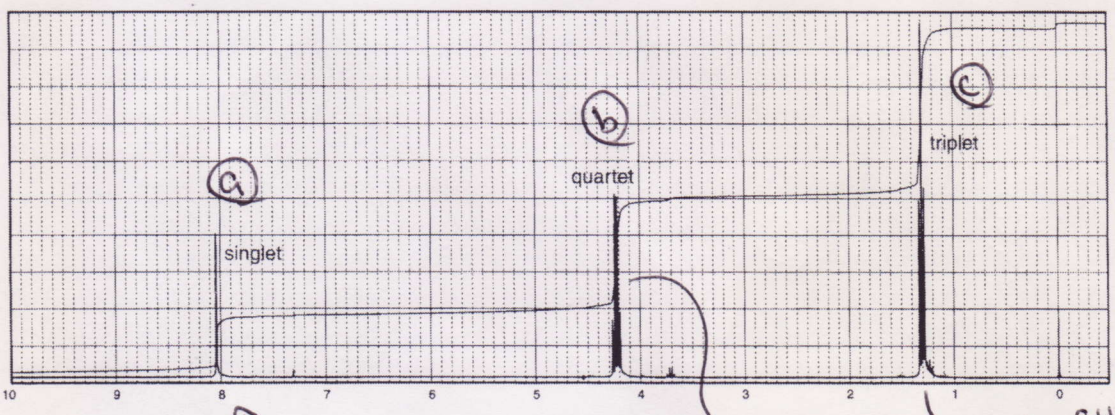
7) (12 pts) Provide the structure of a compound with the molecular formula $C_3H_6O_2$ using the IR, ^{1}H-NMR, and ^{13}C-NMR provided below. Justify your structure by assigning ALL the appropriate peaks in the IR and NMR spectra and with a short narrative describing what structural information each piece of data provided.

DU = $3 - \frac{6}{2} + 1$
= 1

since a carbonyl is present, no C=C or ring. Also, no C≡C or aromatic



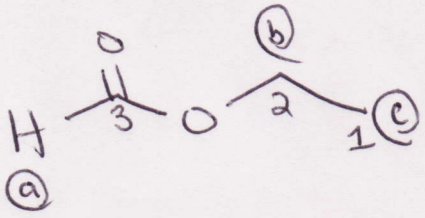
c)



Integration 1H ← aldehyde 2H CH_2 attached to CH_3 an Oxygen 3H → CH_3 attached to CH_2

^{13}C-NMR spectrum shows peaks at 14, 60, and 161 ppm 3 carbons ≡ no symmetry

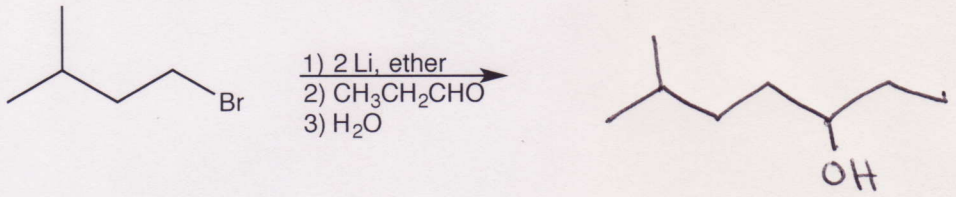
1 2 3 → carbonyl carbon



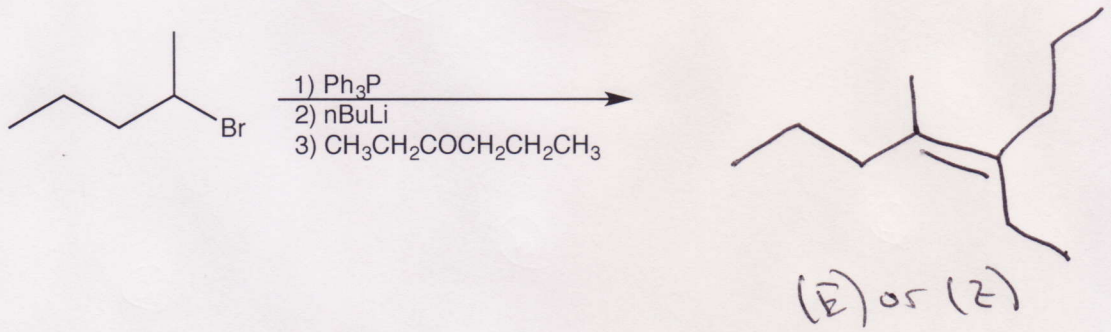
you would write a narrative

8) (8 pts) Draw the product(s), if any, of the following reactions. Indicate stereochemistry where relevant.

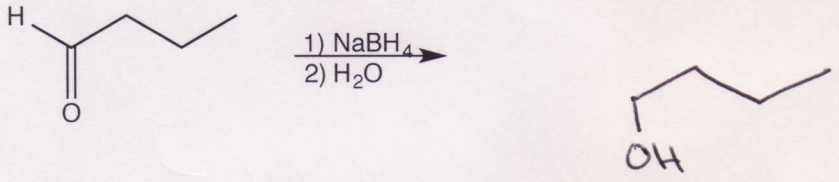
a)



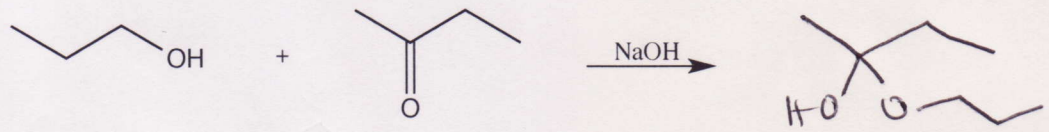
b)



c)

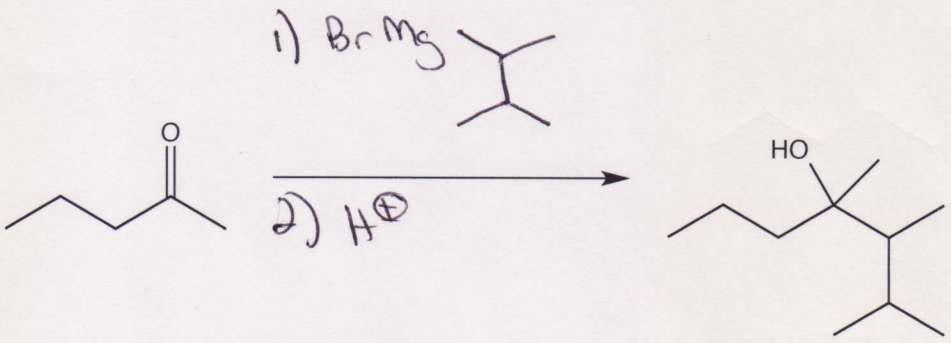


d)

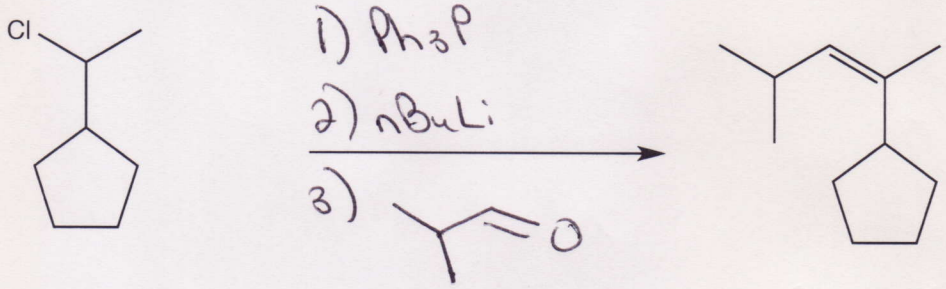


9) (6 pts) Provide the reagents needed to bring about the following transformations.

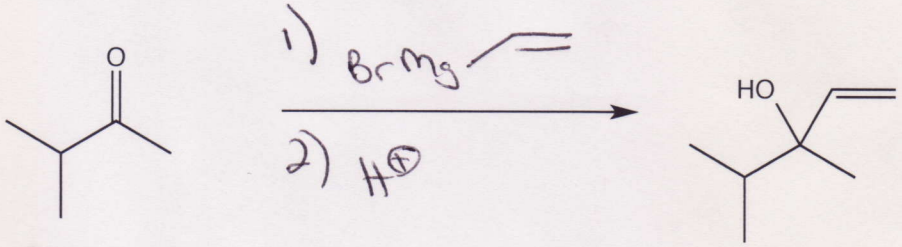
a)



b)



c)



10) (14 pts) Provide a mechanism for the following reaction.