

DAWSON COLLEGE  
DEPARTMENT OF CHEMISTRY & CHEMICAL TECHNOLOGY  
ORGANIC CHEMISTRY (II) 202-BZG-05  
WINTER 2007  
FINAL EXAMINATION

Teachers: E. Cadieux, I. Dionne, D. Montecalvo

Student Name and Number: Answers

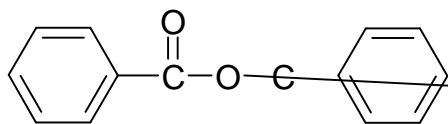
Instructions:

1. This examination package has 10 questions and 17 pages. It is your responsibility to ensure that there are no pages missing.
2. Please write your name and student number before beginning the exam.
3. Answer all questions directly on the exam pages in the spaces provided.
4. Write in ink or you may lose the right to grieve the exam grade.
5. Write clearly. Illegible answers will result in grade deductions.
6. Do not detach any of the sheets in this package.
7. Two blank pages are provided at the end of the examination package for your rough work. Your teacher will not look at any work written on those pages.
8. Calculators are not permitted.
9. Molecular models are permitted but may not be passed to other students.
10. Unless otherwise indicated, structural formulas must be shown with all hydrogen atoms, except in ring structures where bond-line formulas are permitted.

1. _____ / 16	5. _____ / 10	9. _____ / 25	Total _____ / 105
2. _____ / 8	6. _____ / 2	10. _____ / 10	Total _____ / 40
3. _____ / 15	7. _____ / 7		
4. _____ / 6	8. _____ / 6		

1. Provide appropriate names or structural formulas for the following: (16 marks)

(a)



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(b)

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(c) 4-oxo-3-chlorobutanoic acid

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(d)

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(e) benzyl benzoate

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(f)

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(g) ethyl phenyl ether

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(h)

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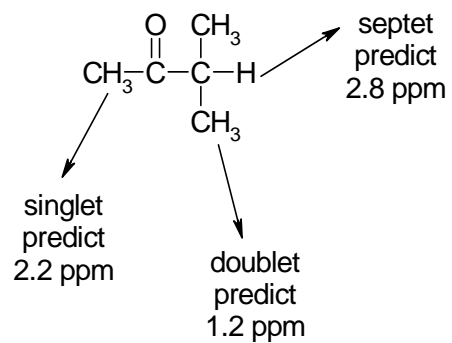
2. Propose a structure for each of the following compounds based on the  $^1\text{H}$  NMR information. (8 marks)

(a)  $\text{C}_5\text{H}_{10}\text{O}$

0.95  $\delta$  doublet

2.10  $\delta$  singlet

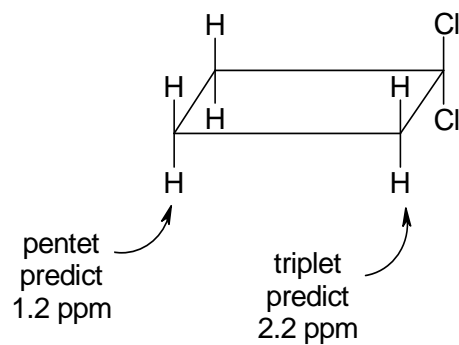
2.43  $\delta$  septet



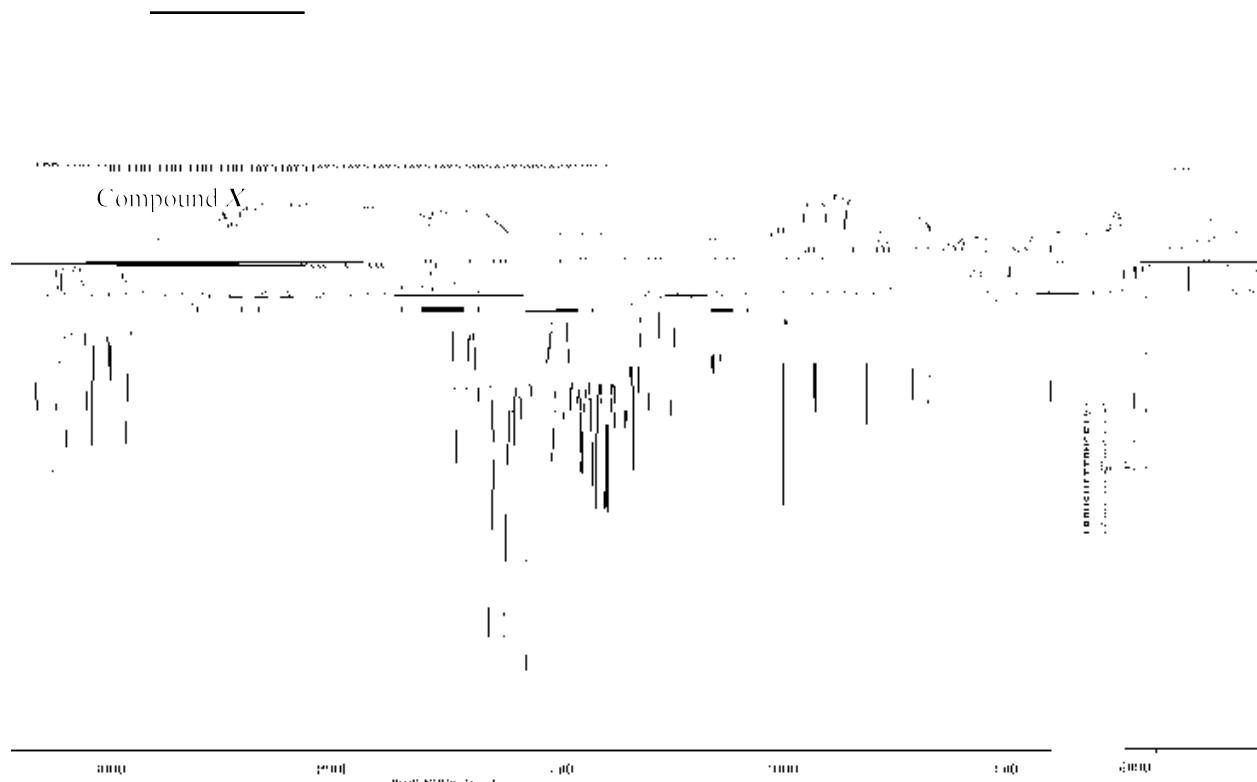
(b)  $\text{C}_4\text{H}_6\text{Cl}_2$

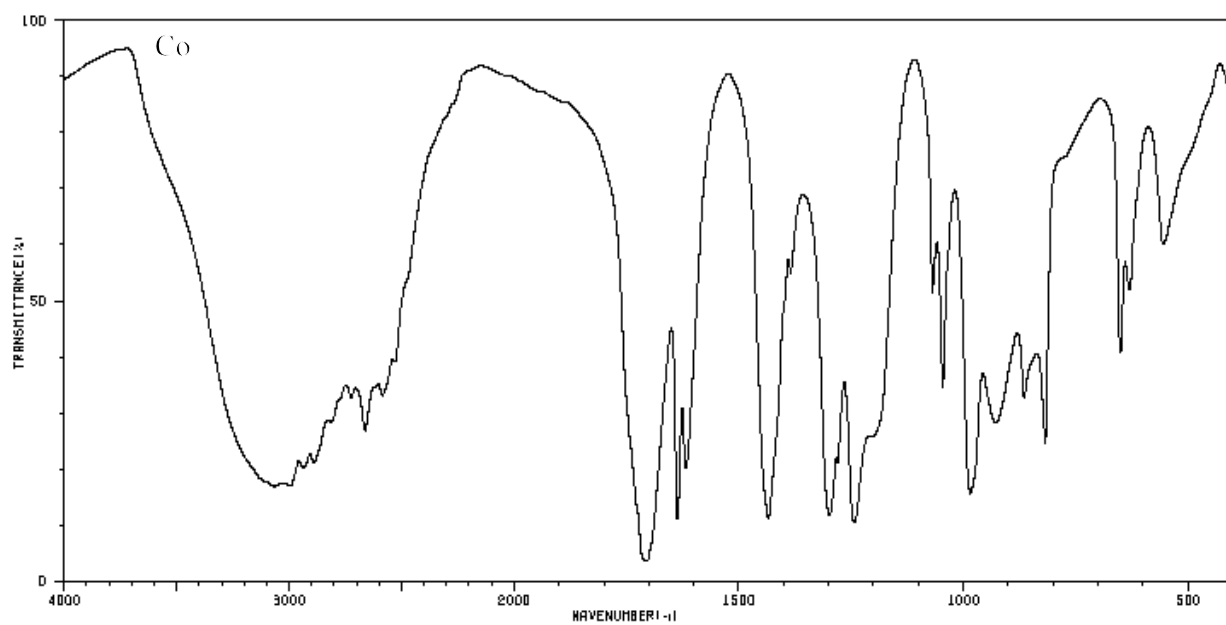
1.4  $\delta$  pentet (5 peaks)

2.1  $\delta$  triplet

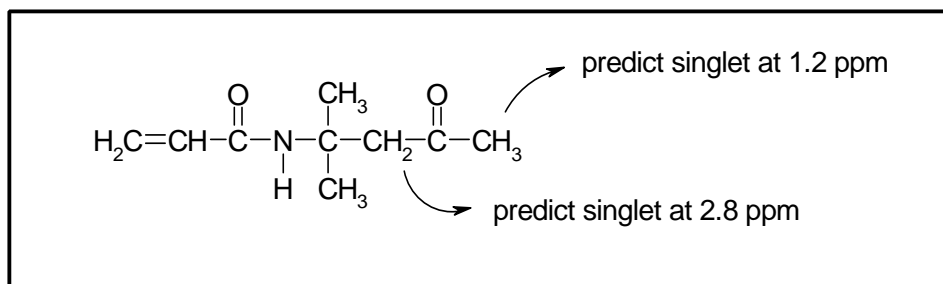


3. An unknown chemical,

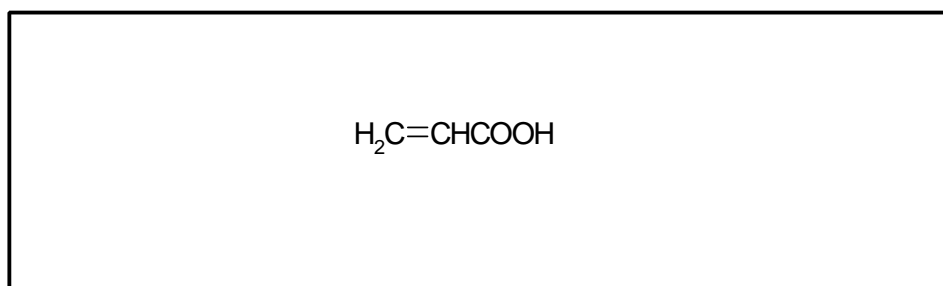




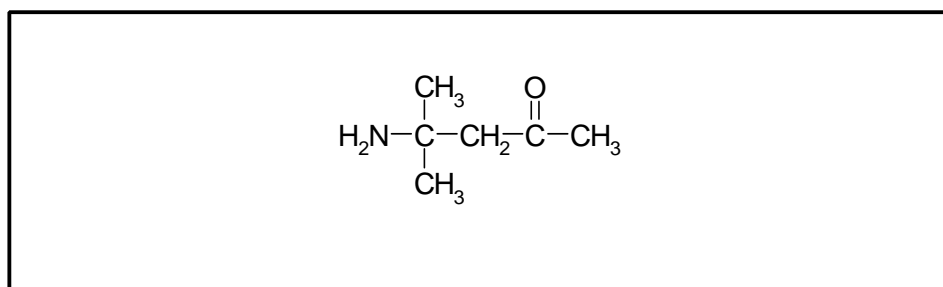
Proposed structures:



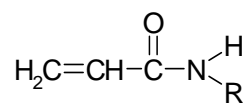
Compound X



Compound Y



Compound Z

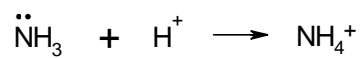


"Z" 115  $\text{H}_2\text{N}-\text{R}$

IR - doublet  
3290  
3350

mass of "R" is 99 amu  
has C=O (28)  
99 - 28 = 71 amu  
fragment  $\text{C}_5\text{H}_{11}$  reasonable

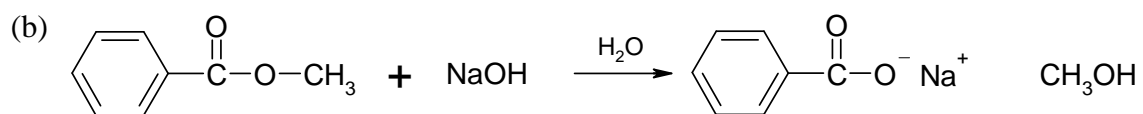
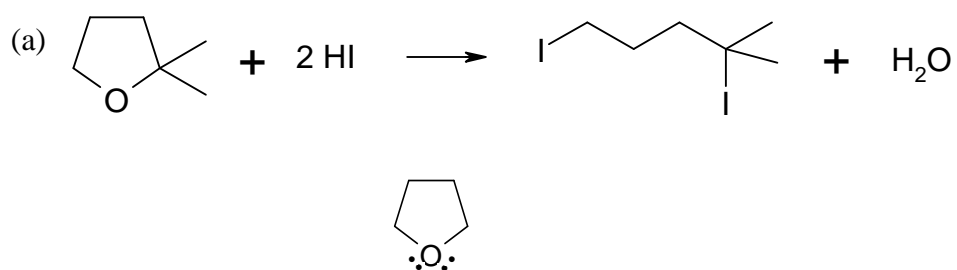
4. (a) Why are  $\text{NH}_3$  and  $\text{CH}_3\text{NH}_2$  no longer nucleophiles in acidic solution? (2 marks)



- (b) Why does a Grignard reagent not attack and bond to the carbonyl carbon of a carboxylic acid? (2 marks)

- (c) Only 15% of 2,4-pentanedione exists as the enol tautomer in water, but 92 % exists as the enol tautomer in hexane. Explain why this is so. (2 marks)

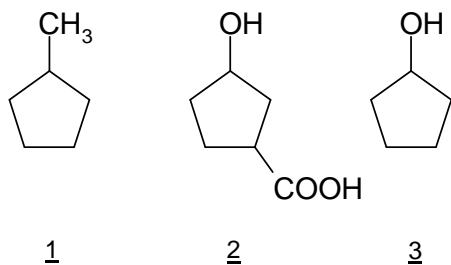
5. Give a detailed step-by-step mechanism to show how the products of the following (10 marks) reaction are formed. Used the curved arrow convention to show electronic movements.





6. Rank the following compounds in order of decreasing solubility in water. (2 marks)

Do not explain.

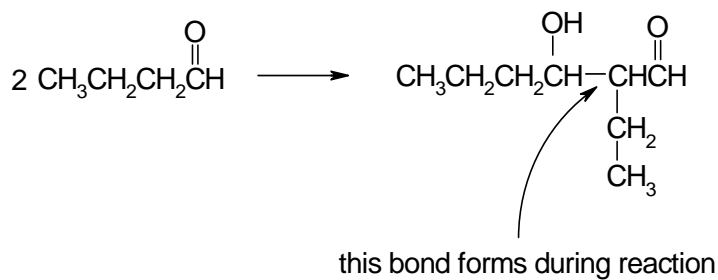


Answer: 2 > 3 > 1

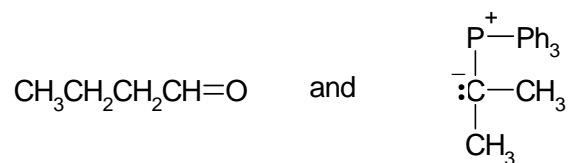
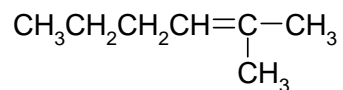
7. (a) Indicate the aldehyde or ketone from which the following compound would be formed by an aldol addition (2 marks)

2-ethyl-3-hydroxyhexanal

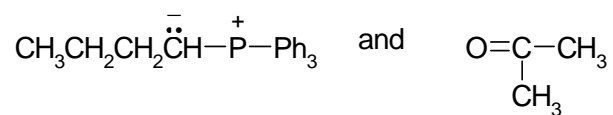
product is from butanal, addition with itself



- (b) What carbonyl compound and what phosphonium ylide are required in the last step of the Wittig synthesis of the following alkene? Provide two routes to achieve this synthesis. (4 marks)



or



- (c) The Gabriel synthesis is used to make what class of compound (functional group)? (1 mark)

primary amines

8. Provide brief answers to the following questions, concerning your laboratory work. (6 marks)

(a) What technique did you use to separate the clove oil (eugenol) from the ground cloves?

steam distillation

(b) What apparatus was used to remove a volatile solvent from a final nonvolatile product, other than a distillation?

rotary (flask) evaporator

(c) What color is  $\beta$ -carotene? Is this compound uv-visible active?

red-orange

definitely active in visilbel range  
(absorbs in blue-green region)

(d) Name 2 techniques, other than spectroscopy (IR, NMR, MS, uv-vis), that can be used to verify the identity of a product.

thin layer chromatography

refractive index

m.p.

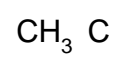
b.p.

etc.

9. Supply missing major organic products.

(25 marks)

(a)



(b)

(c)

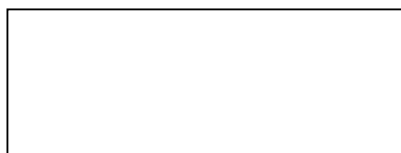
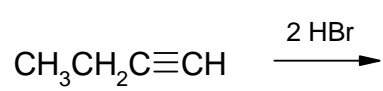
(d)

(e)

(f)

(g)

(h)



(i)



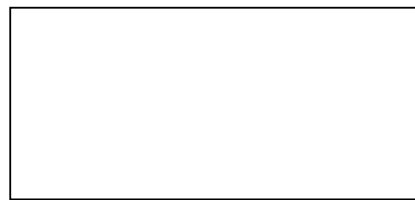
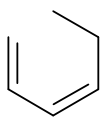
(j)

(k)

(l)

(m)

(n)



(o)

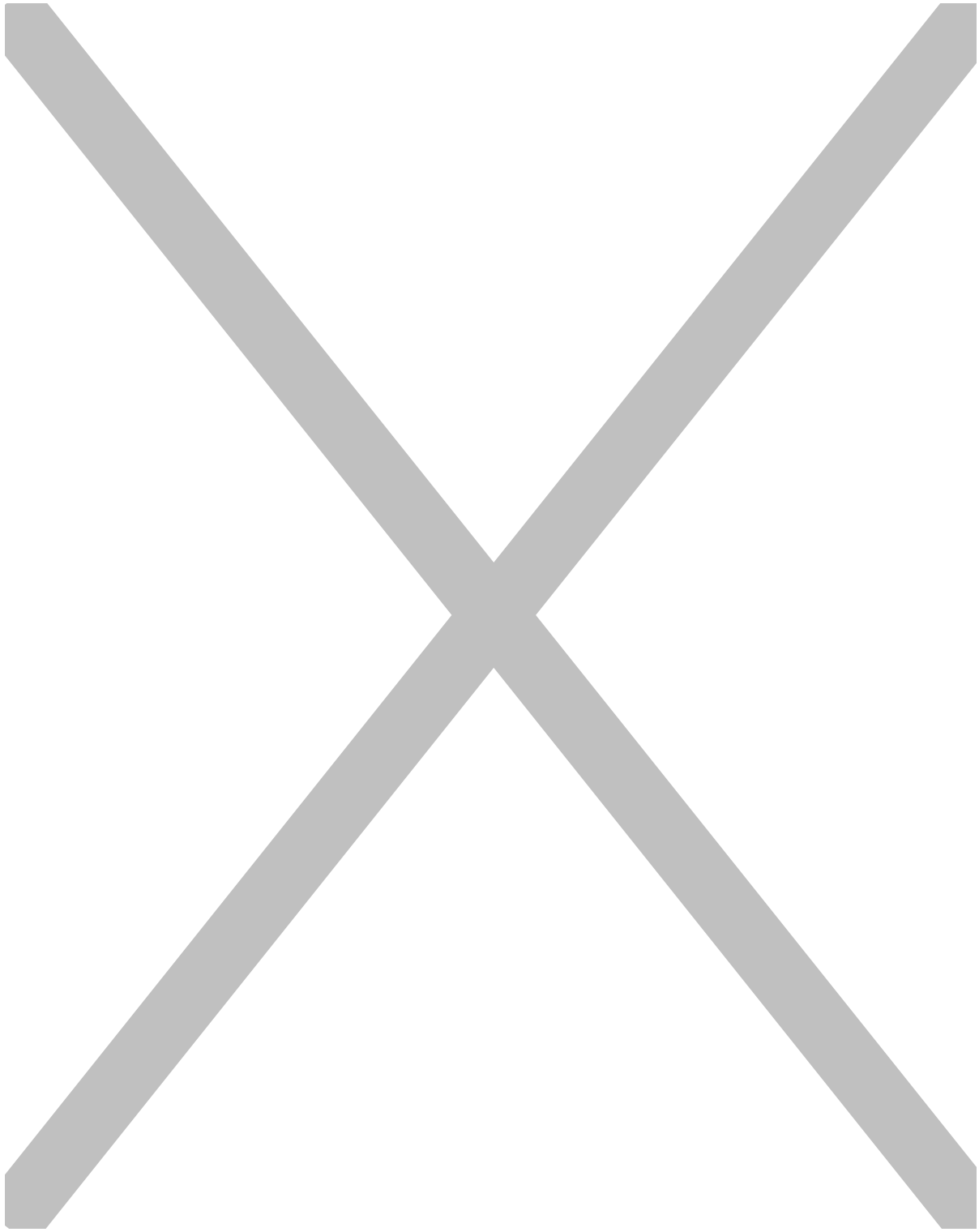
(p)

(q)

(r)



For your rough work. Your teacher will not look at any work written on this page.





For your rough work. Your teacher will not look at any work written on this page.

