EXAMINATION 2

Chemistry 3B
Professor K. Peter C. Vollhardt
April 6, 1995

Name:_____
[Print first name before second! Use capital letters!]

Please check the name of your TA and corresponding section number. Complete the remaining information if applicable.

101	Sari Paikoff	_____	311	Guangcheng Liu	_____
102	Demetra Panomitros	_____	312	Jerry Yang	_____
111	Paul Herrmann	_____	313	Hector Gonzales	_____
112	Kit Mayberry	_____	411	Kelly Yang	_____
113	Barry Bunin	_____	412	Demetra Panomitros	_____
211	Paul Hermann	_____	413	Brian Siesel	_____
212	Satish Jalisatgi	_____	511	Joanna Fuller	_____
213	Melissa Chen	_____	512	Mareia Frost	_____
301	Brad Backes	_____	513	Sheryl Tsai	_____
302	Hector Gonzales	_____	601	Lecture Only	_____
Making up an I Grade		_____			

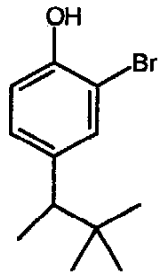
(If you are, please indicate the semester in which you took previous Chem 3B _____)

Please write the answer you wish to be graded in the spaces provided. Do scratch work on the back of the pages. This test should have 15 numbered pages. Check to make sure that you have received a complete exam. A good piece of advice: **read carefully over the questions (at least twice); make sure that you understand exactly what is being asked; avoid sloppy structures or phrases, it is better to be pedantic in accuracy! Good Luck!**

I.	_____	**(30)**
II.	_____	**(50)**
III.	_____	**(60)**
IV.	_____	**(30)**
V.	_____	**(30)**
TOTAL		**(200)**

I. [30 Points] Name (IUPAC) or draw, as appropriate, the following molecules, including their stereochemistry (if indicated).

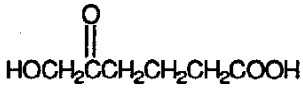
a.



b.

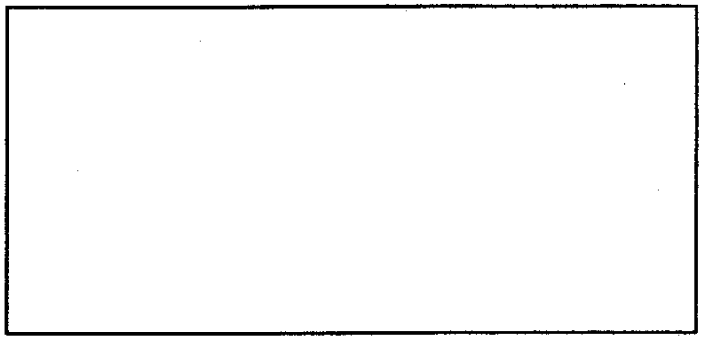
(2S)-Amino-3-(4-hydroxy-phenyl)propanoic acid (the amino acid tyrosine)

c.

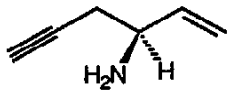


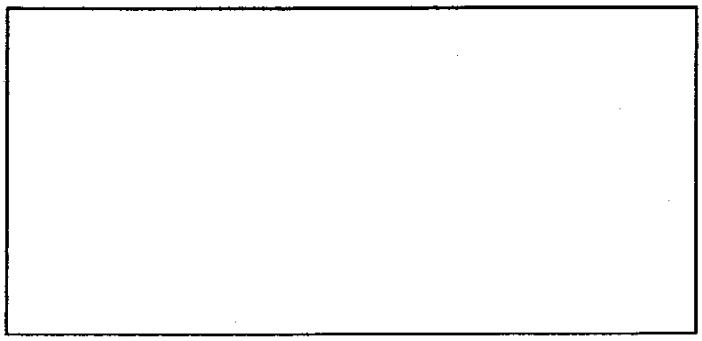
d.

1,1-Dimethylethyl cis-3-methylcyclohexanecarboxylate



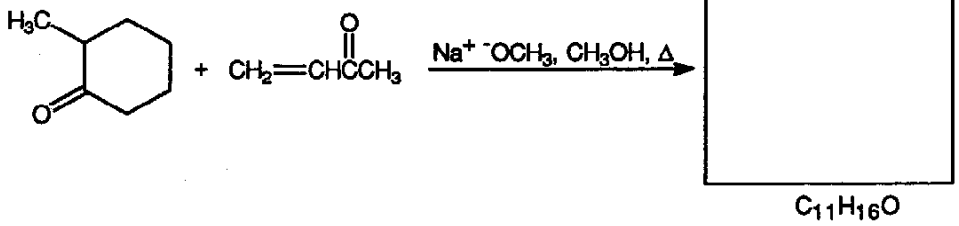
e.



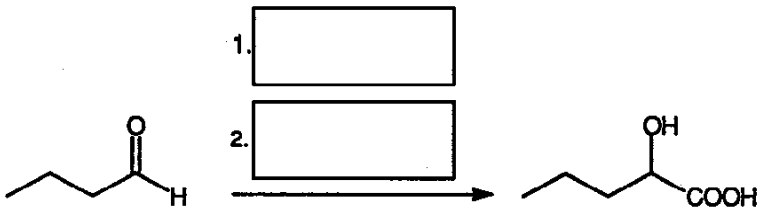


II. [50 Points] Add the missing components (starting materials, reagents, or products) of the following reactions in the boxes provided. Aqueous work-up (when required) is assumed to be part of a step. It is not part of any answer.

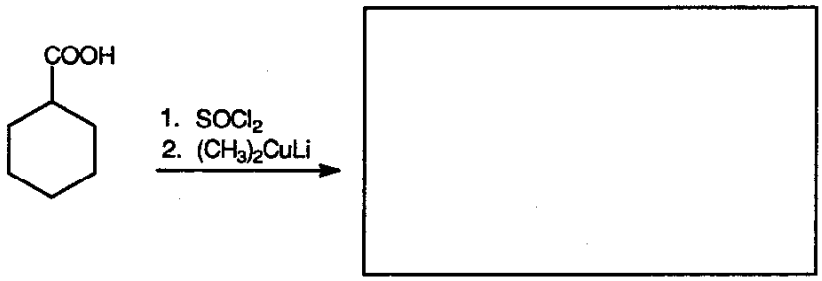
a.



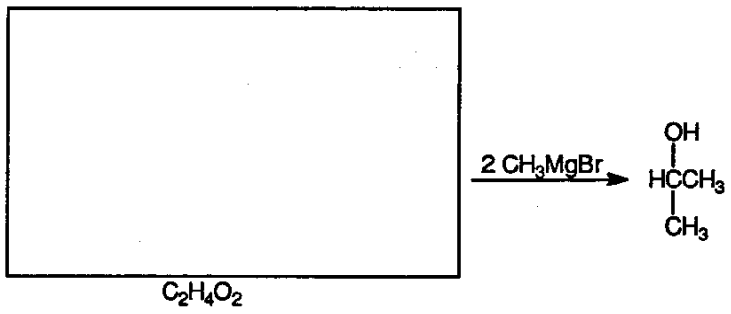
b.



c.



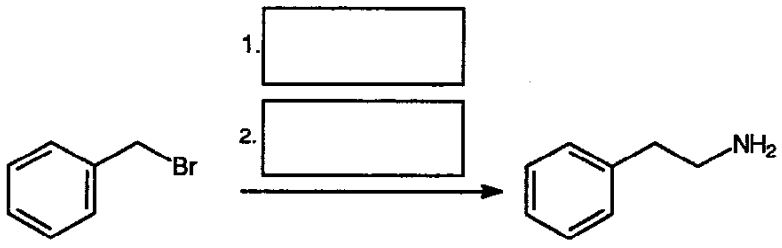
d.



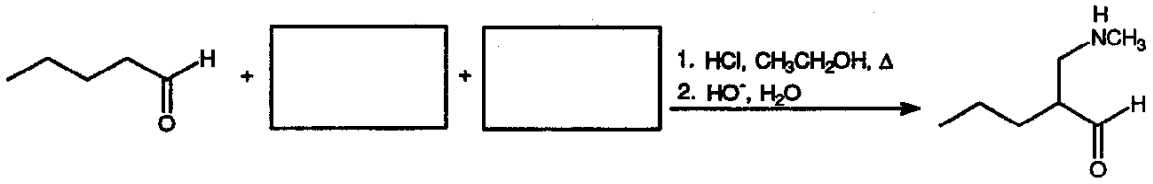
IR: 1700 cm^{-1}

^1H NMR: δ = 8.03 (s, 1H), 2.01 (s, 3H)

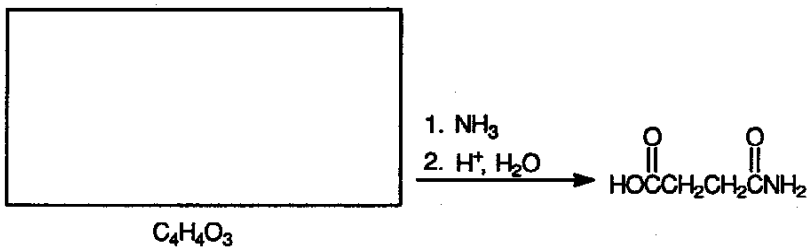
e.



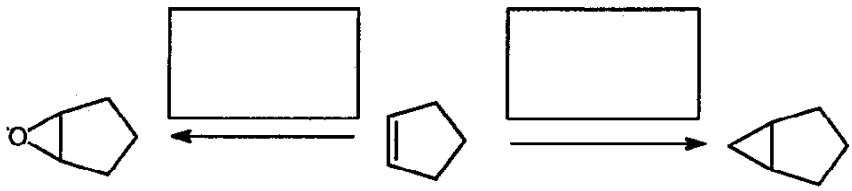
f.


H
O
+
+
1. HCl, CH3CH2OH, Δ
2. HO-, H2O
H
NCH3
H
O

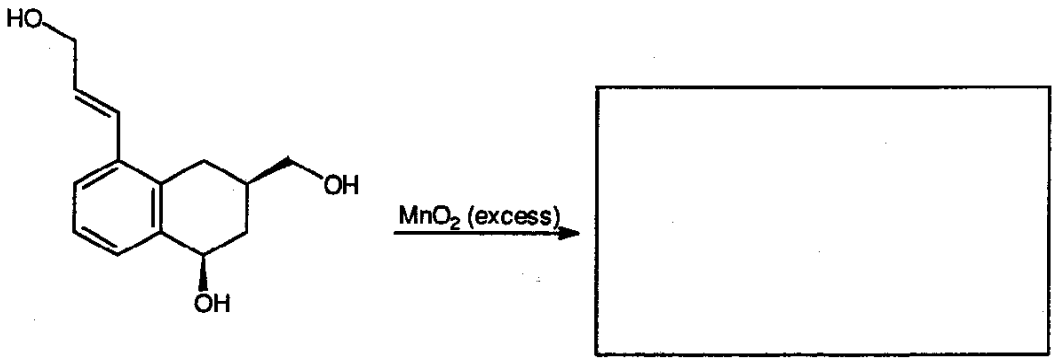
g.


1. NH3
2. H+, H2O
O
O
HOCCH2CH2CNH2
C4H4O3

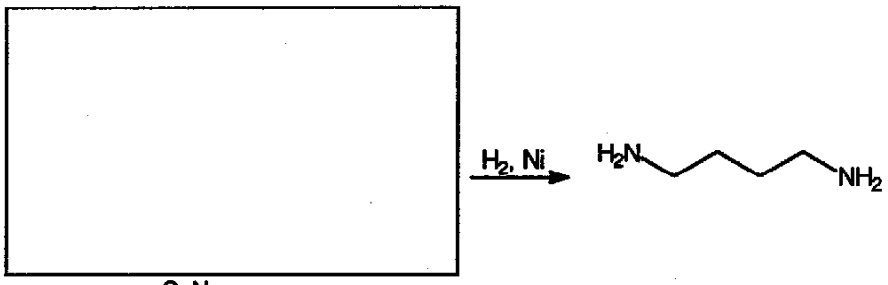
h.


O

i.

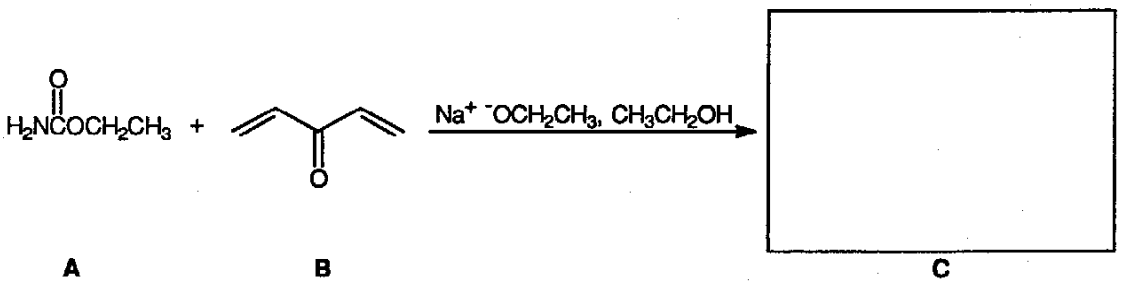

HO
OH
OH
MnO2 (excess)

j.



IR: 2066, 2235 cm^{-1}

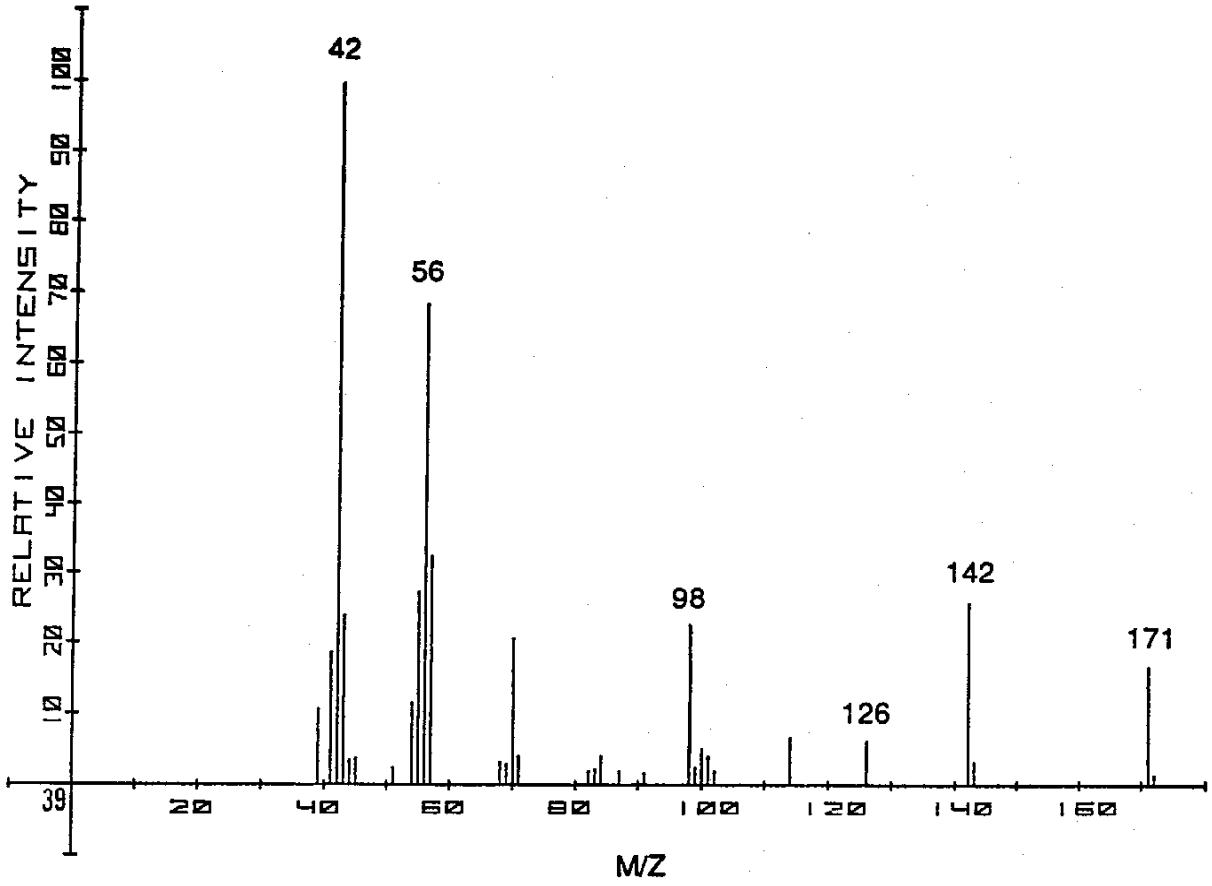
III. [60 Points] Treatment of the carbamate **A** with the diethenylketone **B** in the presence of base gave a new compound **C**. Its mass, IR, and NMR spectra are depicted below.



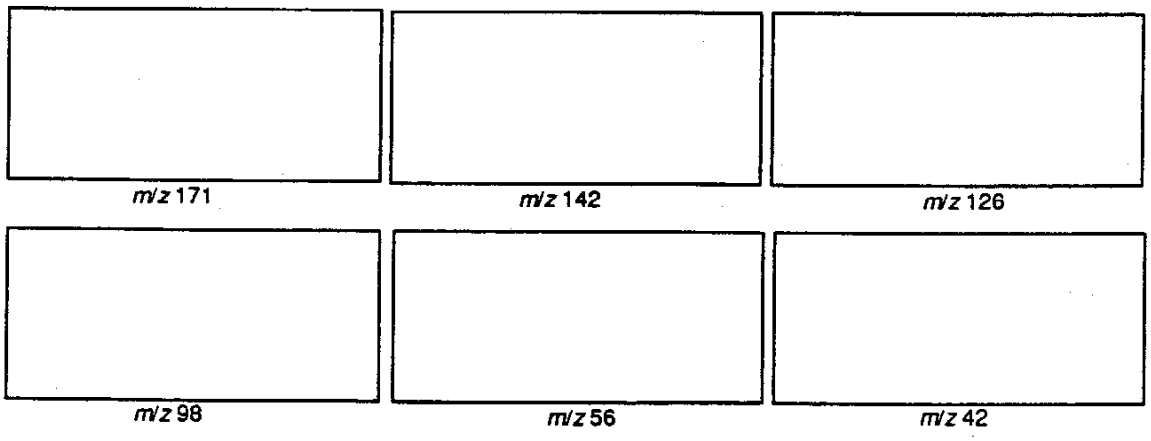
a. What is **C**? (Draw in the box provided.)

b. Interpret the spectral data as requested in the spaces provided.

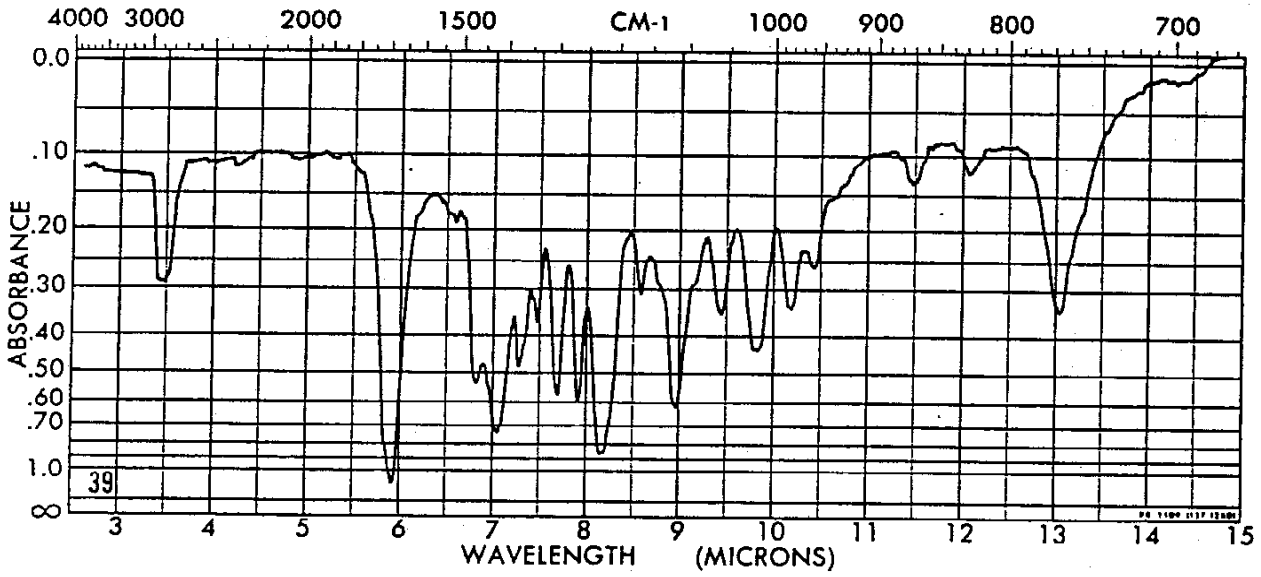
1. Mass Spectrum



Assign the signals indicated in the boxes provided.



2. IR Spectrum

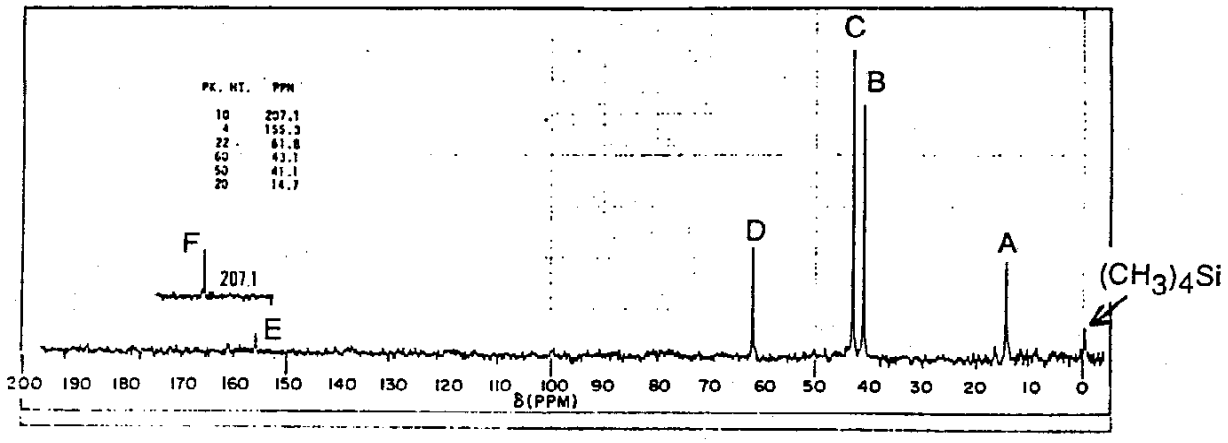


There is a peak present and (considering the starting materials) a characteristic peak absent in the spectrum. Specify and assign to stretching frequencies.

Peak present at [ ], due to [ ].

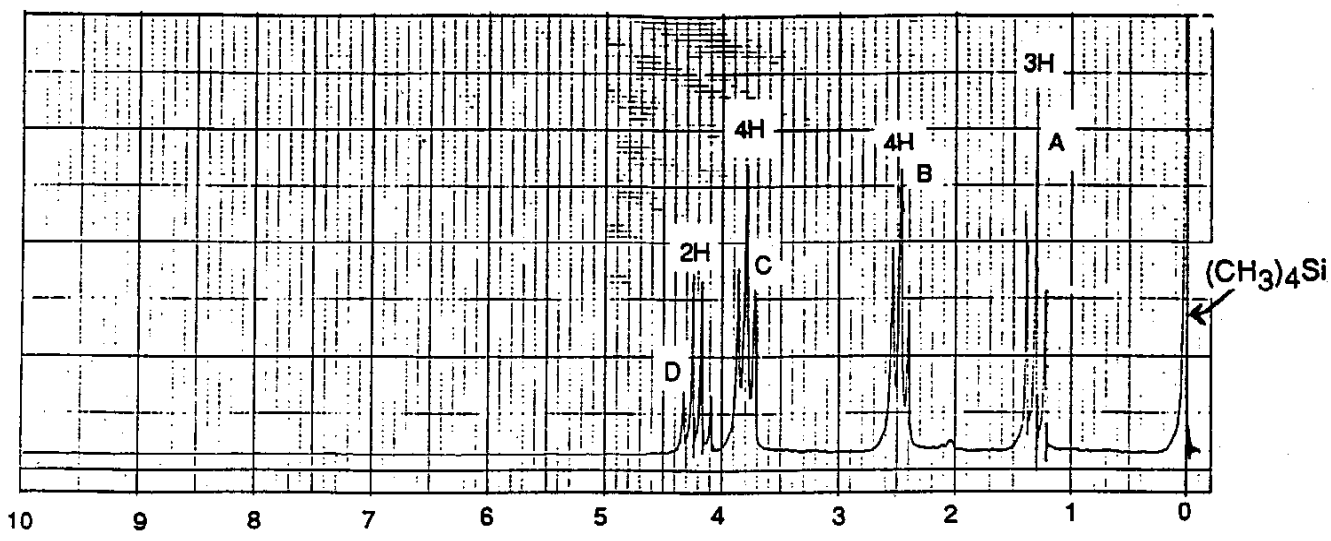
Peak absent at [ ], due to [ ].

3. ^{13}C NMR Spectrum



Draw your suggestion for **C** and label the carbon atoms A, B, C, etc., giving rise to the corresponding signals in the spectrum.

4. ^{1}H NMR Spectrum

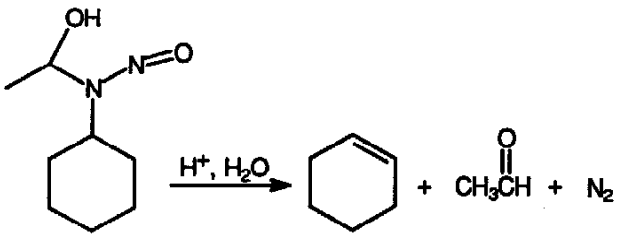


Draw your suggestion for C and label the hydrogens A, B, C, and D giving rise to the corresponding signals in the spectrum. Note: the *J* values for the peaks at δ = 1.30 and 4.23 ppm are 12 Hz, for those at δ = 2.47 and 3.79 ppm they are 8 Hz.

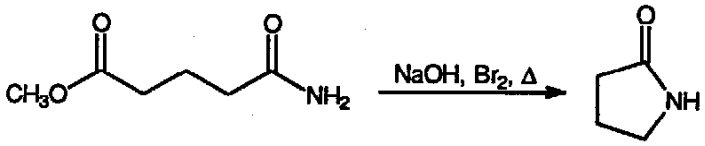
c. Suggest a plausible mechanism for the formation of C.

IV. [30 Points] Write detailed mechanisms to explain the following observations.

a.



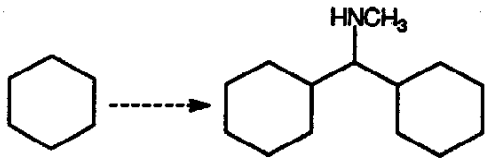
b.



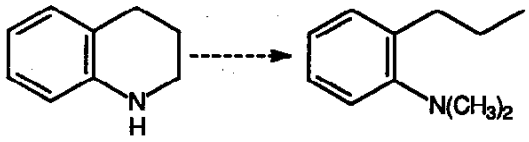
Hint: start by comparing the molecular formulas of starting material and product.

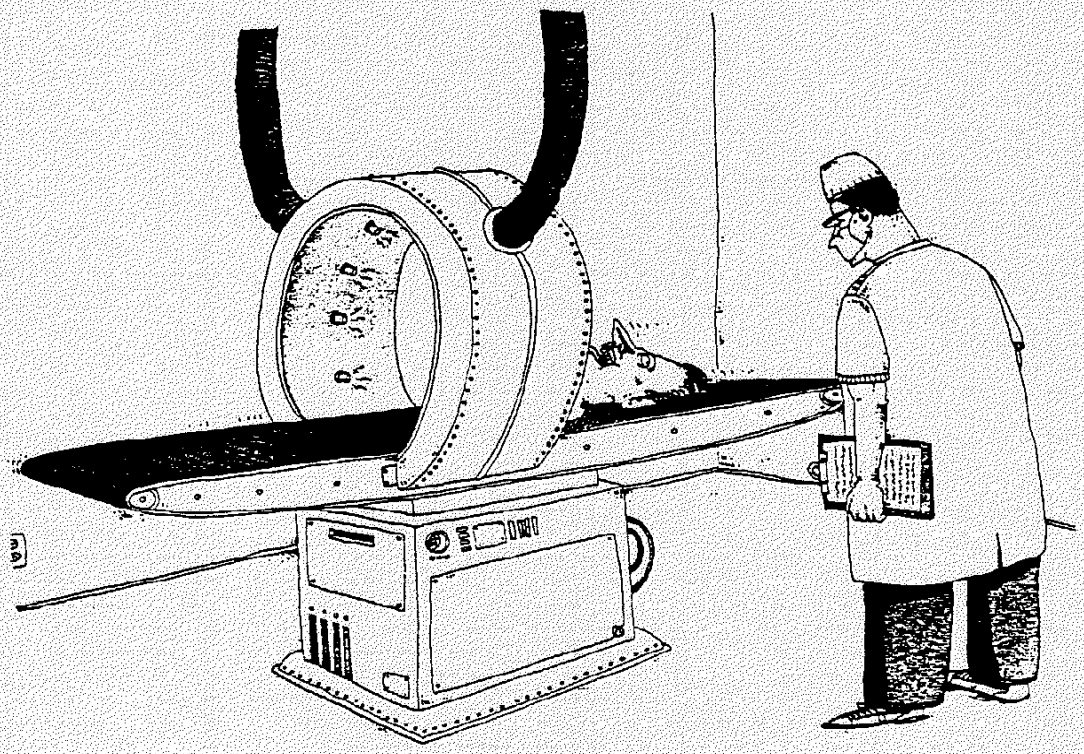
V. [30 Points] Provide a reasonable synthetic route from starting material to product. Note: several steps are required and there may be more than one solution to the problem. You may use any additional organic or organometallic reagents to effect your conversions.

a.



b.





"You're right. I don't feel a thing."

The End