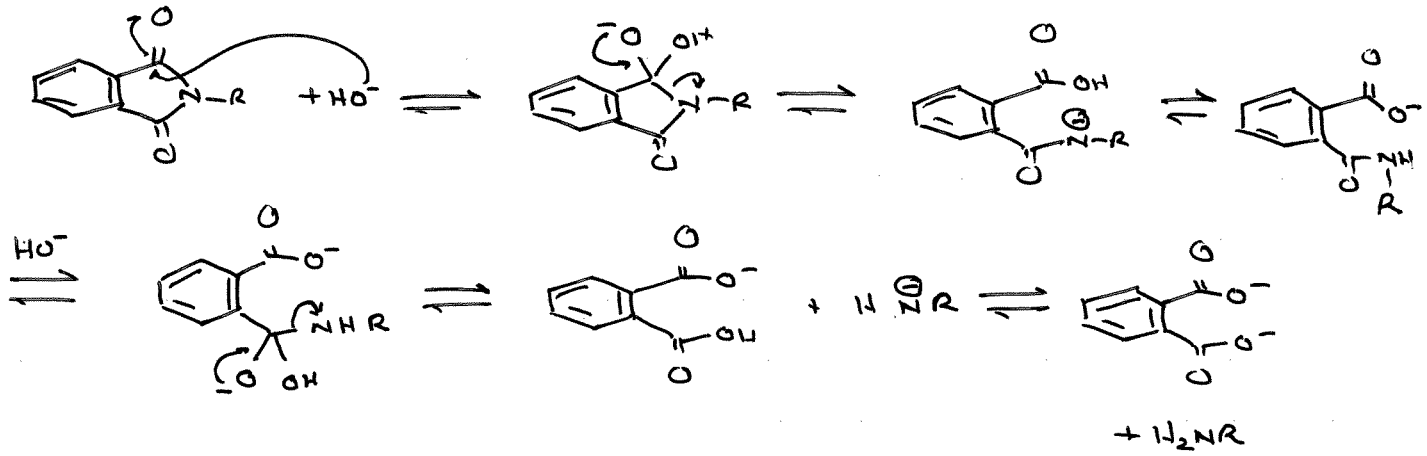
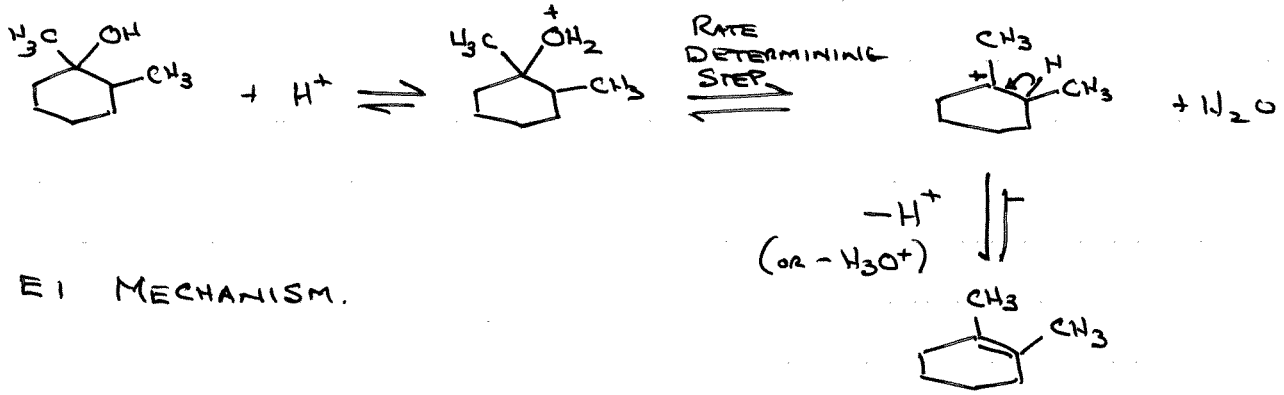
Final Exam - Suggested Solns

1.



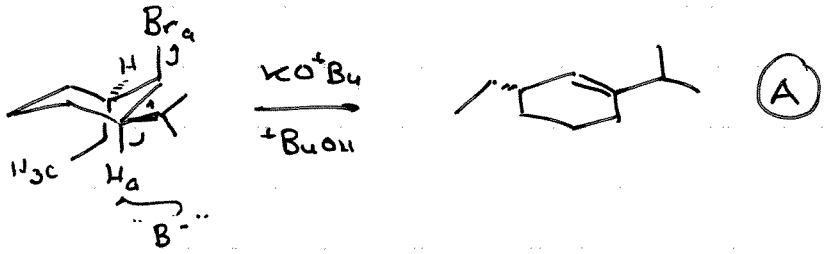
+ H_2NR

2.

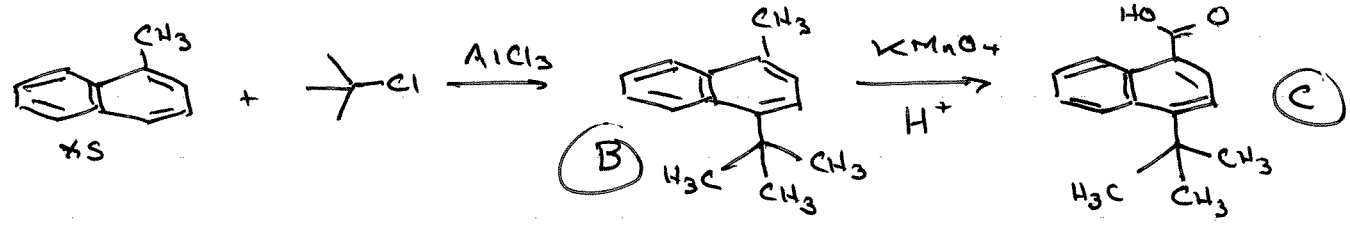


E1 Mechanism.

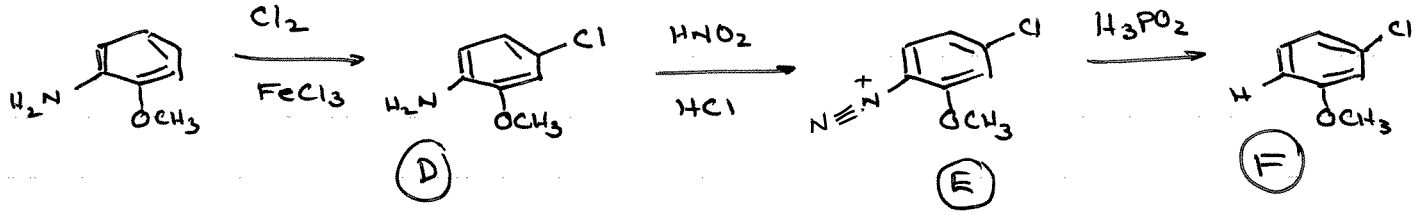
3. a)



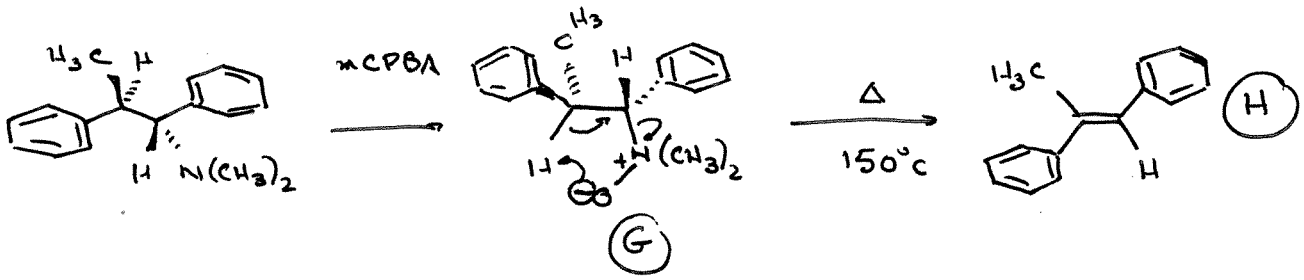
b)



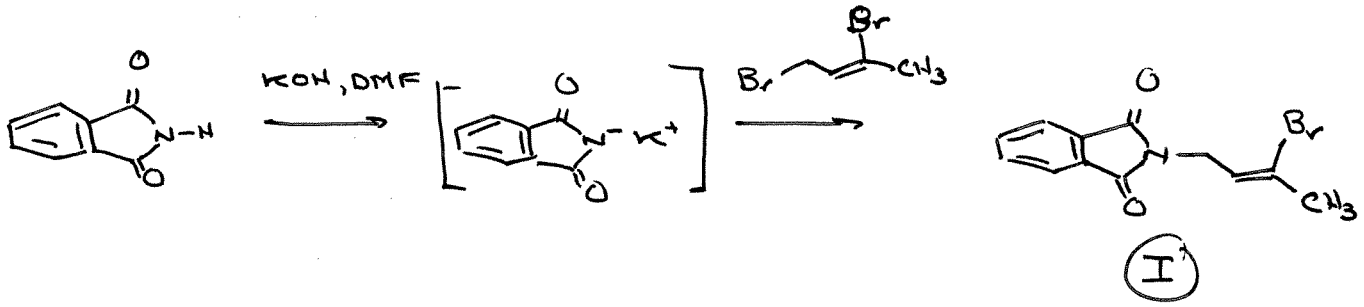
c)

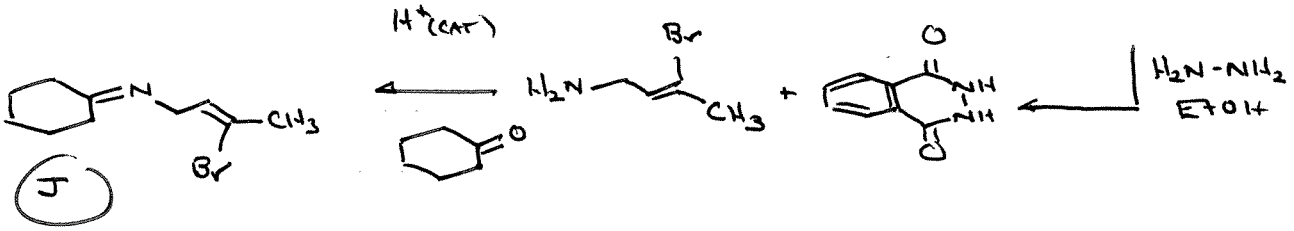


d)


mCPBA
Δ
150°C
G
H

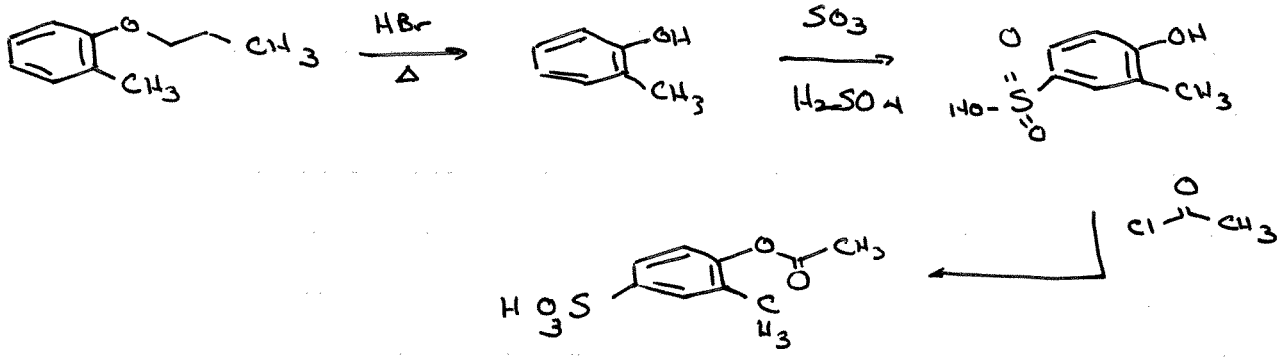
e)


KOH, DMF
I

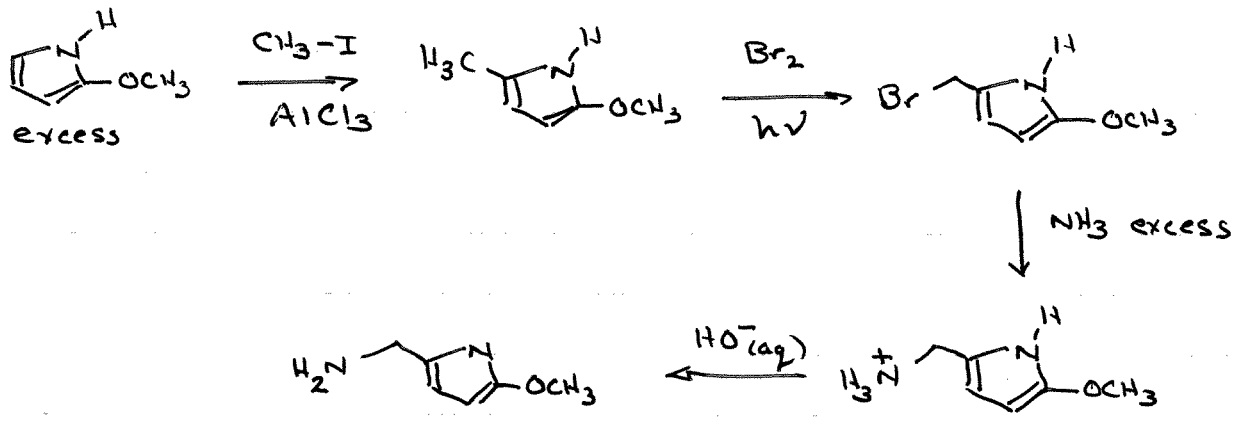

H+(CAT)
H2N-NH2
EtOH
J

4.

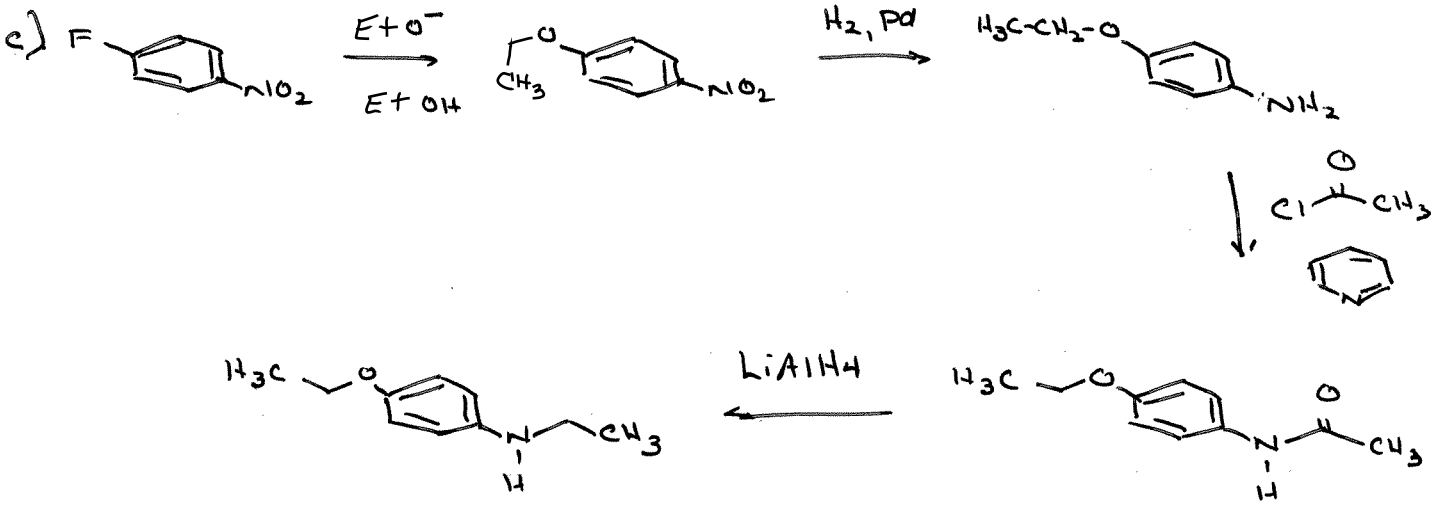
a)


HBr
Δ
SO3
H2SO4

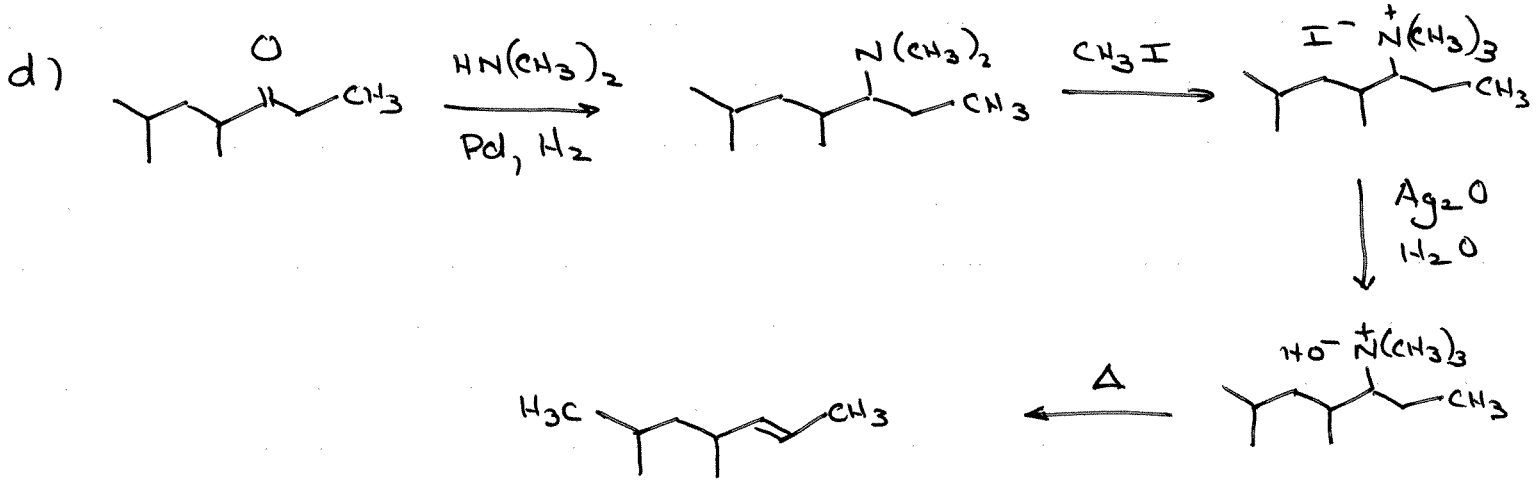
b)


excess
CH3-I
AlCl3
Br2
hν
NH3 excess
HO-(aq)

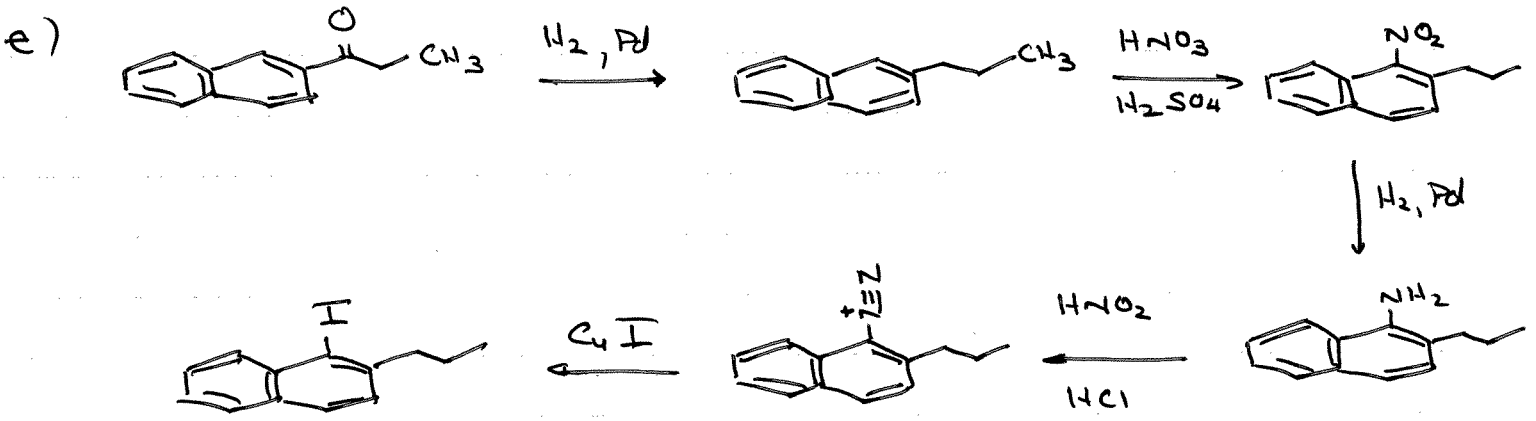
c)

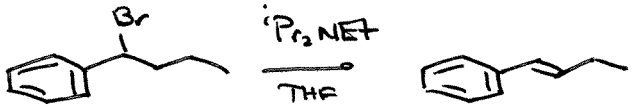

F
NO2
Et+O⁻
Et OH
CH3
O
NO2
H2, Pd
H3C-CH2-O
NH2
O
Cl
CH3
H3C
O
N
H
CH3
LiAlH4
H3C
O
N
H
O
CH3

d)


O
CH3
HN(CH3)2
Pd, H2
N(CH3)2
CH3
CH3I
I⁻
N(CH3)3
CH3
Ag2O
H2O
HO⁻
N(CH3)3
CH3
Δ
H3C
CH3

e)


O
CH3
H2, Pd
CH3
HNO3
H2SO4
NO2
H2, Pd
NH2
HNO2
HCl
+N≡N
C4I
I

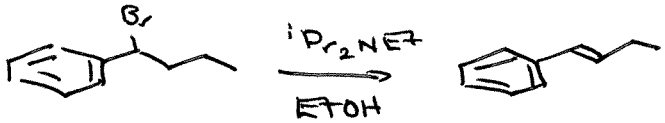
5. 

LEAVING GROUP V. GOOD - USUALLY E2 BUT COULD BE E1

BASE - NOT V. STRONG - MORE TOWARDS E1 THAN KO^tBu CASE

2ND MOST E2 — SOLVENT - NOT V. POLAR - TOWARDS E2

SUBSTRATE 2° BENZYLIC - NOT AS E1 INCLINED AS 3° CASE

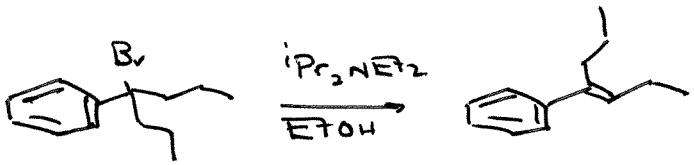


LEAVING GROUP V. GOOD - USUALLY E2 BUT E1 POSSIBLE

BASE - NOT. V. STRONG - MORE TOWARDS E1 THAN KO^tBu CASE

2ND MOST E1 — SOLVENT - V. POLAR - TOWARDS E2

SUBSTRATE 2° BENZYLIC - NOT AS E1 INCLINED AS 3° CASE

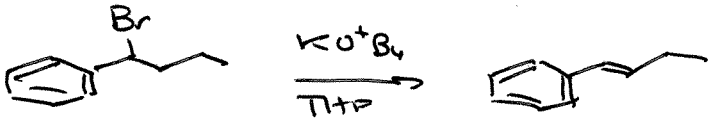


LEAVING GROUP V. GOOD - E2 USUALLY BUT COULD BE E1

BASE - NOT V. STRONG - MORE TOWARDS E1 THAN KO^tBu CASE

MOST E1 — SOLVENT - V. POLAR - TOWARDS E1

SUBSTRATE 3° BENZYLIC - VERY E1 FAVOURING

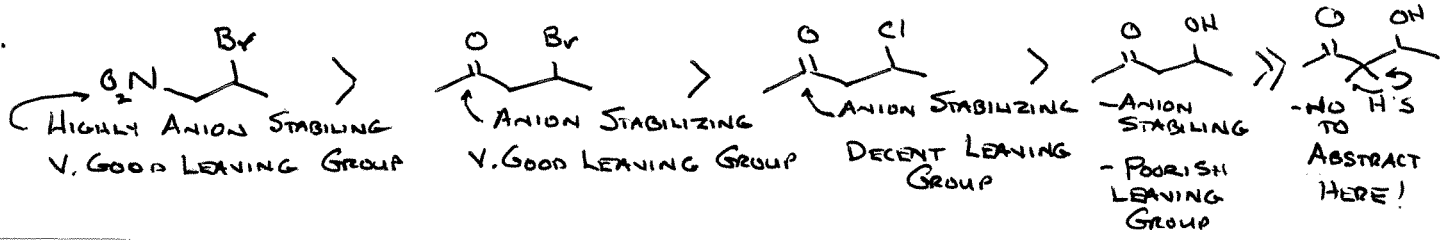


LEAVING GROUP V. GOOD - E2 USUALLY BUT COULD BE E1

BASE - V. STRONG - FAVOURS E2 DISTINCTLY

MOST E2 — SOLVENT - NOT V. POLAR - TOWARDS E2

SUBSTRATE 2° BENZYLIC - NOT AS E1 INCLINED AS 3° CASE

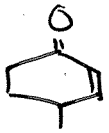
6. 

7. C $\frac{74.95}{12.011}$ = $\frac{6.24}{0.891}$ = 7.00 H $\frac{16.78}{1.008}$ = $\frac{10.69}{0.891}$ = 12.00 O $\frac{14.26}{15.999}$ = $\frac{0.891}{0.891}$ = 1

∴ $C_7H_{12}O$ IS EMPERICAL FORMULA

CORRESPONDS TO m/e = 112 ∴ TRUE MOLECULAR FORMULA

$$IHD = \frac{2c+2-h-x+n}{2} = \frac{14+2-12}{2} = 2$$

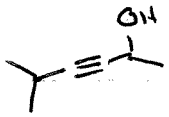
∴  DOES NOT FIT IHD = 3 $C_7H_{10}O_2$!

TO IR, ν (cm^{-1})

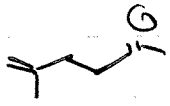
2974 C-H STRETCH sp^3

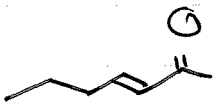
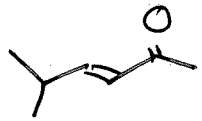
1676 C=O STRETCH CONJUGATED KETONE

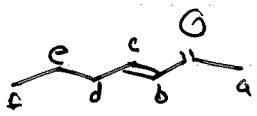
1620 C=C STRETCH ALKENE

 FAILS - NO 3400 cm^{-1} O-H STRETCH

NO ~2200 cm^{-1} C≡C STRETCH

 FAILS $\nu_{C=O}$ SHOULD BE 1710 cm^{-1}, NOT 1676 cm^{-1}

LEAVES  AND 

PREDICT PATTERN FOR 

a A=3, S ONE IS PRESENT δ 2.2

b A=1, d ONE IS PRESENT δ 6.05

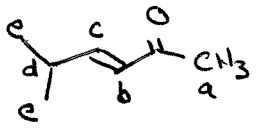
c A=1 dt MAYBE THE 2.5 ppm BUT CHEMICAL SHIFT ISN'T IN ALKENE REGION

d. A=2 dt NO SUCH RESONANCE ANYWHERE

e A=2 tq NO SUCH RESONANCE ANYWHERE

f A=3 t NO SUCH RESONANCE

FAILS.

HOW ABOUT 

PREDICT a A=3, S, δ = 2.1 ppm

GOOD MATCH WITH A=3, S, δ = 2.2 ppm

b. A=1, d, δ = 6.0 ppm

GOOD MATCH WITH A=1, d, δ = 6.05 ppm

c. A=1, dd, δ = 6.9 ppm

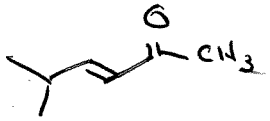
GOOD MATCH WITH A=1, dd, δ = 6.8 ppm

d. A=1, septet, δ = 2.4 ppm (ALTHOUGH I WOULD SUGGEST IT MIGHT BE A BIT FURTHER DOWNFIELD)

GOOD MATCH WITH A=1, m, δ = 2.5 ppm

e. A=6, d, δ = 1.0 ppm

GOOD MATCH WITH A=6, d, δ = 1.1 ppm



IS THE COMPOUND.

Bonus Question: It is possible to do α-Eliminations also, less commonly than β-eliminations. In this case, Deprotonation of the Suprisingly Acidic H of Chloroform does this α-Elimination to Give a Carbene a Highly Reactive But Know Six Valence electron Neutral Carbon Based Species, This does a Rapid Cycloaddition to Alkenes to Give a Cyclopropane.