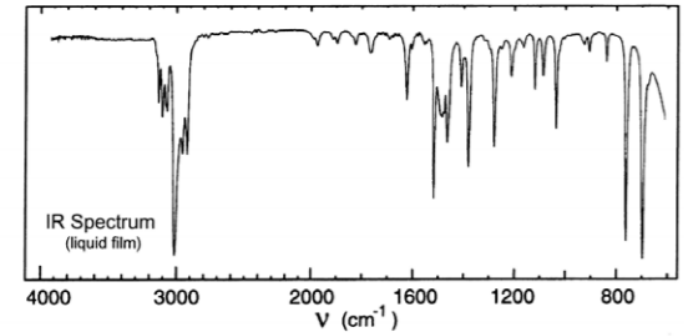
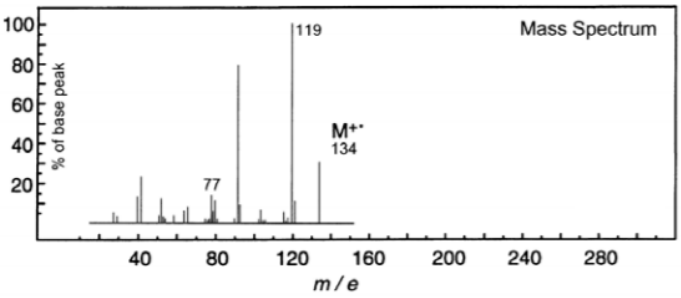
PILOT Learning
Organic Chemistry I – Dr. Townsend
Problem Set #11
Fall 2018

1.

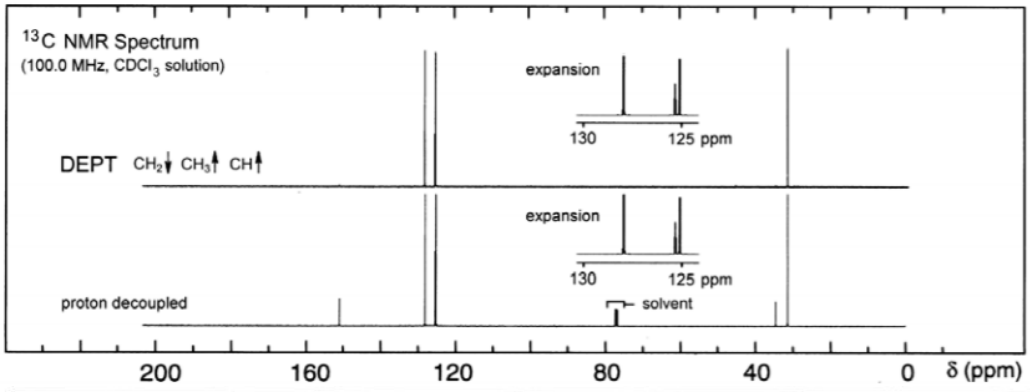


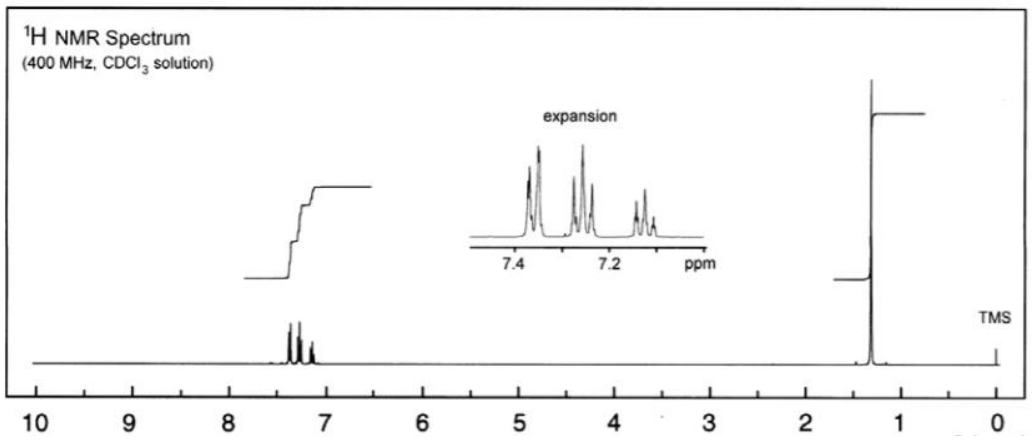


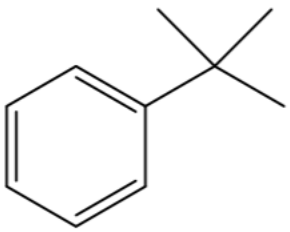
UV Spectrum

λ_{max} 262 nm ($\log_{10}\varepsilon$ 2.5)

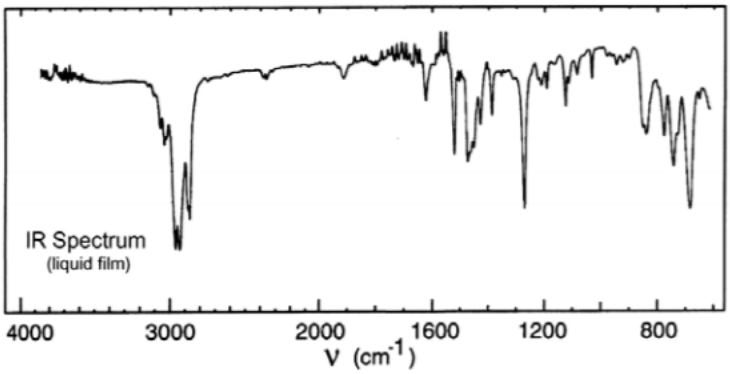
solvent : ethanol

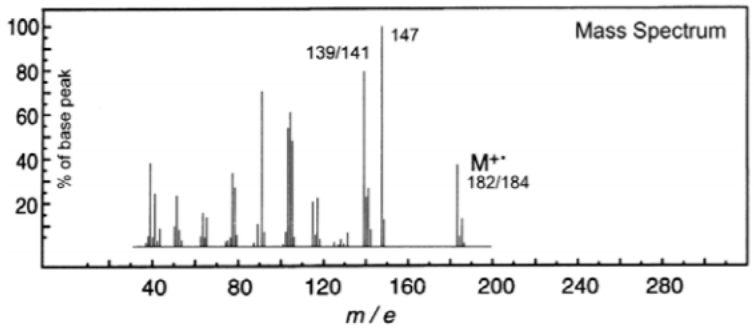


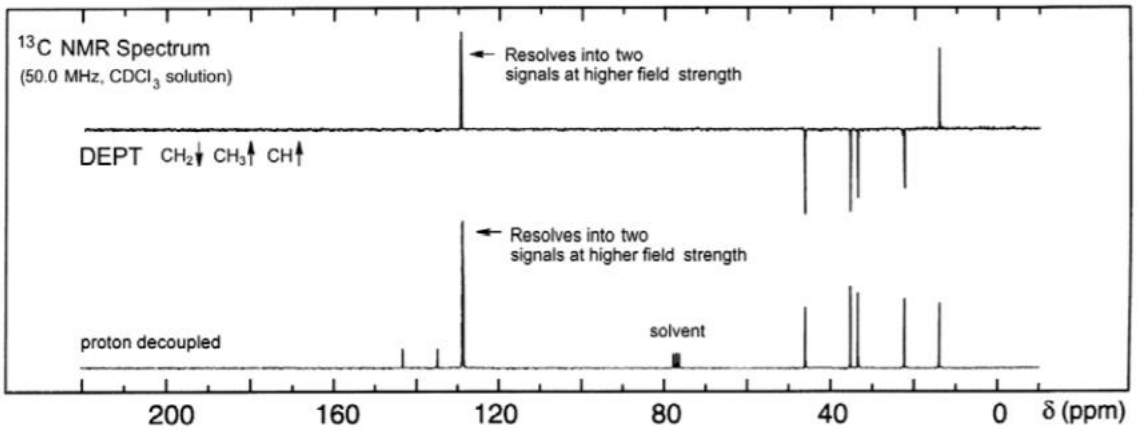


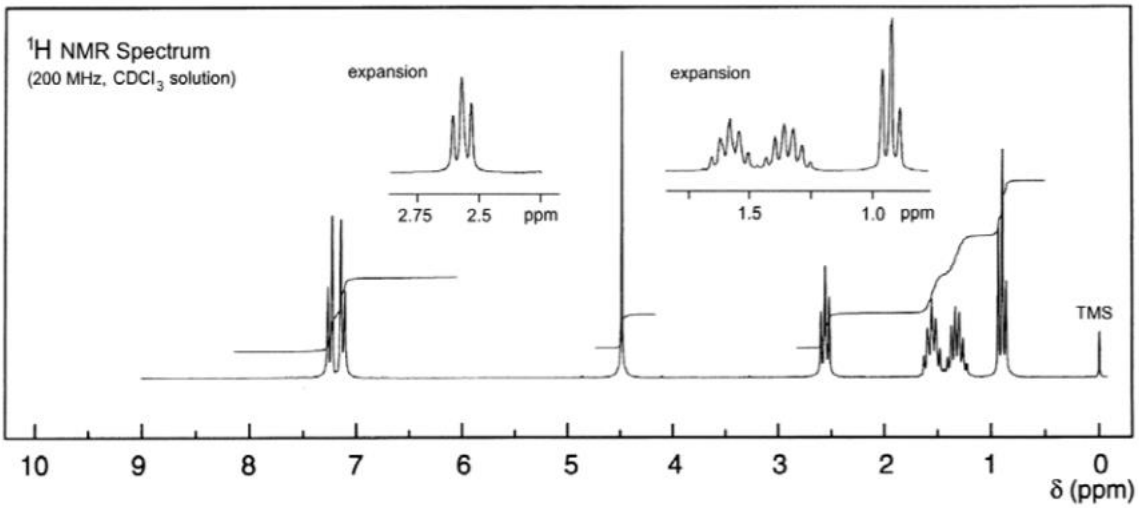


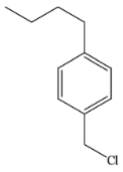
2.


IR Spectrum
(liquid film)
4000
3000
2000
1600
1200
800
ν (cm-1)

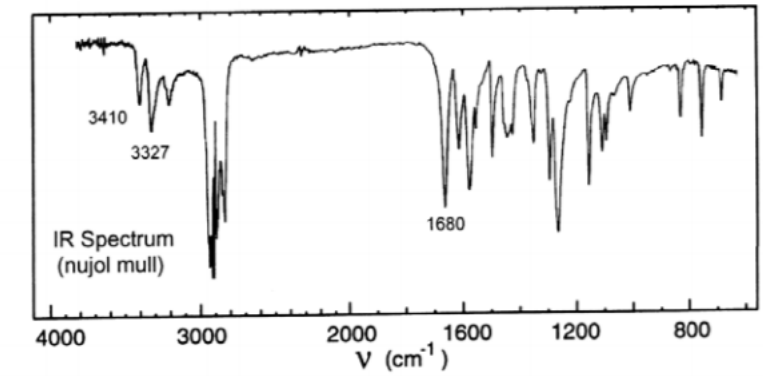

Mass Spectrum
% of base peak
100
80
60
40
20
139/141
147
M+·
182/184
40
80
120
160
200
240
280
m / e

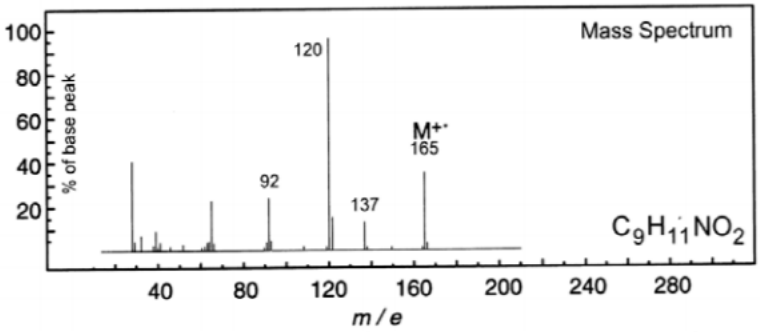

13C NMR Spectrum
(50.0 MHz, CDCl3 solution)
Resolves into two
signals at higher field strength
DEPT CH2 CH3 CH
Resolves into two
signals at higher field strength
proton decoupled
solvent
200
160
120
80
40
0
δ (ppm)

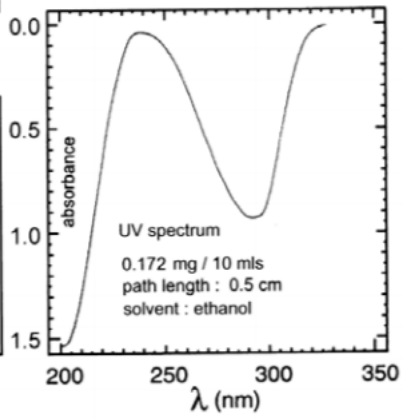

1H NMR Spectrum
(200 MHz, CDCl3 solution)
expansion
2.75
2.5
ppm
expansion
1.5
1.0
ppm
TMS
10
9
8
7
6
5
4
3
2
1
0
δ (ppm)

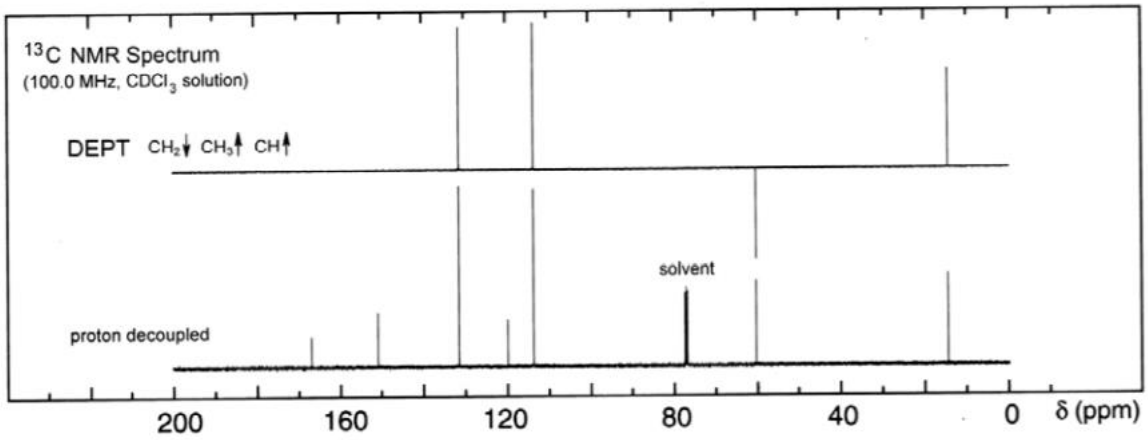

Cl

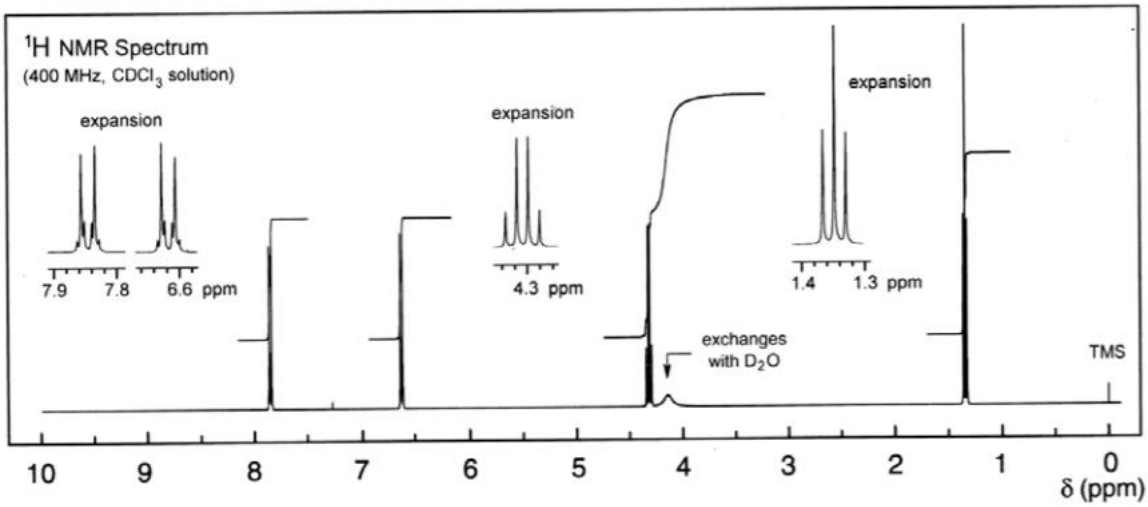
3.

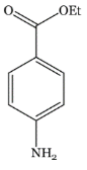

3410
3327
1680
IR Spectrum
(nujol mull)
4000
3000
2000
1600
1200
800
ν (cm-1)


Mass Spectrum
% of base peak
120
M+·
165
92
137
C9H11NO2
40
80
120
160
200
240
280
m/e


absorbance
UV spectrum
0.172 mg / 10 mls
path length : 0.5 cm
solvent : ethanol
0.0
0.5
1.0
1.5
200
250
300
350
λ (nm)


13C NMR Spectrum
(100.0 MHz, CDCl3 solution)
DEPT CH2 CH3 CH
solvent
proton decoupled
200
160
120
80
40
0
δ (ppm)


1H NMR Spectrum
(400 MHz, CDCl3 solution)
expansion
7.9
7.8
6.6 ppm
expansion
4.3 ppm
expansion
1.4
1.3 ppm
exchanges
with D2O
TMS
10
9
8
7
6
5
4
3
2
1
0
δ (ppm)


O
OEt
NH2

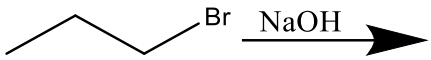
4. Rank the following from the best to worst leaving group

CH_3CH_2I CH3NH2 CH3OH CH2CH3Cl

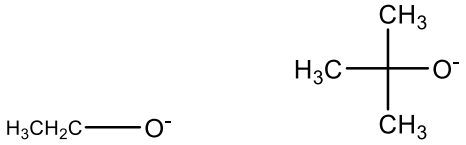
5. Rank the following in order of decreasing nucleophilicity in a protic solvent (methanol). How would this change in a non-protic solvent? Explain your reasoning in terms of basicity and polarizability.

I- CH3O- Br- NH3 F-

6. Predict the product for the following reaction and write out the mechanism.



7. Rank the following in order of decreasing nucleophilicity.



OH^-

8. Discuss the relative rates of reaction for the following cyclohexyl iodides and draw the products they would form when reacted with NaNH2.