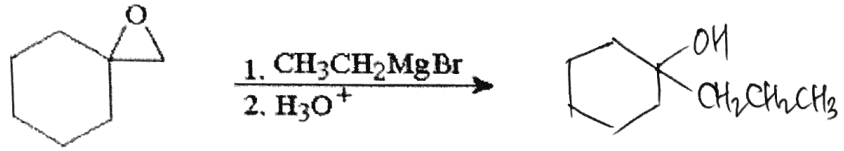
Organic Chemistry 2 EXAM 1 Oct 2018 Student # **Name** 과정기준

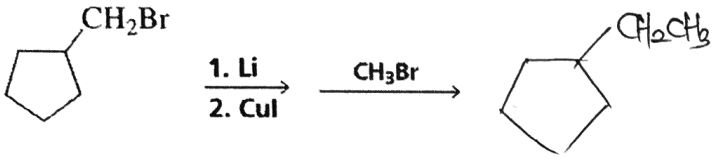
1. [12 pts] What is the product of the following reactions?

(a)



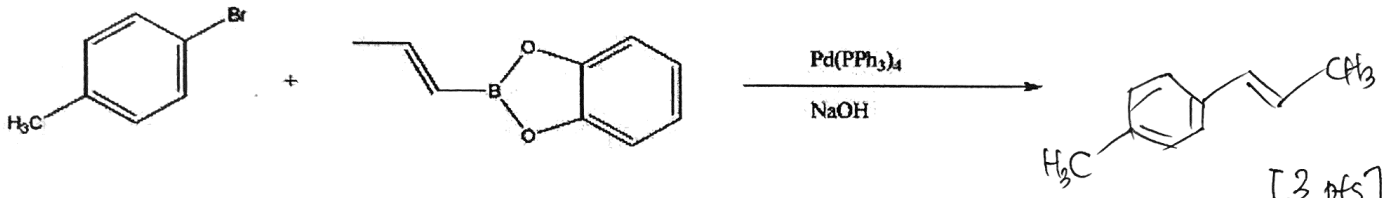
[3 pts]

(b)



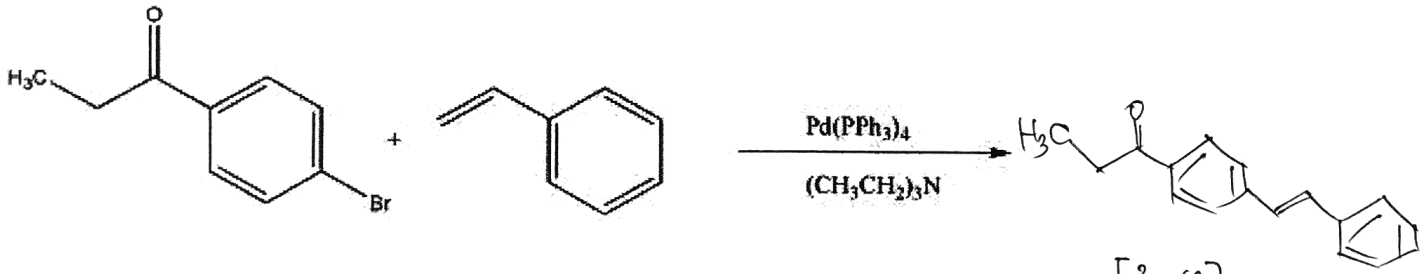
[3 pts]

(c)



[3 pts]

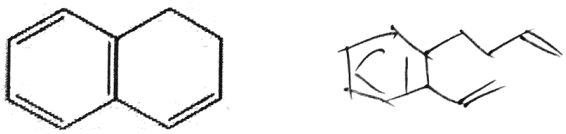
(d)



[3 pts]

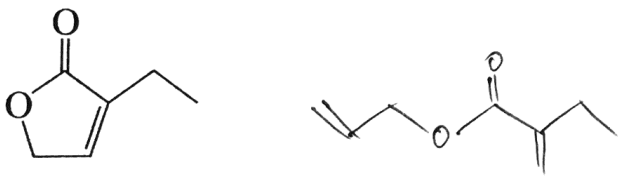
2. [6 pts] Provide the structure of the alkene that will undergo metathesis to generate the following compounds.

(a)



[3 pts]

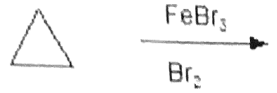
(b)



[3 pts]

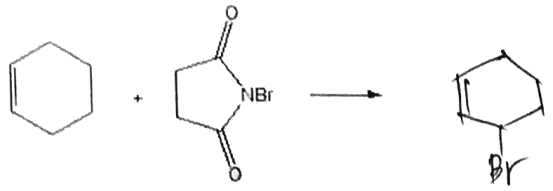
3. [9 pts] What is the major product of the following reactions.

(a)



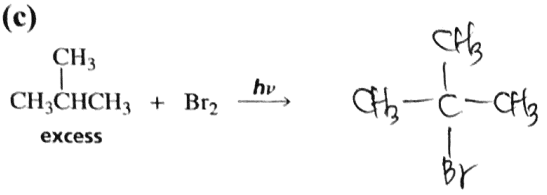
Br-CH2CH2CH2Br [3 pts]

(b)



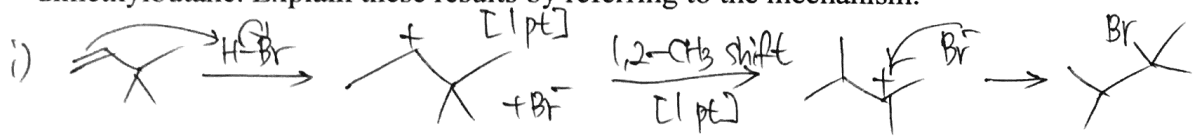
[3 pts] or peroxide가 없으므로 반응이 일어나지 않는다.

(c)

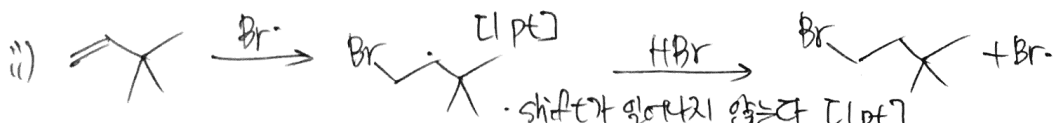


[3 pts]

4. [6 pts] When 3,3-dimethyl-1-butene is treated with HBr alone, the major product is 2-bromo-2,3-dimethylbutane. When the same alkene is treated with HBr and peroxide, the product is 1-bromo-3,3-dimethylbutane. Explain these results by referring to the mechanism.

i) 

· 최종 product의 구조식 [1 pt]

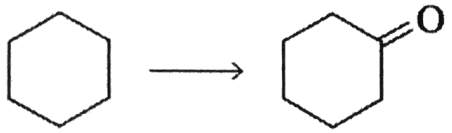
ii) 

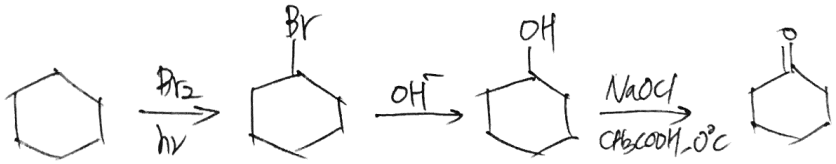
· shift가 일어나지 않는다 [1 pt]

· 최종 product의 구조식 [1 pt]

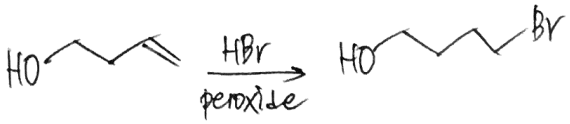
5. [10 pts] Using the given starting material and any necessary organic or inorganic reagent, indicate how the desired product could be obtained.

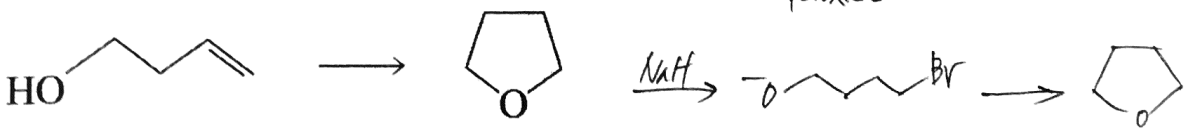
(a)





(b)





* 각 문제 5점 ; 1step 정답 1점, 2step 정답 3점

6. [4 pts] Show the m/z values of the molecular ion and 5 likely fragments for the compound ethyl ether, $CH_3CH_2OCH_2CH_3$

74 : m/z value of molecular ion [1 pt]

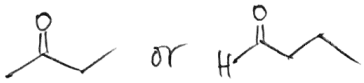
59, 45, 44, 30, 29, 15 중 5개 기입 [개당 0.6 pt]

7. [12 pts] Propose structures of the following there compounds consistent with each set of the corresponding data. Assume each compound has an sp3 hybridized C-H absorption in IR spectrum, and other major IR absorptions above 1500 cm^{-1} are listed as follows.

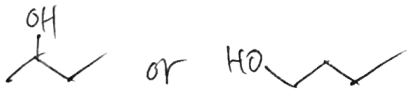
(a) A compound having a molecular ion at 72 and an IR absorption at 1725 cm^{-1}.

(b) A compound having a molecular ion at 55 and an IR absorption at 2250 cm^{-1}.

(c) A compound having a molecular ion at 74 and an IR absorption at 3200-3600 cm^{-1}.

(a)  [4 pts]

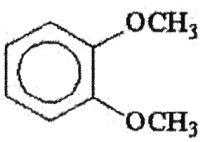
(b) $CH_3CH_2C{\equiv}N$ [4 pts]

(c)  [4 pts]

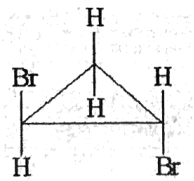
8. [5 pts] Is the λ_{max} of phenol in aqueous solution affected by the pH of the solution? If so, explain how and why λ_{max} changes.

영향을 받는다. [1 pt] phenol의 pKa 보다 작은 pH 조건에서는 phenol로, 큰 pH 조건에서는 phenolate ion으로 존재하게 되는데, [1 pt] 이 때 두 compound의 공명구조를 비교하면 phenolate ion이 더 많은 비공유 전자쌍을 가져 더 큰 λ_{max} 값을 가지게 되므로 [2 pts] pH가 커질수록 전체 용액의 λ_{max} 값이 커지게 된다. [1 pt]

9. [6 pts]) How many signals would you expect to see in the ^1H NMR spectrum of the following compounds?



A



B

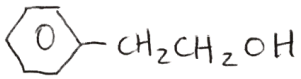
A: 3개 [3 pts]

B: 3개 [3 pts] (diastereotopic)

10. [15 points × 2] Identify the structure of the following compounds, **A**, and **B** based on the spectral data provided on the following pages, respectively.

- Try to assign as many peaks in the spectra as possible for the full credit and you should show your peak assignments directly on top of the spectra. peak assign 안할시 감점 -1.
- Write down the proposed structure and your reasoning process on this page.

(A)



[Correct structure +3pt]

IR:

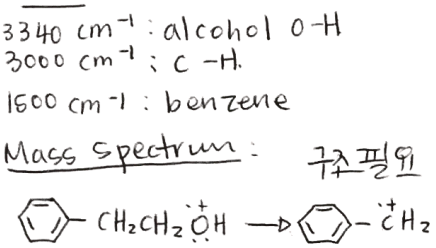
3340 cm^{-1} : alcohol O-H

~3000 cm^{-1} : C-H.

~1600 cm^{-1} : benzene

[+3pt]

Mass spectrum: 구조필요



m/z = 91. m/z = 31.

[+3pt]

UV spectrum:

λ = 250nm benzene

^{13}C NMR:

130ppm: benzene

~60 ppm: R-CH_2-R

~40 ppm: C-O

[+3pt]

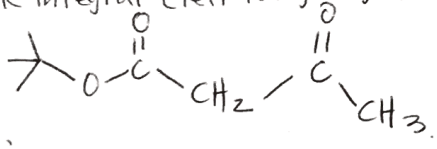
^{1}H NMR:

peak integral (left to right) = 5 : 2 : 2 : 1 ← singlet (triplet)

[+3pt]

각분석항목 max 3pt

(B)



[Correct structure +3pt]

IR:

~3000 cm^{-1} : C-H

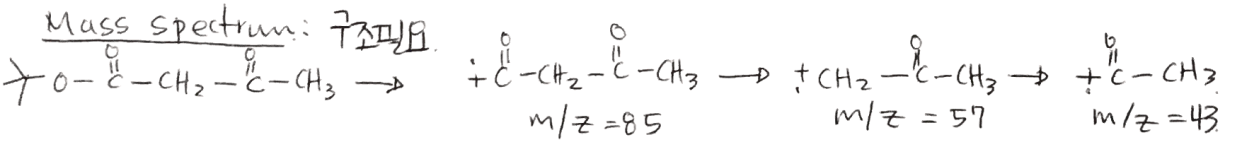
1735 cm^{-1} : ester

1717 cm^{-1} : ketone } 구분필요.

~1200 cm^{-1} : C-O.

[+3pt]

Mass spectrum: 구조필요.



m/z = 85 m/z = 57 m/z = 43

UV spectrum:

no benzene.

[+3pt]

^{13}C NMR:

200 ppm: ketone.

165 ppm: ester

80 ppm: Me, Me, Me

30 ppm: R-CH_3

[+3pt]

^{1}H NMR:

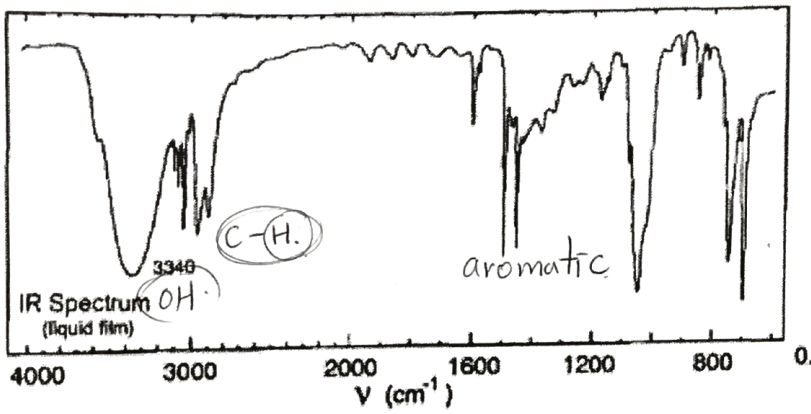
peak integral (left to right) = 2 : 3 : 9

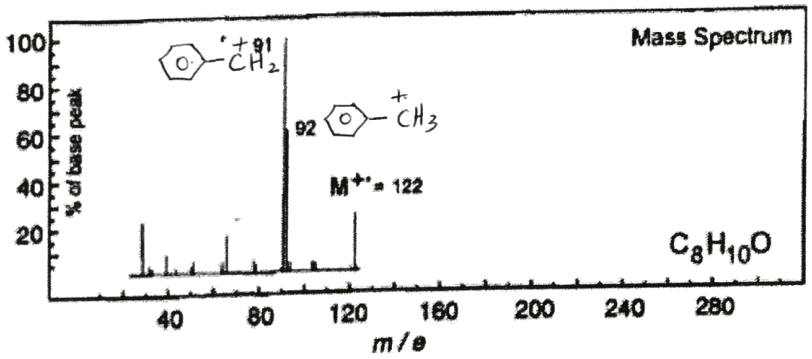
all singlet

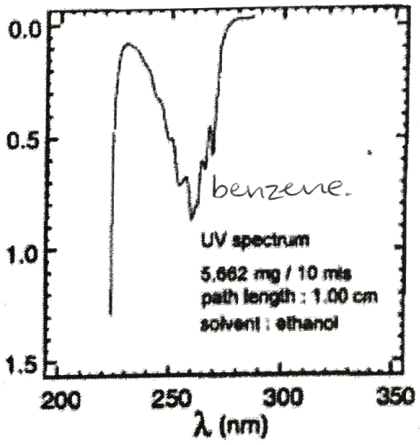
[+3pt]

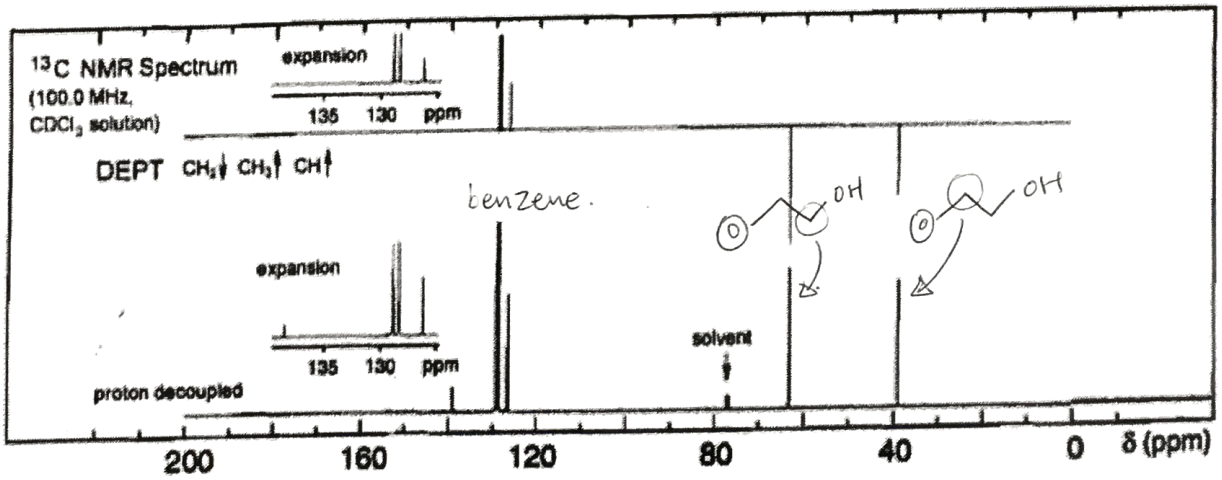
각분석항목 max 3pt

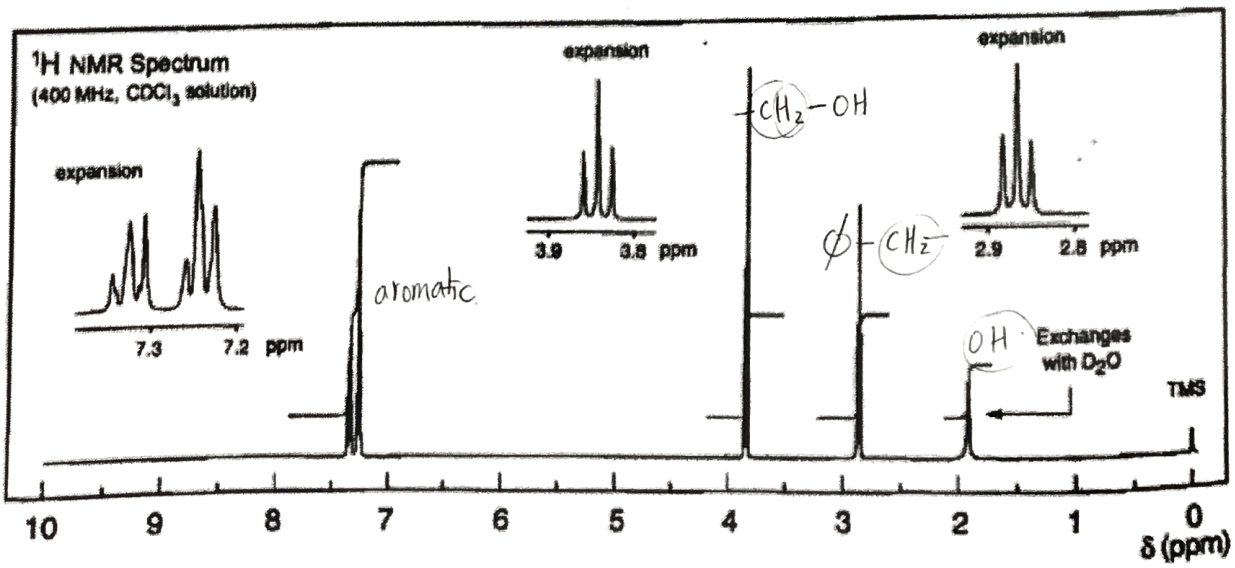
(A)


IR Spectrum
(liquid film)
3340
OH
C-H.
aromatic
4000
3000
2000
1600
1200
800
ν (cm⁻¹)

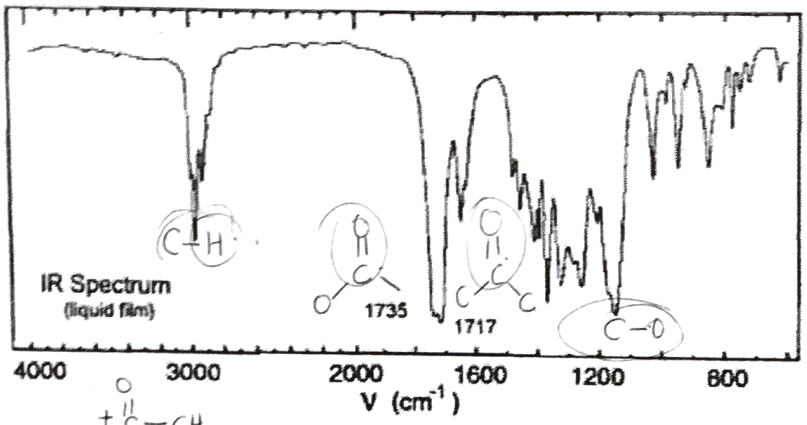

Mass Spectrum
% of base peak
91
92
M⁺· = 122
C8H10O
m/e

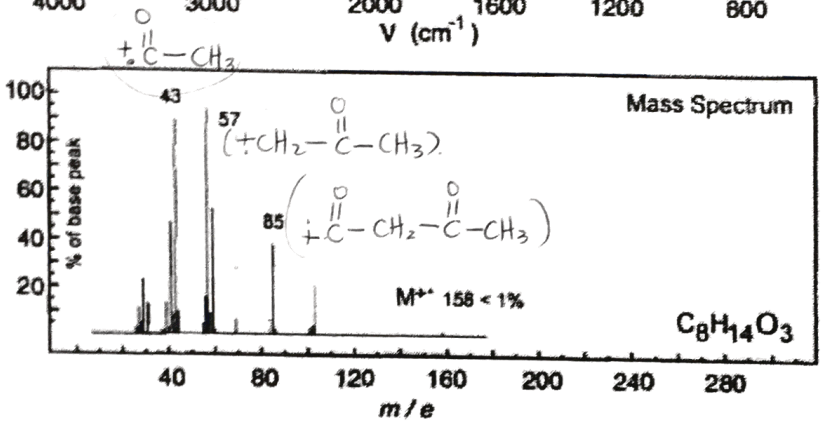

benzene.
UV spectrum
5.662 mg / 10 mls
path length : 1.00 cm
solvent : ethanol
λ (nm)


13C NMR Spectrum
(100.0 MHz,
CDCl3 solution)
expansion
135 130 ppm
DEPT CH2↓ CH3↑ CH↑
benzene.
OH
OH
solvent
proton decoupled
δ (ppm)


1H NMR Spectrum
(400 MHz, CDCl3 solution)
expansion
7.3 7.2 ppm
aromatic
expansion
3.9 3.8 ppm
CH2-OH
expansion
2.9 2.8 ppm
CH2
OH
Exchanges with D2O
TMS
δ (ppm)

(B)





No significant UV absorption above 220 nm