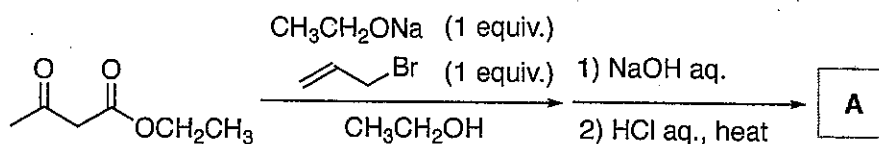


[有機化学基礎]

以下の問 (1) ~ (4) に答えよ。

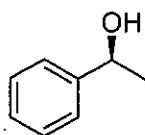
(1) カルボニル化合物について、問(a)~(d)に答えよ。

- (a) 塩化アセチル, 酢酸, アセトアミドについて希釈溶媒として四塩化炭素を用いて赤外スペクトルを測定した. C=O 伸縮振動波数 (cm^{-1}) の最も大きい化合物を答えよ.
- (b) エタノール溶液中の酢酸に対して, 微量の硫酸を加えたところ酢酸エチルが得られた. 電子の移動を表す巻矢印表記法を用いて, 反応機構を示せ. ただし, 想定される中間体をすべて示すこと.
- (c) 酢酸エチルとアセト酢酸エチルについて pK_a が小さい化合物を選び, そのように判断した理由を簡潔に説明せよ.
- (d) 以下の反応によって得られる主生成物 **A** の構造を示せ.

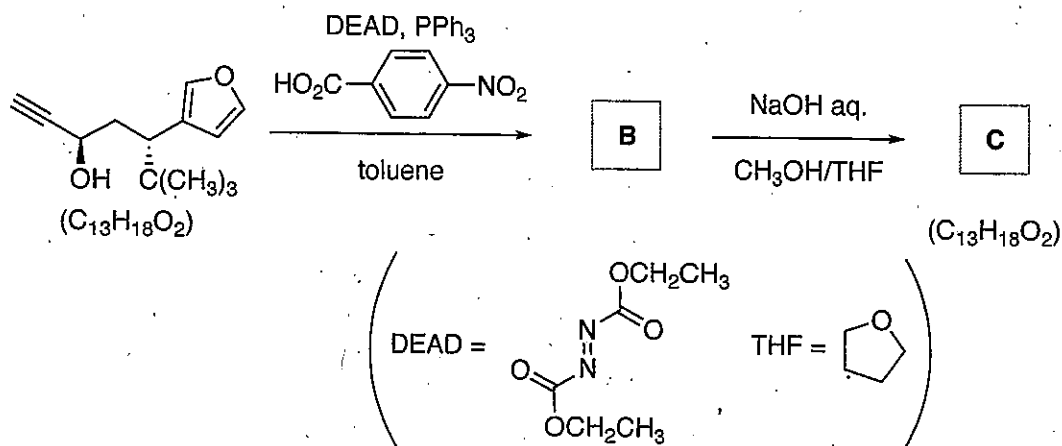


(2) アルコール化合物について、問(e)~(g)に答えよ。

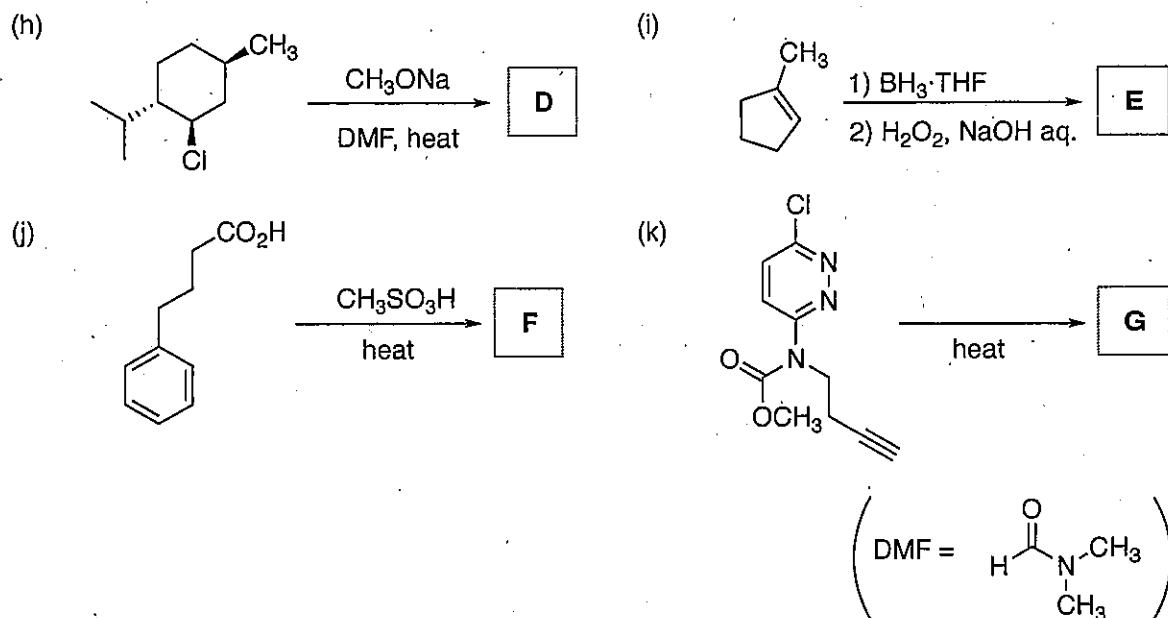
- (e) IUPAC 命名法に従い, 以下のキラルなアルコールを命名せよ. ただし, 絶対立体配置を含めること.



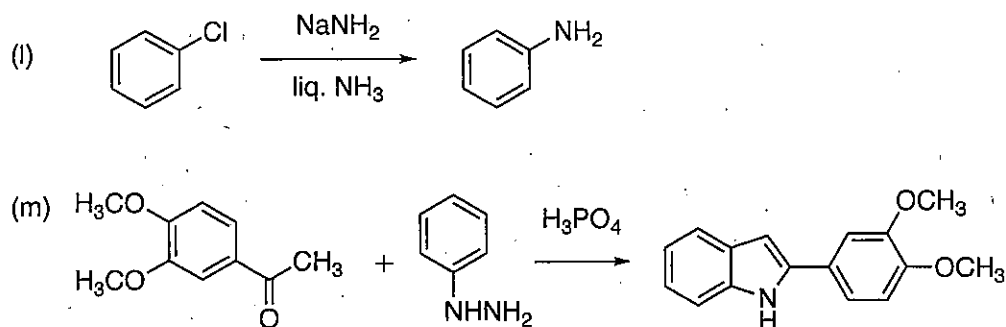
- (f) 上記のアルコールを酸性水溶液に溶かすとラセミ化した. この理由を化合物の構造に着目して, 簡潔に説明せよ.
- (g) 以下の反応において, 化合物 **B** と **C** の構造を示せ. ただし, 絶対立体配置を含めること.



- (3) 以下に示す反応(h)~(k)について、主生成物となる有機化合物 **D**~**G** の構造を描け。ただし、化合物の立体化学を明記すること。



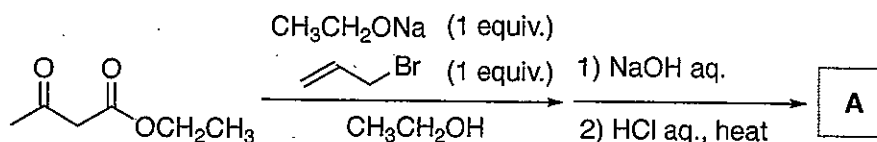
- (4) 以下に示す反応(l), (m)について、反応機構を示せ。ただし、電子の移動を表す巻矢印表記法を用いて、段階的に示すこと。必要に応じて構造を省略して示しても良い。



Answer problems (1) through (4).

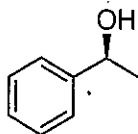
(1) Answer problems (a)–(d), regarding carbonyl compounds.

- (a) The infrared spectra of acetyl chloride, acetic acid, and acetamide were measured using carbon tetrachloride as the diluent solvent. Identify the compound with the highest C=O stretching vibration wavenumber (cm^{-1}).
- (b) Sulfonic acid-catalyzed reaction of acetic acid with ethanol in excess yields ethyl acetate. Show the reaction mechanism, using the curved arrow formalism to show all intermediates that occur.
- (c) Choose the compound with the lower $\text{p}K_a$ between ethyl acetate and ethyl acetoacetate, and briefly explain the reason for the difference.
- (d) Show the main product **A** of the following transformation.

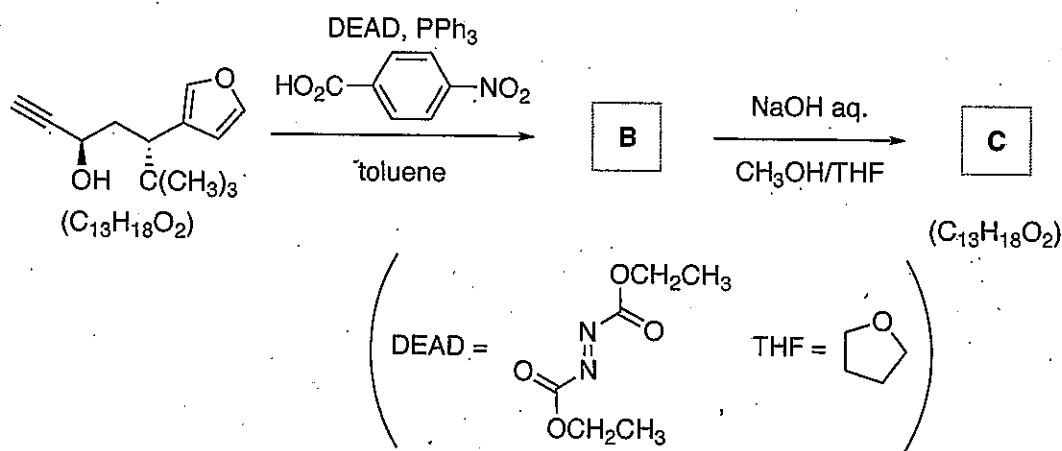


(2) Answer problems (e)–(g), regarding alcohol compounds.

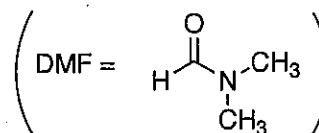
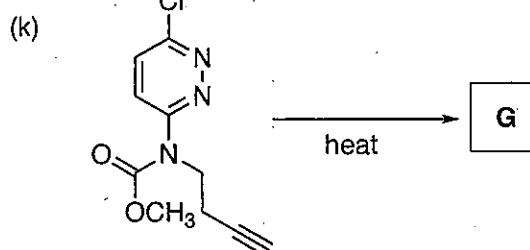
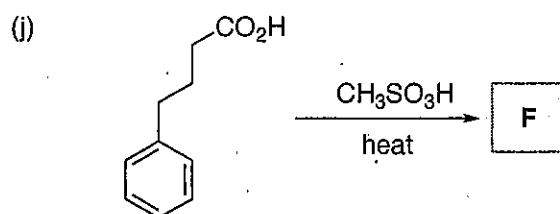
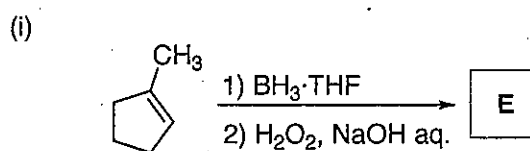
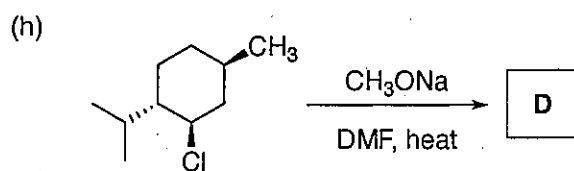
- (e) Name the following chiral alcohol according to the IUPAC nomenclature, including its absolute configuration.



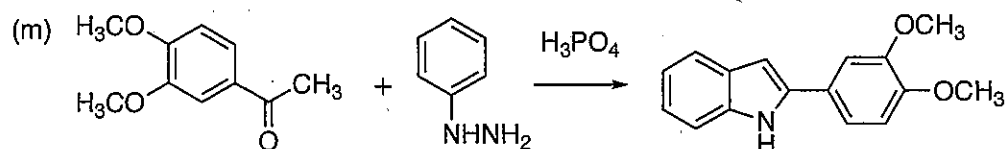
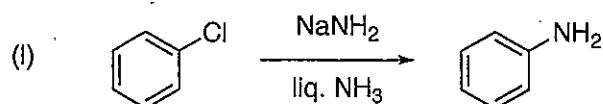
- (f) When this alcohol was dissolved in an acidic aqueous solution, racemization progressed. Briefly explain the reason for this observation, focusing on the structure.
- (g) Show the structures of compounds **B** and **C** in the following reaction, including the absolute configuration.



- (3) Predict the main organic products **D–G** of the following reactions (h)–(k). Specify the stereochemistry of the compounds.



- (4) Using the curved arrow formalism, show the reaction mechanisms of the following reactions (l) and (m). Simplify part of structures if necessary and show the mechanism step by step.



Correction (English only)

Subject: Organic Chemistry: Basic

(1) (b).

Incorrect) Sulfonic acid

Correct) Sulfuric acid