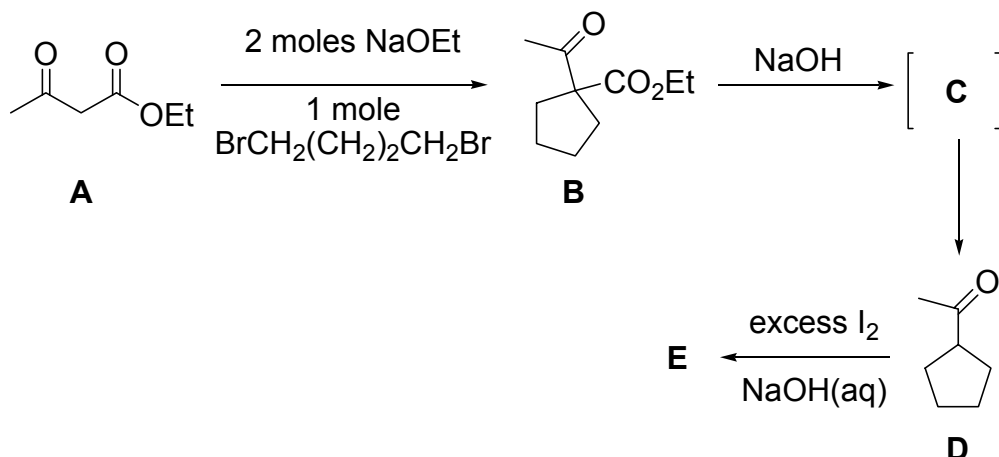


Bifunctional Chemistry, Semester 2, 2005 (06522)

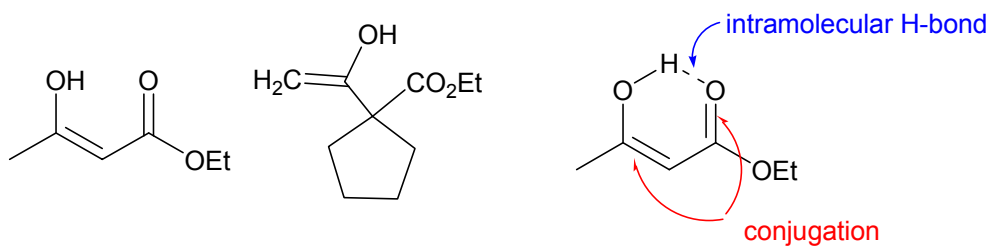
1. Consider the following reaction scheme and answer **all** of the following parts.



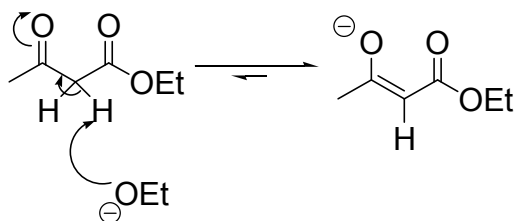
- (a) Compounds **A** and **B** have at least one enol tautomer. Show one enol tautomer in each case. What features of **A** mean that its enol form is more stable than that of a simple ketone? (4 marks)
- (b) Give the mechanism of the reaction of **A** with NaOEt to form an enolate. (2 marks)
- (c) In the conversion of **B** to **D** intermediate **C** is not normally isolated. What is the structure of **C**? State the reagents and conditions needed to convert **C** into **D**. (3 marks)
- (d) What by-product is formed in the conversion of **C** into **D**? Show the mechanism for this reaction. (3 marks)
- (e) What would you expect to observe in the reaction of compound **D** with aqueous sodium hydroxide and an excess of I₂? Give all products and outline the key intermediates in this reaction. (4 marks)
- (f) Give the mechanism to show how **A** can be converted to **B** using the reagents given. (5 marks)
- (g) Compound **A** can be prepared from ethyl acetate and NaOEt. Outline the mechanism of this reaction and state why at least one molar equivalent of NaOEt is required for this reaction. (4 marks)

Bifunctional Chemistry, Semester 2, 2005 (06522)
MODEL ANSWER

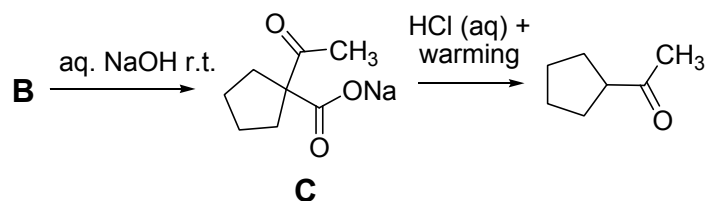
1(a)



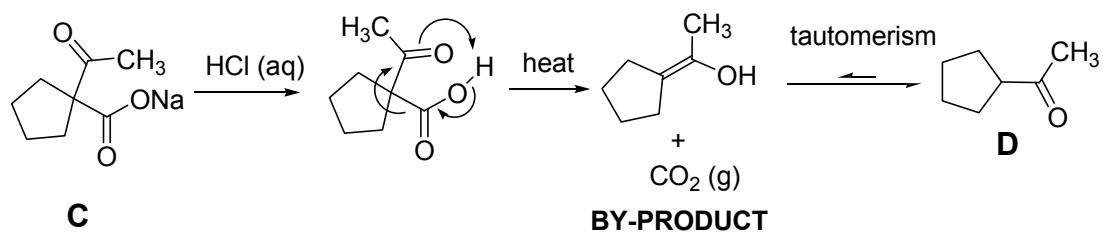
1(b)



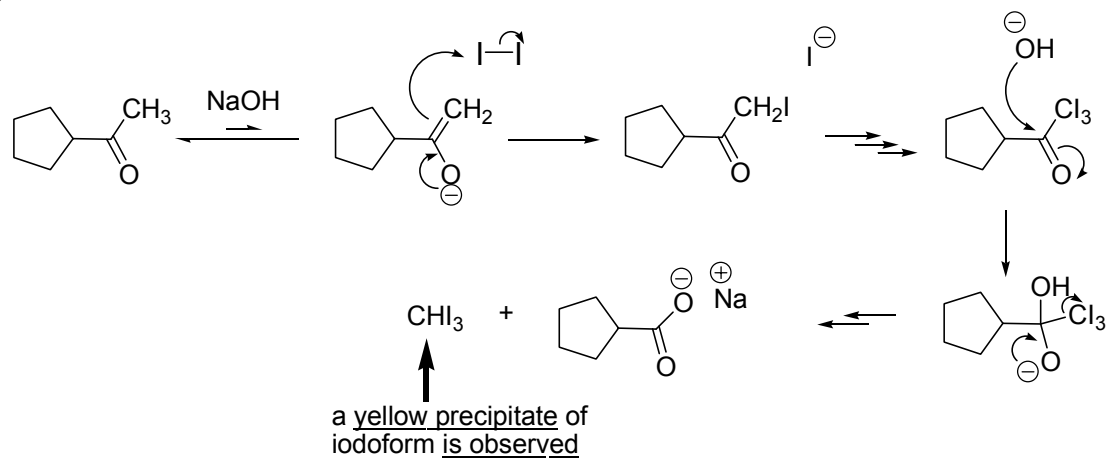
1(c)



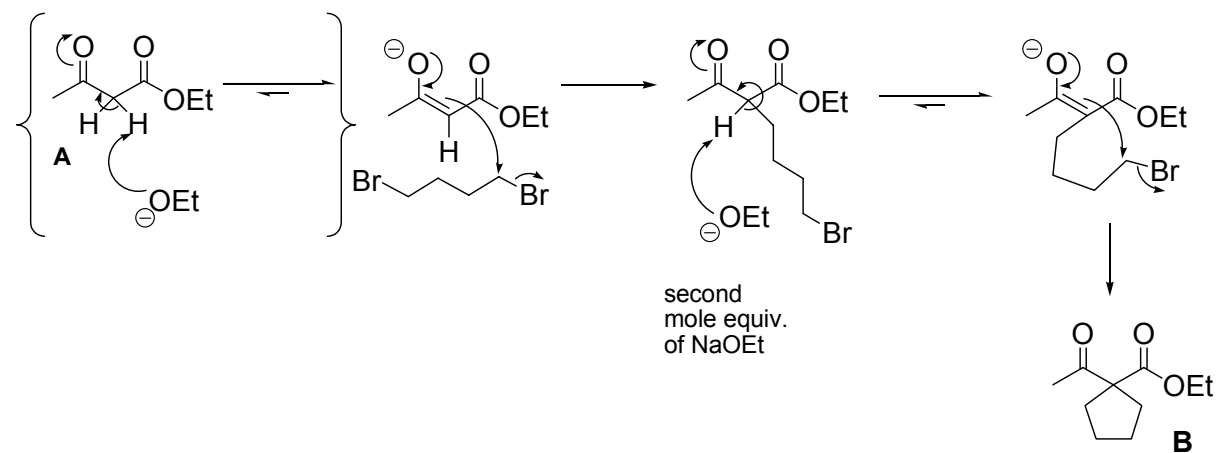
1(d)



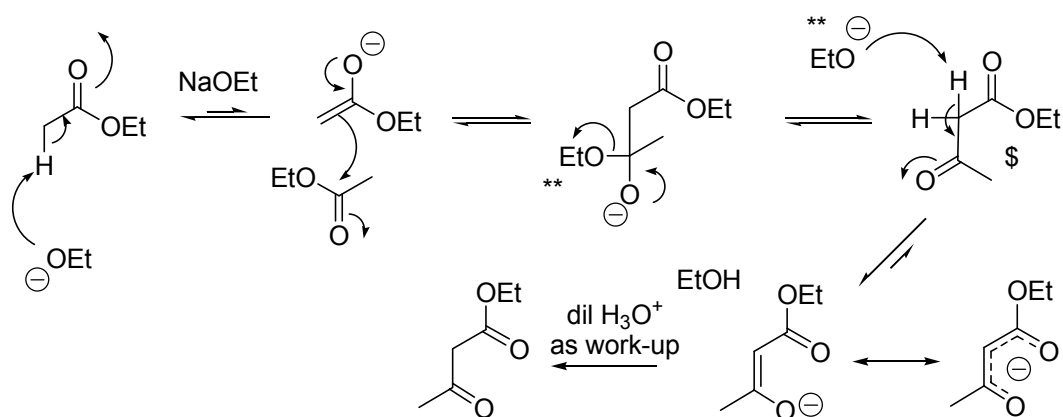
1(e)



1(f)



1(g)



A whole molar equivalent of ethoxide is needed as the pK_a of the product \$ (~12) is significantly greater than ethanol (~16). Thus liberated ethoxide** is 'used up' and cannot be returned to make a catalytic cycle. (1 mark)