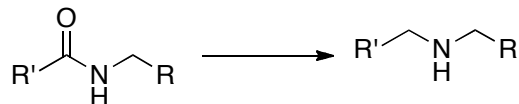


2. Answer Parts A, B and C.

Part A.

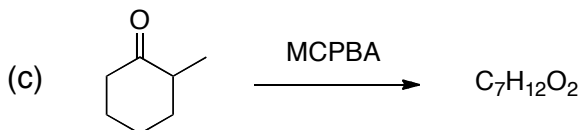
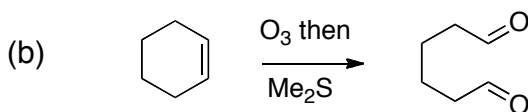
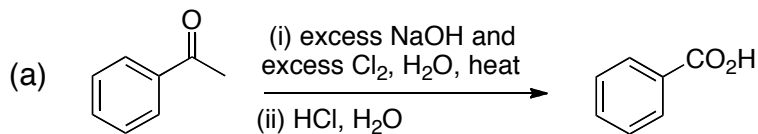
Suggest reagents and reaction conditions that could be used to achieve *either* of the indicated conversions below, giving a mechanistic rationale for your choice (more than one step may be necessary).



[4]

Part B.

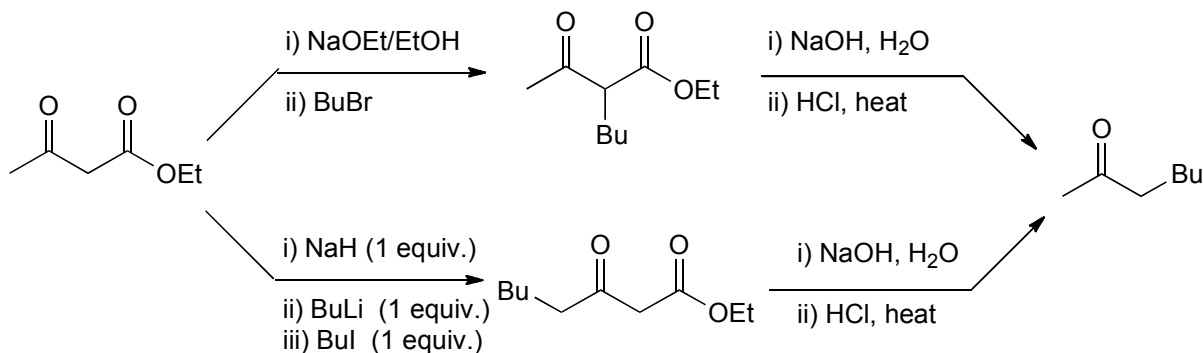
Provide explanations for *two* of the following.



[2 × 4]

Part C.

Provide an explanation for the following sequence.

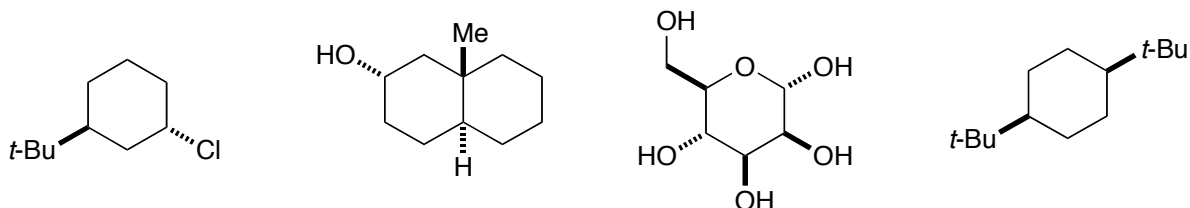


[8]

5. Answer both Parts A and B.

Part A.

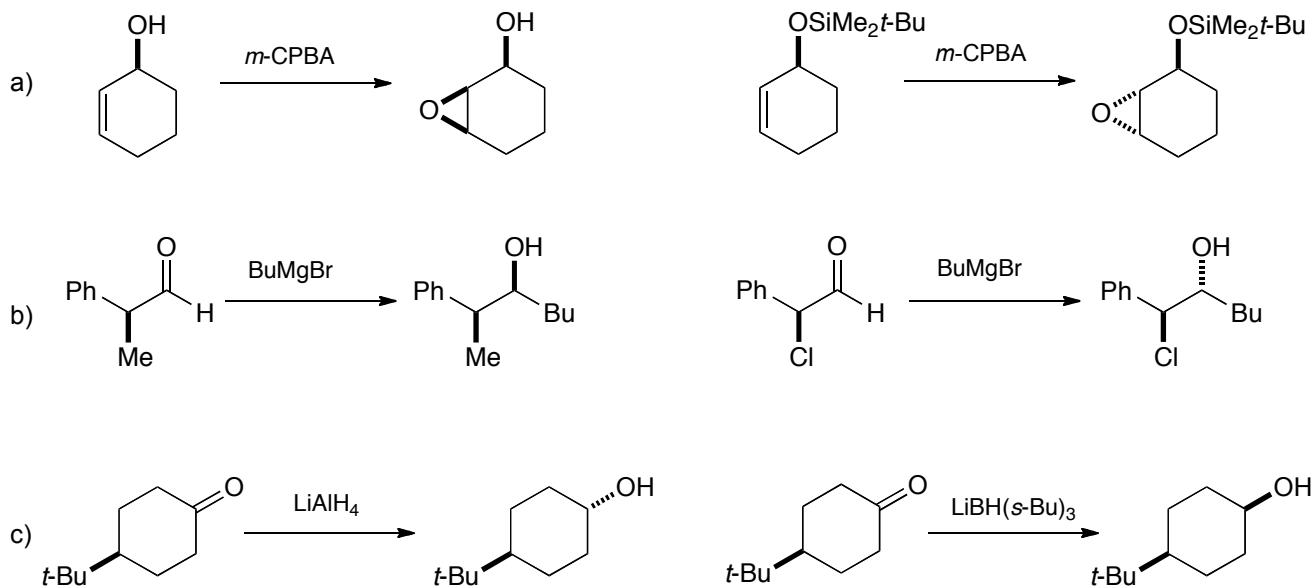
Discuss the factors which affect the preferred conformations of six-membered rings. You may wish to refer to some or all of the following molecules to illustrate your answer, or provide examples of your own.



[8]

Part B.

Contrast and explain the outcomes of *two* of the following pairs of reactions; in each case only the major product diastereomer is shown.



[2 × 6]

6. Answer *both* Parts A and B.

Part A

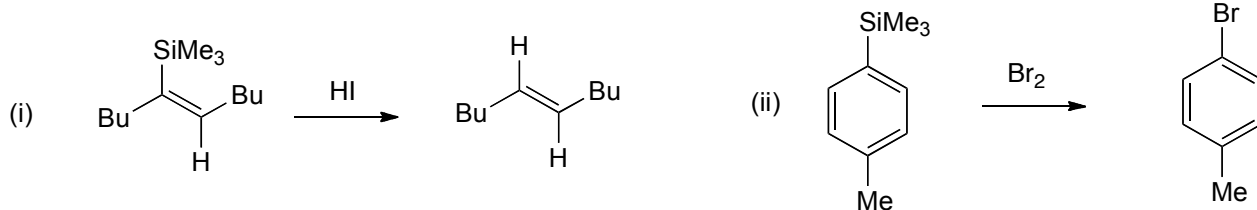
Describe one method for the preparation of aldehydes from primary alcohols using dimethyl sulfoxide (Me_2SO) as a reagent. Your answer should include a mechanism for the reaction. Why is Jones' reagent (CrO_3 , aq H_2SO_4 , acetone) not efficient for this purpose?

[6]

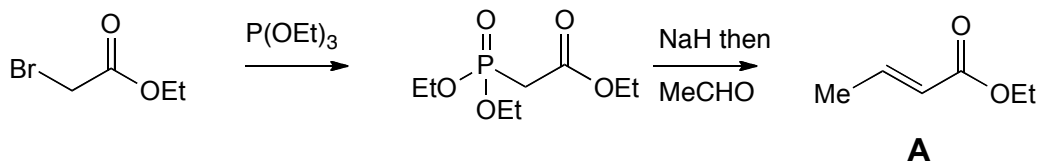
Part B.

Provide explanations for *two* of the following.

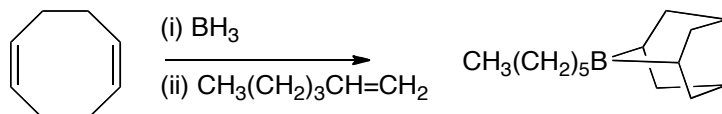
(a) Write mechanisms for the following two reactions. Account for the stereochemistry of the product in (i).



(b) Write mechanisms for the following two reactions. How could ^1H NMR spectroscopy be used to confirm the stereochemistry of compound A?



(c) Write mechanisms for the two steps of the following sequence.



[2 × 7]

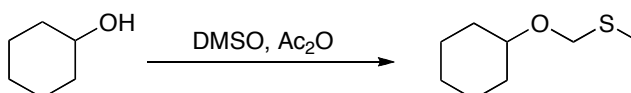
4. Answer *four* of the following.

[4 × 5]

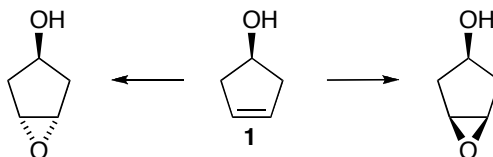
(a) Provide reagents to achieve the following transformation (more than one step may be necessary), and write a mechanism to explain the reaction.



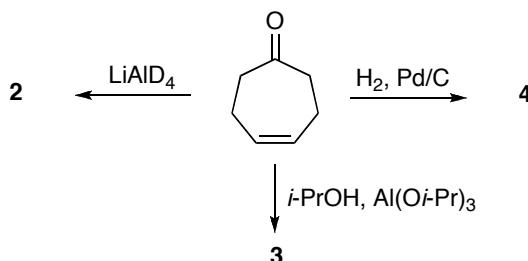
(b) Write a mechanism for the following reaction.



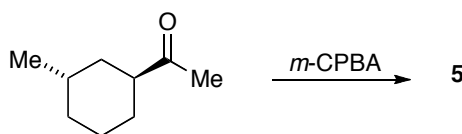
(c) Propose reagents to convert alkene **1** into the two epoxides shown below (more than one step may be necessary). Provide mechanisms to account for the transformations.



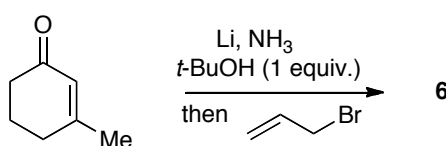
(d) Predict the structures of compounds **2**, **3** and **4**, and give a mechanism for the formation of compound **3**.



(e) Predict the structure of compound **5**, including stereochemistry, and write a mechanism to explain its formation.



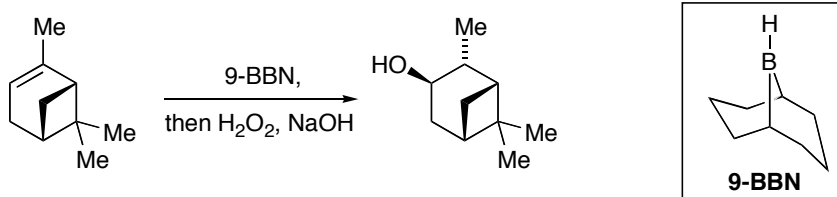
(f) Predict the structure of compound **6**, including stereochemistry, and write a mechanism to explain its formation.



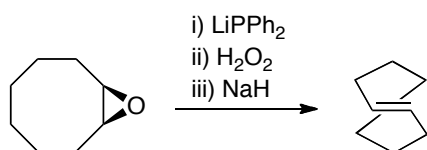
TURN OVER

8. Provide mechanisms for **four** of the following transformations, commenting on aspects of regio and stereoselectivity where appropriate. [4 × 5]

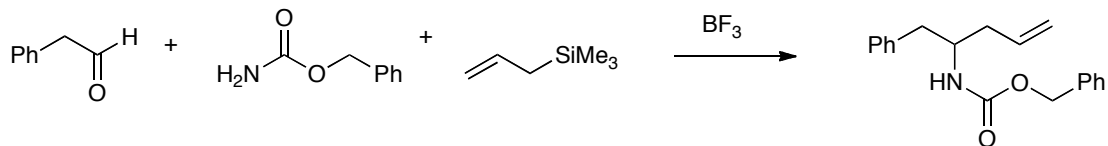
(a)



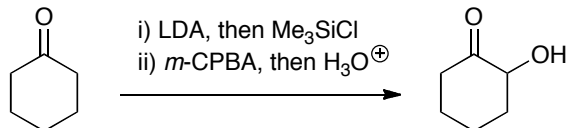
(b)



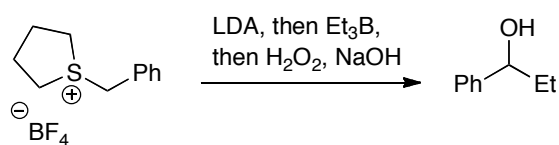
(c)



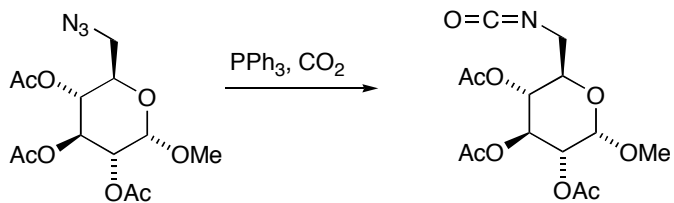
(d)



(e)



(f)



6. Answer **both** Parts **A** and **B** of this question.

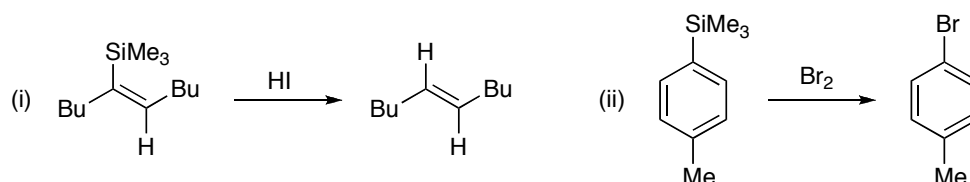
Part A

Describe one method for the preparation of aldehydes from primary alcohols using dimethyl sulfoxide (Me₂SO) as a reagent. Your answer should include a mechanism for the reaction. Why is Jones' reagent (CrO₃, aq. H₂SO₄, acetone) not efficient for this purpose? [6]

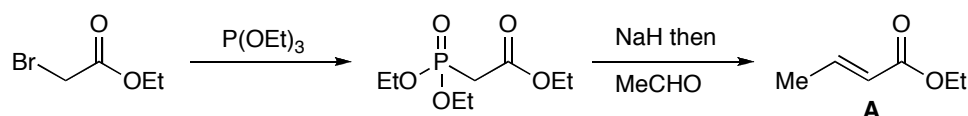
Part B

Answer **two** of the following parts. [2 × 7]

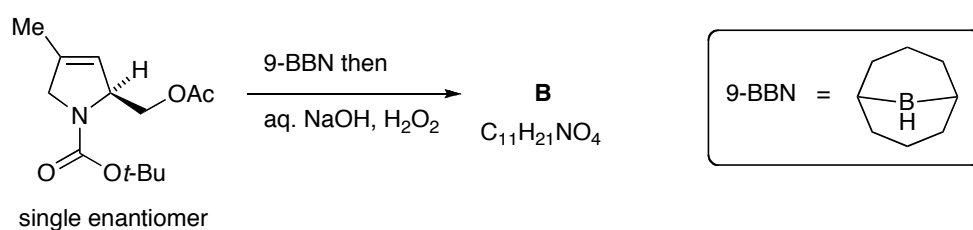
(a) Write mechanisms for the following two reactions. Account for the stereochemistry of the product in reaction (i).



(b) Write mechanisms for the following two reactions. How could ¹H NMR spectroscopy be used to confirm the stereochemistry of compound **A**?



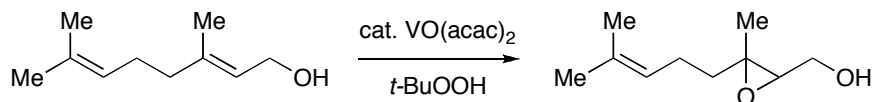
(c) Deduce the structure of compound **B**, including stereochemistry, and write a mechanism for its formation. Suggest a synthesis of 9-BBN.



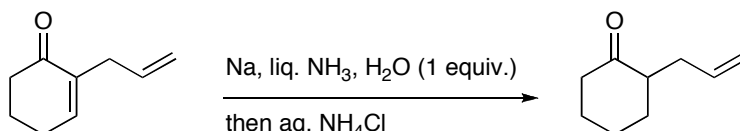
7. Answer *four* of the following.

[4 × 5]

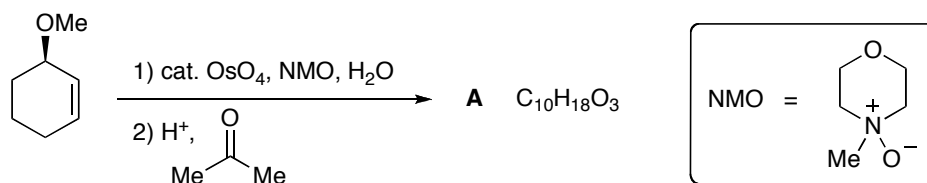
(a) Write a mechanism for the following epoxidation and explain the regioselectivity of the reaction.



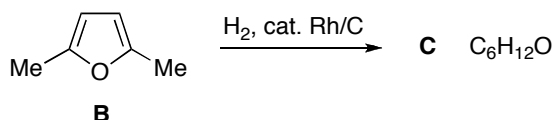
(b) Write a mechanism for the following reaction.



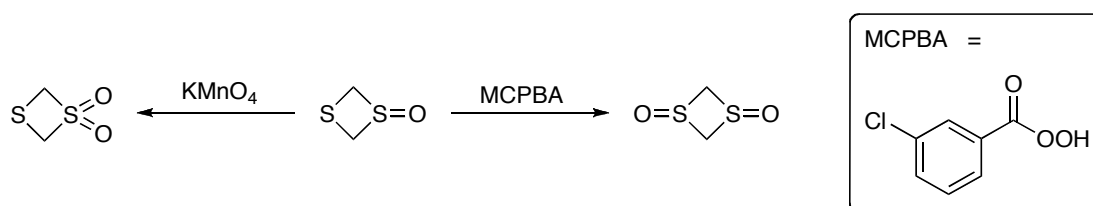
(c) Deduce the structure of compound **A**, including stereochemistry, and write a mechanism to explain its formation.



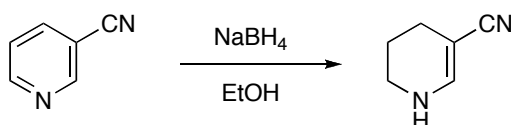
(d) Deduce the structure of compound **C**. Devise a synthesis of starting compound **B** from a non-aromatic starting material.



(e) Write mechanisms for the following reactions and explain the different outcomes with the two oxidants.



(f) Write a mechanism for the following transformation.



TURN OVER

8. Answer *both* Parts **A** and **B** of this question.

Part A

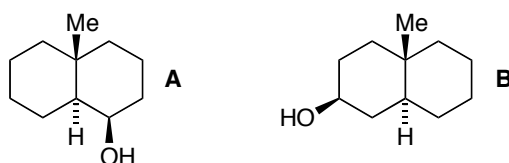
(a) For *two* classes of alicyclic rings (small, normal, medium, large) give *one* example each of a ring-forming synthesis. [2 × 3]

(b) *Briefly* outline the problems encountered in the formation of alicyclic rings. In your answer make specific reference to small, medium, and large rings. [5]

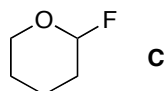
Part B

Discuss *three* of the following in the context of conformational analysis. [3 × 3]

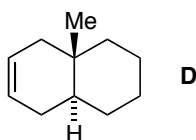
(a) The relative rates of oxidation of **A** and **B** with CrO_3, H^+ .



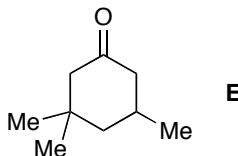
(b) The position of the conformational equilibrium of **C**.



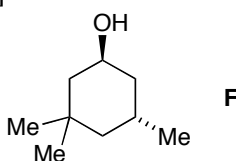
(c) The major product of treatment of **D** with $\text{Br}_2, \text{H}_2\text{O}$.



(d) The stereoisomeric products, obtained in *ca.* 50:50 ratio, from the reduction of **E** with LiAlH_4 .

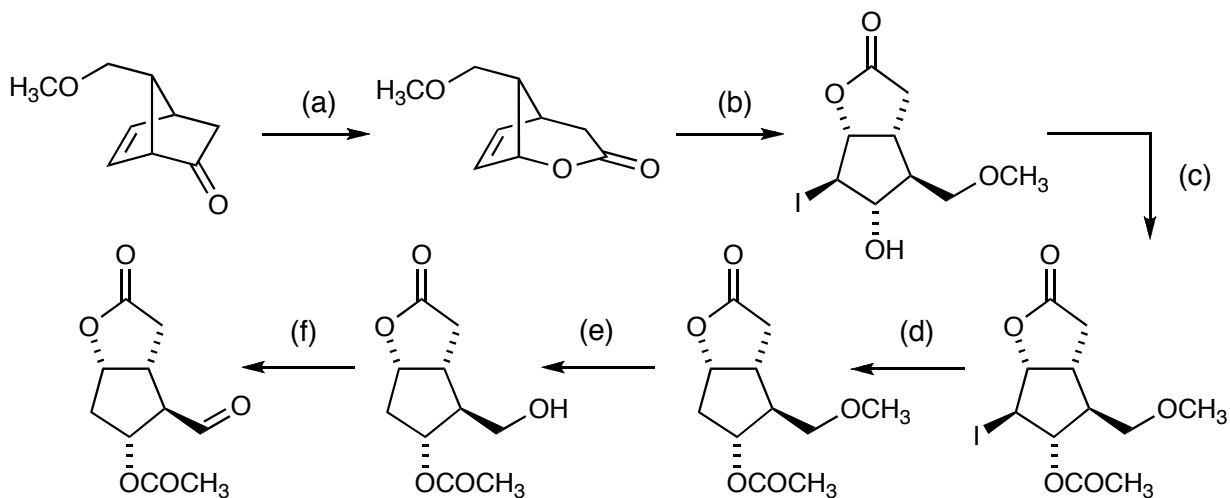


(e) The major product obtained from treatment of **F** with *i*-PrOH, $\text{Al}(\text{O}i\text{-Pr})_3$ and a *small quantity* (5 mole %) of acetone at 80°C . [The product shows a broad IR absorption centred on 3300 cm^{-1} .]



8. Answer *both* Parts A and B of this question.

Part A. Suggest reagents, with mechanistic justification, for *three* out of the four transformations (a), (b), (c) and (f) in the following scheme. More than one step may be required in some cases. [3 × 4]



Part B. The following reagents and conditions were used to achieve transformations (d) and (e):

(d) Bu_3SnH , $\text{Me}_2\text{C}(\text{CN})\text{-N=N-C}(\text{CN})\text{Me}_2$ (trace), heat.

(e) BBr_3

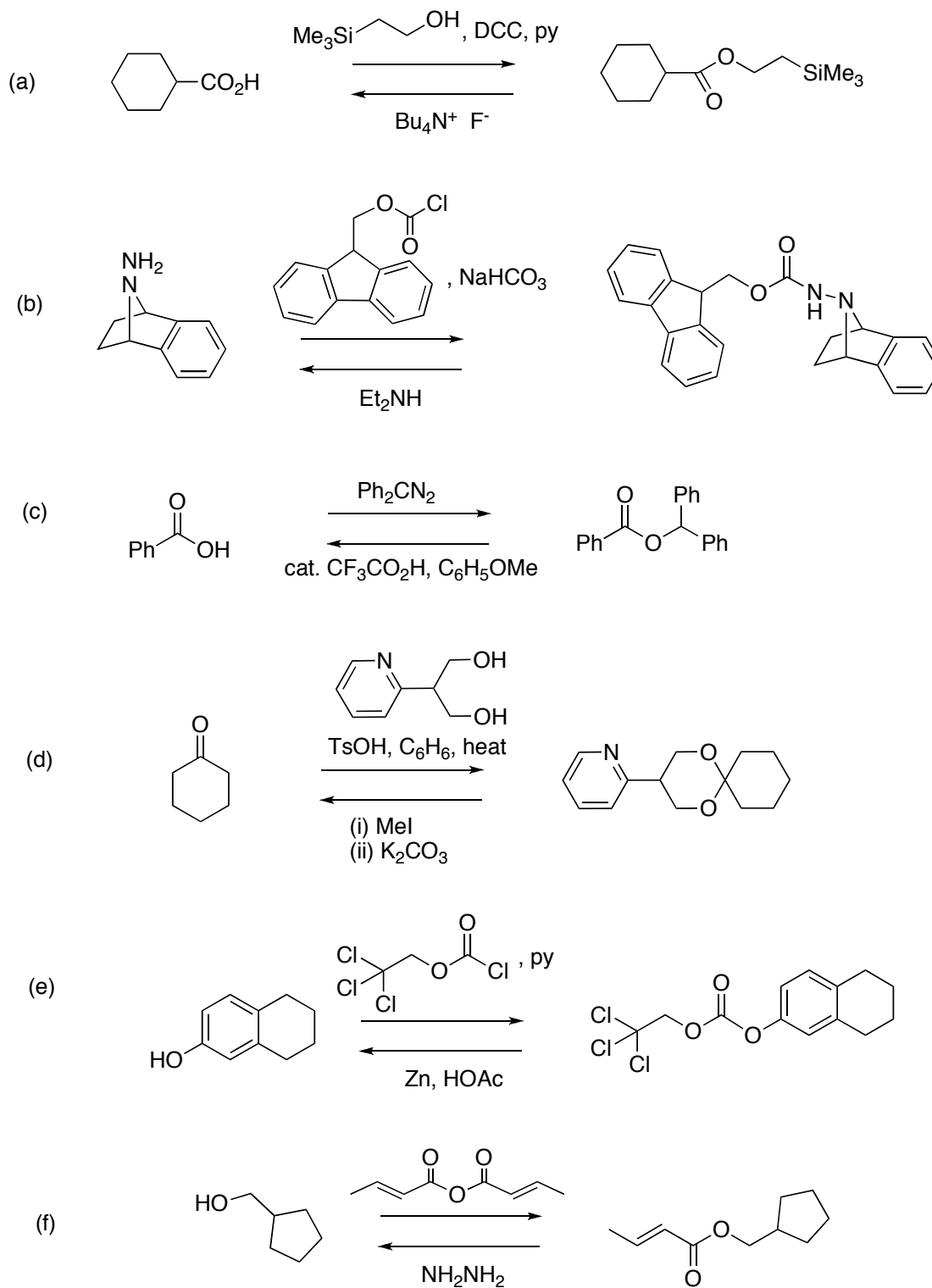
Suggest mechanisms for both of these transformations.

[2 × 4]

TURN OVER

6. Protecting group chemistry.

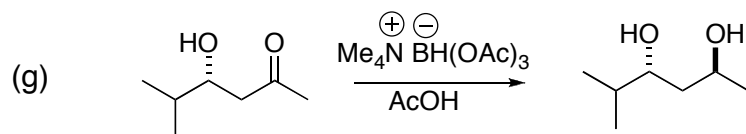
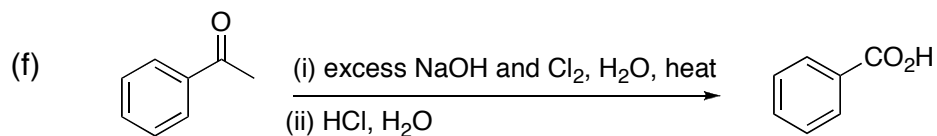
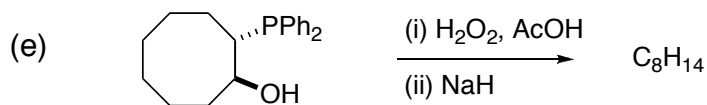
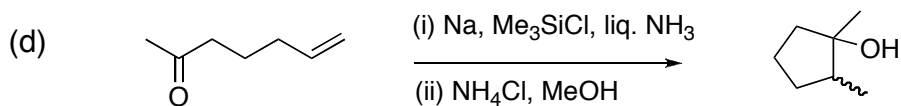
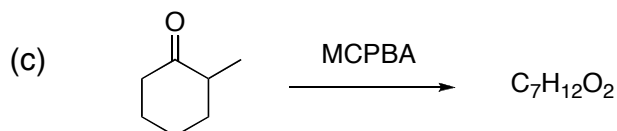
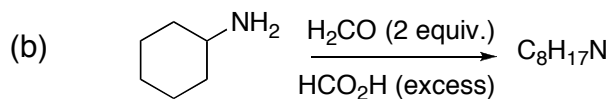
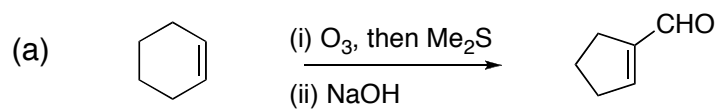
Explain the chemistry involved in *four* of the following. Give an indication of the driving force for reactions in each direction.



[4 × 5]

7. Reaction mechanisms.

Provide explanations for *five* of the following.



[5 × 4]