1. Provide the missing reagents or products for the following reactions. More than one step may be necessary.

- a) 
  ![Reaction Diagram](attachment:image.png)
  \[ \text{Br}_2, \text{AcOH} \]

- b) 
  ![Reaction Diagram](attachment:image.png)
  \[ 1. \text{Pr}_2\text{NLi} \quad 2. \text{H}_3\text{C} \text{CN} \]

- c) 
  ![Reaction Diagram](attachment:image.png)
  \[ \text{H}_3\text{C} \text{CH}_3 \quad \text{H}_3\text{C} \text{O-} \text{CH}_3 \]

- d) 
  ![Reaction Diagram](attachment:image.png)

2. What are the products formed when each of the following compounds are treated exhaustively with alkaline methanol-d₄ (NaOD, CD₃OD)?

- ![Compound 1](attachment:image.png)
- ![Compound 2](attachment:image.png)
- ![Compound 3](attachment:image.png)
3. The following transformation was reported recently by Prof. Myers here at Harvard.

Tritylhydrofuran (THF) is an organic solvent commonly used in synthesis.

a) Provide a mechanism for this reaction.

b) Why was none of the 6-membered ring product observed in the reaction? (Hint: is the ring-closing step reversible?)

4. As part of a total synthesis of cis-jasmone, the following rearrangement was carried out.

a) Provide a mechanism for this transformation. (Hint: compound 1 is a putative intermediate in the reaction)

b) Provide a careful drawing of the necessary bond alignment for the ring-opening step.

5. Propose a synthesis of the following molecule from the provided precursor You may ignore stereochemistry in this problem.