1. Provide a multi-step synthesis for each of the following compounds using the starting reagent drawn. Take into consideration the stereochemistry.

- **a)**
  - 1) KOH, heat
  - 2) HBr / peroxides

- **b)**
  - 1) Br₂, light / CCl₄
  - 2) NaOCH₃ / CH₃OH, Δ
  - 3) KMnO₄ / NaOH, cold or OsO₄, NMMO, t-BuOH

- **c)**
  - 1) Hg(OAc)₂ / THF, CH₃OH
  - 2) NaBH₄ / NaOH, H₂O

- **d)**
  - 1) O₃, -78°C
  - 2) (CH₃)₂S

- **e)**
  - 1) SOCl₂ / pyr or PBr₃ / pyr
  - 2) KOC(CH₂)₃ / (CH₃)₃COH
  - 3) BH₃ / THF
  - 4) H₂O₂ / NaOH

- **f)**
  - 1) Br₂ / CCl₄, hv
  - 2) NaOH, Δ
  - 3) mCPBA or PAA
  - 4) NaOH / H₂O

- **g)**
  - 1) BH₃ / THF
  - 2) H₂O₂ / NaOH, H₂O
  - 3) NaH
  - 4) CH₃I
2. Draw a plausible arrow-pushing mechanism for the following transformation. Provide a brief explanation.
The addition of the bromine to form the bromonium ion occurs through the less hindered side of the double bond, as shown above, because bromine is a big atom. On the other hand, the water molecule is small and can attack the bromonium through a somewhat hindered side.