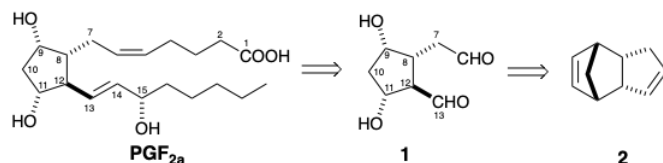


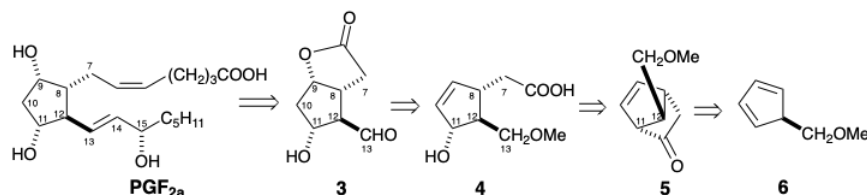
3.9: Study Questions

1. Turner's synthesis of $\text{PGF}_{2\alpha}$ uses endo dicyclopentadiene (**2**) as starting material and generates an intermediate **1**.



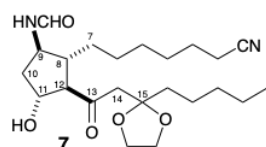
Use one or more of the following terms to answer each of the following questions: thermodynamic control, stereoelectronic control, steric approach control, or temporary bridge. How is stereocontrol achieved:

- at the 11 position relative to the 9 position in **1**?
 - at the 8-position relative to the 9-position in **1**?
 - at the 12-position relative to the 8-position in **1**?
2. Corey's second synthesis of $\text{PGF}_{2\alpha}$ exploited a lactone intermediate **3** that contains all of the cyclopentane ring stereochemical information present in $\text{PGF}_{2\alpha}$.

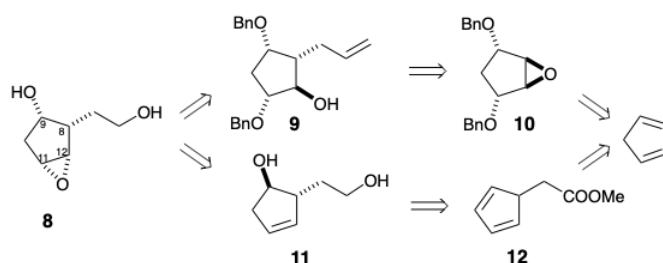


Use one or more of the following terms to answer each of the following questions: thermodynamic control, stereoelectronic control, steric approach control, or temporary bridge.

- Two factors favor the correct relative stereochemistry for the aldehyde substituent in **3** during its synthesis from **6** by way of **5** and **4**. What are these two stereocontrolling factors?
 - How is stereocontrol achieved at the 9-position relative to the 8-position in **3**?
 - How is stereocontrol achieved at the 11-position relative to the 8-position in **3**?
3. In Corey's first synthesis of PGE_1 , he uses a substituted cyclohexene precursor that is suggested by a polar disconnection of the subtarget **7** and by his intention to use target-related functionality at the 15-position to stabilize a carbanion at that carbon during assembly of the lower side chain.

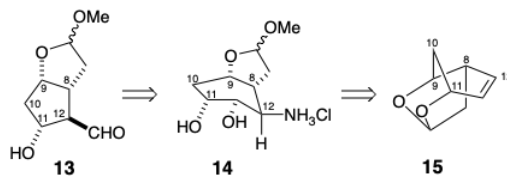


- What is the structure of Corey's cyclohexene intermediate in his synthesis of **7**?
 - Why does Corey choose an *[Math Processing Error]* group in his cyclohexene intermediate to serve as a precursor of the *[Math Processing Error]* group in **7**?
4. Two syntheses of the $\text{PGF}_{2\alpha}$ precursor **8** were described as outlined in the following retrosynthetic analysis:

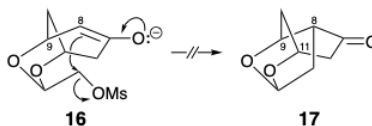


- Why was the **10** to **9** conversion **not** achieved enantioselectively?
- How was the **12** to **11** conversion accomplished enantioselectively?
- What stereocontrolling factor is responsible for the configuration of the epoxy group relative to the other stereocenters in **8** when this epoxide is prepared from the alkene **11**?

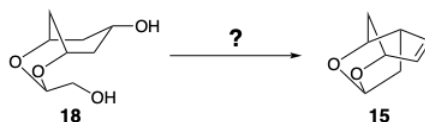
5. Woodward's $\text{PGF}_{2\alpha}$ synthesis generates the key intermediate **13**, that is similar to Corey's lactone **3**, by a ring contraction of **14**.



- In an attempt at preparing the precursor **15** of **14** by intramolecular alkylation of enolate **16**, the desired ketone **17** was not obtained. Why?



- Woodward achieved the synthesis of **15** from **18** by a multistep sequence that began with a polar process closely related to the **16** to **17** reaction. How did he accomplish the **18** to **15** conversion?



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