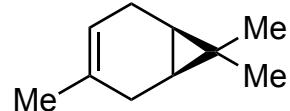
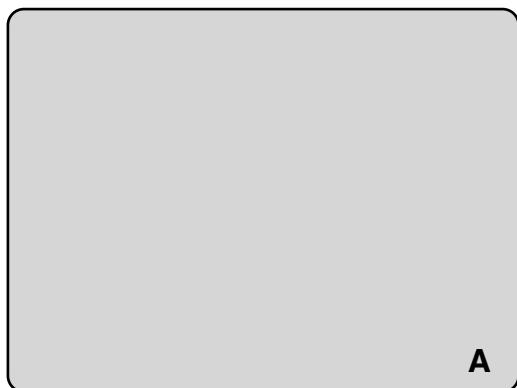


14-Step Synthesis of (+)-Ingenol from (+)-3-Carene

Jørgensen L.; McKerrall S. J.; Kuttruff C. A.; Ungeheuer F.; Felding J.; Baran P. S.
Science, 2013, 341, 878.

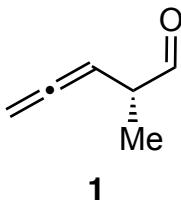


1-6



7-10

- 1) NCS, DMAP
- 2) O₃, thiourea
- 3) Lithium Naphthalenide, HMPA, Mel *then* LiHMDS **1**
- 4) Ethynyl magnesium bromide
- 5) TBSOTf (1 equiv) *then* TMSOTf (1 equiv)
- 6) [Rh(Cl(CO)₂)₂, CO]

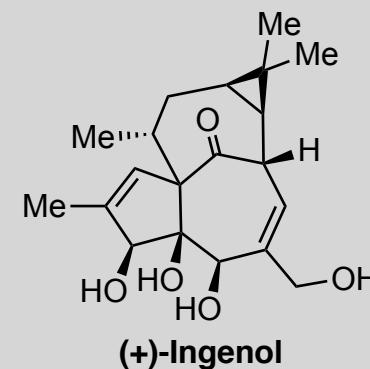


- 7) MeMgBr
- 8) OsO₄
- 9) CDI
- 10) BF₃•OEt₂

2) Name of the reaction? Why would you use thiourea? What other sulfur compound could you use? Please show the mechanism

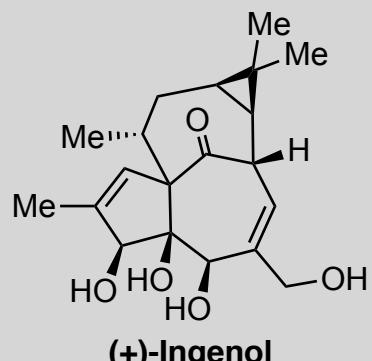
6) Name of the Reaction?

10) Name of the reaction?



B

11-14



- 11) SeO_2 *then* Ac_2O
12) HF
13) Martin's Sulfurane *then* NaOH
14) SeO_2 , HCO_2H

14) Name of the reaction? Please provide a mechanism