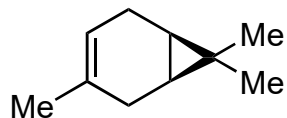


## 14 Step Synthesis of (+)-Ingenol

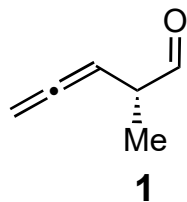
L. Jørgensen, S. J. McKerrall, C. A. Kuttruff, F. Ungeheuer, J. Felding, P. S. Baran, *Science*, 2013, 341, 878.



- 1) NCS, DMAP
- 2) O<sub>3</sub> thiourea
- 3) LiNap, HMPA, MeI *then* LiHMDS **1**
- 4) Ethynylmagnesiumbromide
- 5) TBSOTf (1 equiv) *then* TMSOTf (1 equiv)
- 6) [Rh(Cl(CO)<sub>2</sub>)<sub>2</sub>] CO

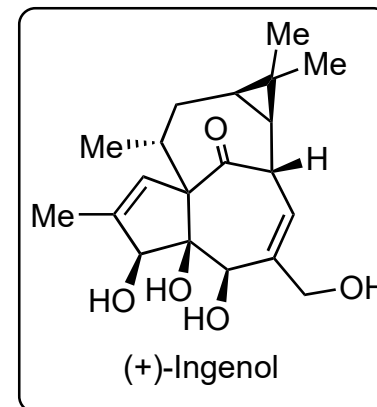
2) Name of the reaction? Why would you use thiourea? What other sulfur compound could you use? Please show the mechanism

6) Name of the Reaction?



- 7) MeMgBr
- 8) OsO<sub>4</sub>
- 9) CDI
- 10) BF<sub>3</sub>•OEt<sub>2</sub>

10) Name of the reaction?



- 11)  $\text{SeO}_2$  then  $\text{Ac}_2\text{O}$
- 12)  $\text{HF}$
- 13) Martin's Sulfurane then  $\text{NaOH}$
- 14)  $\text{SeO}_2$ ,  $\text{HCO}_2\text{H}$

14) Name of the reaction? Please provide a mechanism

