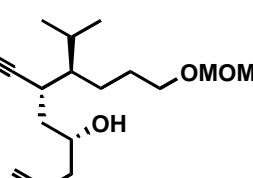
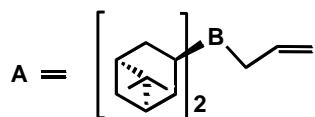
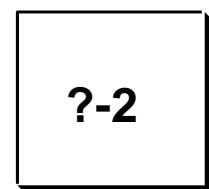


- 1) reagent, 96% (single isomer)
- 2) reagent, 82% (dr > 98:2)
- 3) Et<sub>2</sub>Li, 96%
- 4) DIBAL-H, 59%
- 5) Ph<sub>3</sub>P-CHBr<sub>3</sub>, t-BuOK
- 6) *n*-BuLi then TMSCl  
78% (2 steps)
- 7) OsO<sub>4</sub>, NaIO<sub>4</sub>  
2,6-lutidine
- 8) A  
73% (2 steps), dr 85:15



- 1) TBAF, 90%
- 2) 2NHCl, MeOH, 89%
- 3) TBSCl, 97%
- 4) PivCl, DMAP, 92%
- 5) TBAF, 93%
- 6) Swern oxi.
- 7) vinyl Grignard
- 8) Swern oxi.  
72% (3 steps)

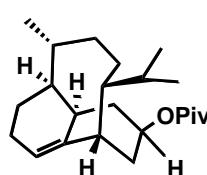


Grubbs' II (15 mol%)  
toluene, ethylene  
rt, 12 h

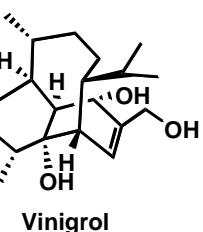
then N<sub>2</sub>, -78 °C  
SnCl<sub>4</sub>, 2 h  
73%



- 1) Ph<sub>3</sub>P=CH, 75%
- 2) PtO<sub>2</sub>, EtOAc  
H<sub>2</sub>, 0°C, 82%  
(regioselective hydrogenation)



steps



Q1, Answer each structure of ?-1,2,3.

Q2, Answer the appropriate reagent of 1st step and 2nd step.

Q3, Answer the mechanism of transformation from ?-2 to ?-3.

*Org. Lett.*, 2014, 16, 5540-5543, Krishna P. Kaliappan et al.