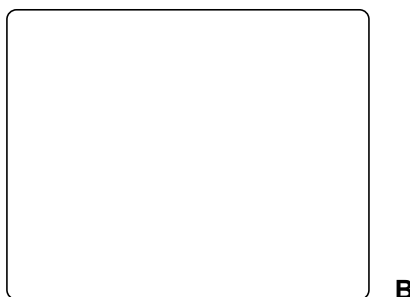
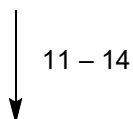
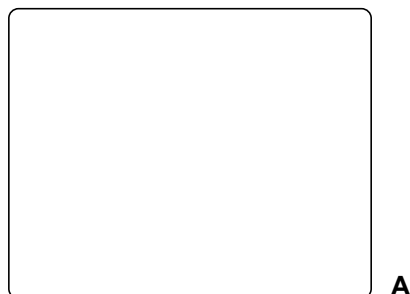
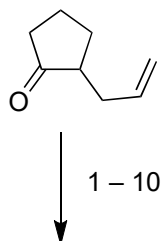


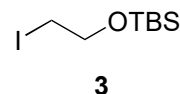
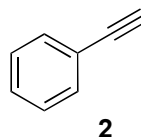
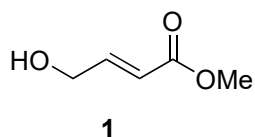
Total Synthesis of Ginkgolide C and Formal Syntheses of Ginkgolides A and B

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1. Amberlyst 15, CH(OMe)₃, MeOH, reflux
2. Propionic acid (cat.), **1**, 150 °C
3. Grubbs II, CH₂Cl₂, reflux
4. DBU, PhMe, 80 °C
5. PhNTf₂, LHMDS, THF, -45 °C
6. Pd(PPh₃)₂Cl₂, **2**, CuI, Et₃N, 60 °C
7. KHMDS, 18-Crown-6, THF, -78 °C *then* **3**
8. *m*-CPBA, CH₂Cl₂, r.t.
9. Ac₂O, Et₃N, DMAP, CH₂Cl₂, r.t. *then* MeOH, TBAF, 65 °C
10. AcOK, DMSO, 145 °C



11. DMP, CH₂Cl₂, r.t.
12. Amberlyst 15, CH(OMe)₃, MeOH, CH₂Cl₂, 65 °C
13. DIBAL-H (5 eq.), THF, -78 °C → 0 °C
14. HCl (4M in dioxane), THF, r.t. *then* Et₃N, DMAP, Ac₂O, r.t.

Step 2: Please, name the reaction.

Step 3: Please, show the structure of Grubbs II catalyst.

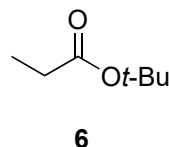
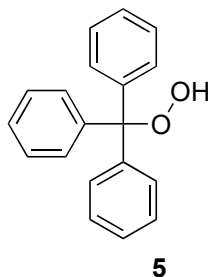
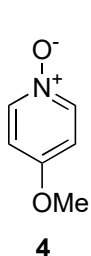
Hint step 4: Isomerization.

Step 6: Please, name the reaction.

Hint step 8: Two products are formed. Step 9 converts one of them into **A** and step 10 converts the other into **A**.

The chemical structure shows a complex polycyclic molecule, likely a steroid derivative. It features a central four-ring core (three six-membered rings and one five-membered ring). Substituents include a methyl group (Me) on the left, a hydroxyl group (OH) on the top left, a hydroxyl group (OH) on the top right, a hydroxyl group (OH) on the bottom right, and a hydroxyl group (OH) on the bottom left. The structure is highly detailed with stereochemistry indicated by wedges and dashes.

15. SeO_2 , 1,4-dioxane, $110\text{ }^\circ\text{C}$ *then* DMP, CH_2Cl_2 , $60\text{ }^\circ\text{C}$
16. *t*-BuLi, CuCN, THF, $-78\text{ }^\circ\text{C}$ *then* TMSI, $-78\text{ }^\circ\text{C}$ *then* TBAF, r.t. *then* NaOH, MeOH, THF, H_2O . $75\text{ }^\circ\text{C}$
17. KHMDS, Davis' oxaziridine, THF, $-78\text{ }^\circ\text{C} \rightarrow$ r.t.
18. MOMBr, DIPEA, TBAI, CH_2Cl_2 , $55\text{ }^\circ\text{C}$
19. RuCl_3 , NaIO_4 , CCl_4 , MeCN, H_2O , $50\text{ }^\circ\text{C}$
20. NaBH_4 , THF, H_2O , r.t. *then* NaOH, $50\text{ }^\circ\text{C}$ *then* AcOH, r.t.
21. IBX (8 eq.), **4** (8 eq.), DMSO, $75\text{ }^\circ\text{C}$



22. PPTS, pyr, Ac₂O, PhCl, 135 °C
23. DBU, **5**, CH₂Cl₂, -25 °C
24. LDA, **6** *then* SM, THF, HMPA, -78 °C → -30 °C
25. CSA, CH₂Cl₂, r.t.
26. DMDO, acetone, r.t.
27. Br₂, NaOAc, AcOH, H₂O, r.t.
28. K₂CO₃, MeOH, r.t.

Step 26: How would you generate DMDO?