11.10
Reactions of Arenes:
A Preview

1. Some reactions involve the ring.

2. In other reactions the ring is a substituent.

1. Reactions involving the ring

   a) Reduction

      Catalytic hydrogenation (Section 11.4)
      Birch reduction (Section 11.11)

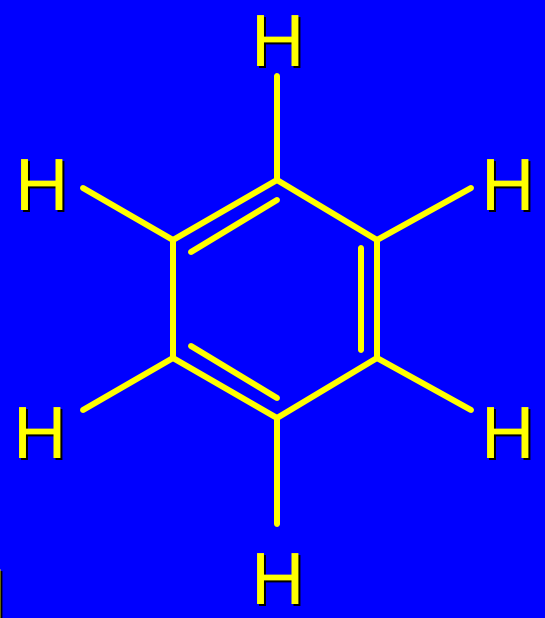
   b) Electrophilic aromatic substitution (Chapter 12)

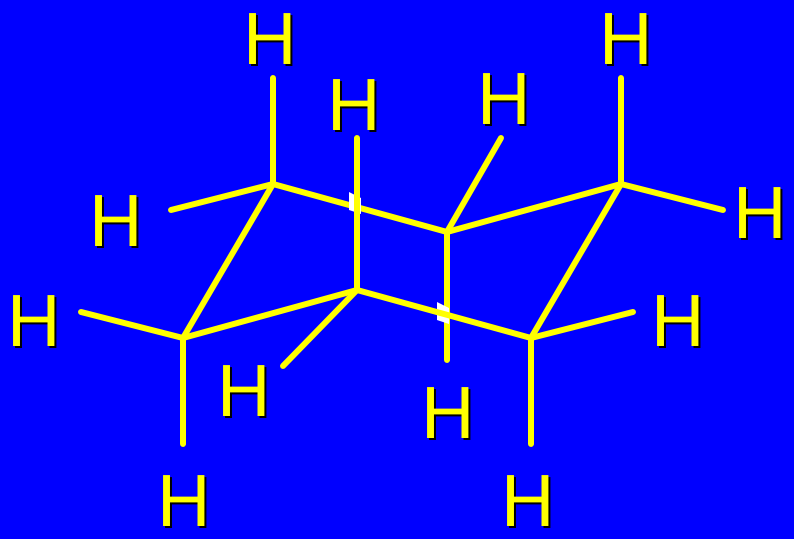
   c) Nucleophilic aromatic substitution (Chapter 23)

2. The ring as a substituent (Sections 11.12-11.17)

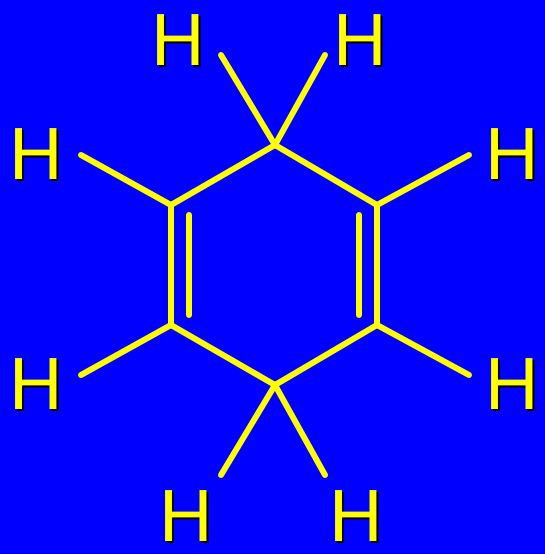
Reduction of Benzene Rings

catalytic hydrogenation (Section 11.4)



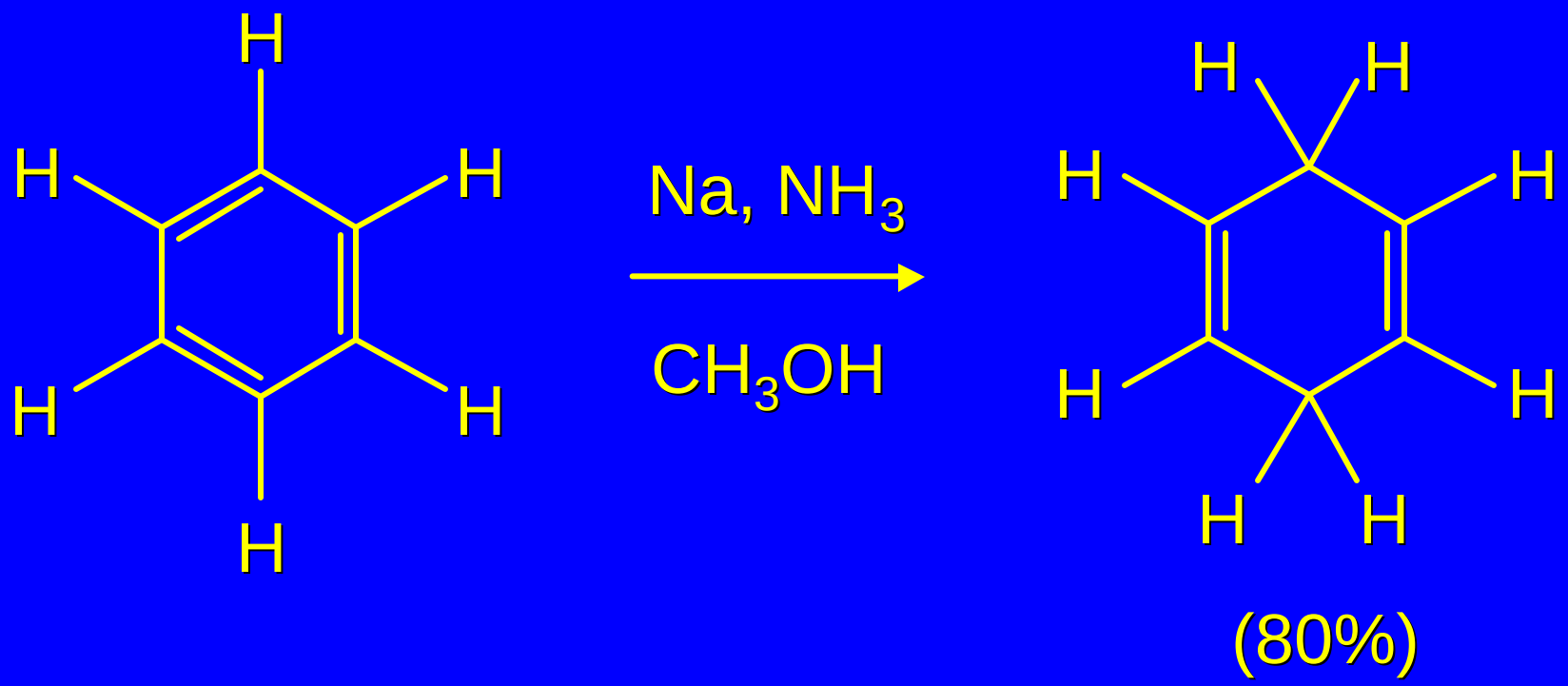


Birch reduction (Section 11.11)



11.11
The Birch Reduction

Birch Reduction of Benzene



(80%)

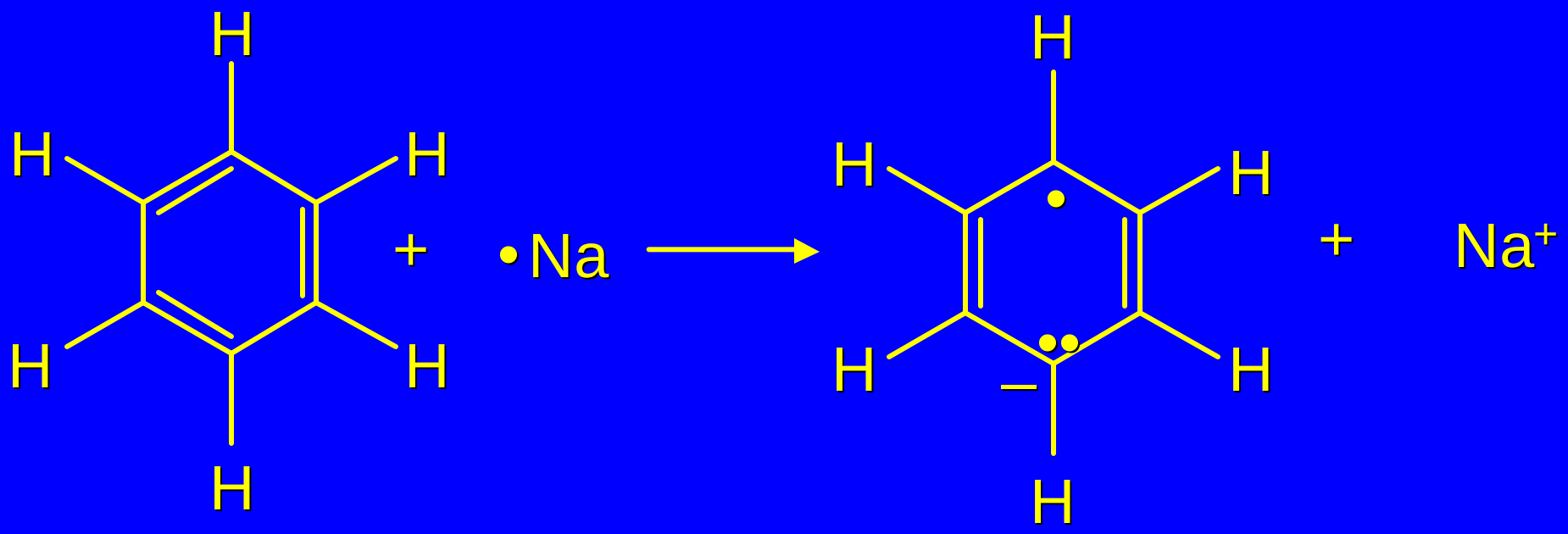
Product is non-conjugated diene.

Reaction stops here. There is no further reduction.

Reaction is not hydrogenation. H_2 is not involved in any way.

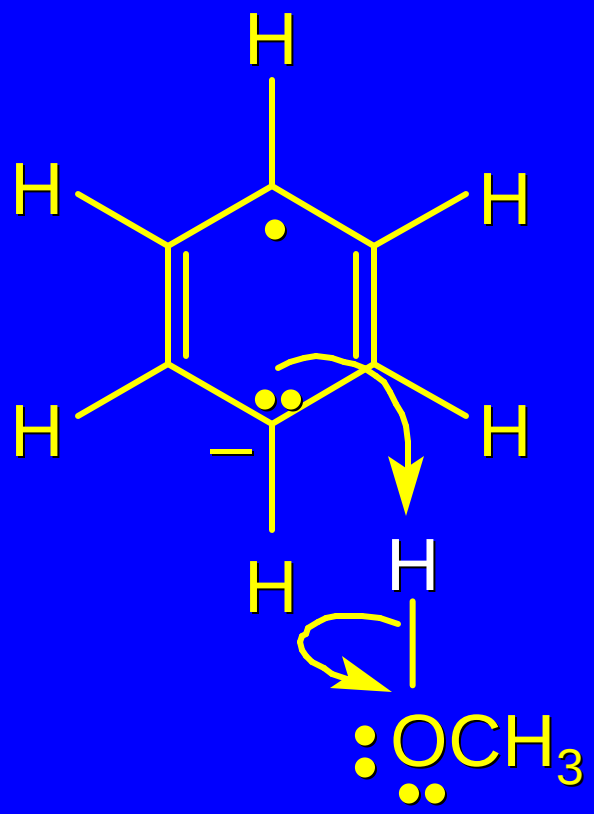
Mechanism of the Birch Reduction (Figure 11.8)

Step 1: Electron transfer from sodium



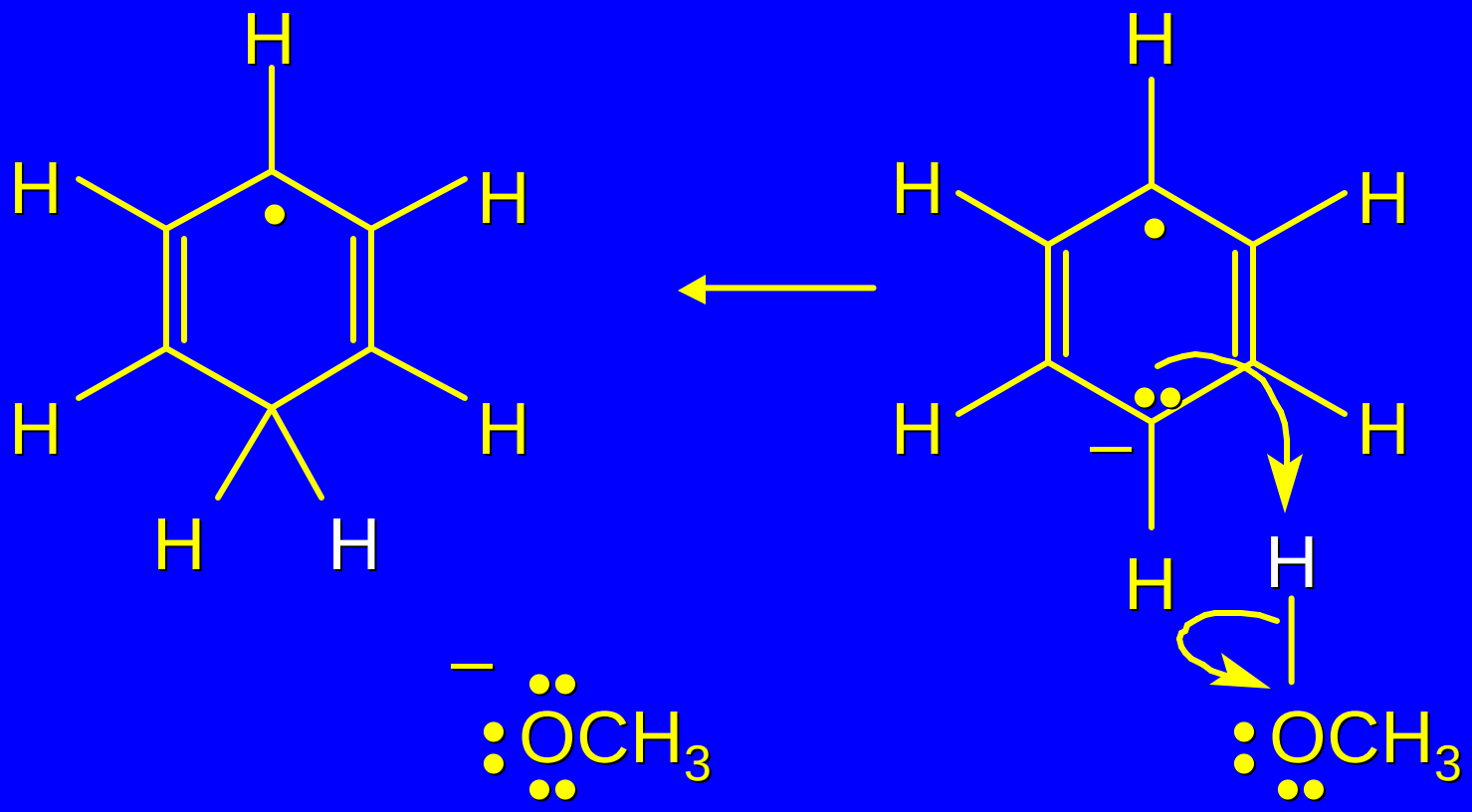
Mechanism of the Birch Reduction (Figure 11.8)

Step 2: Proton transfer from methanol



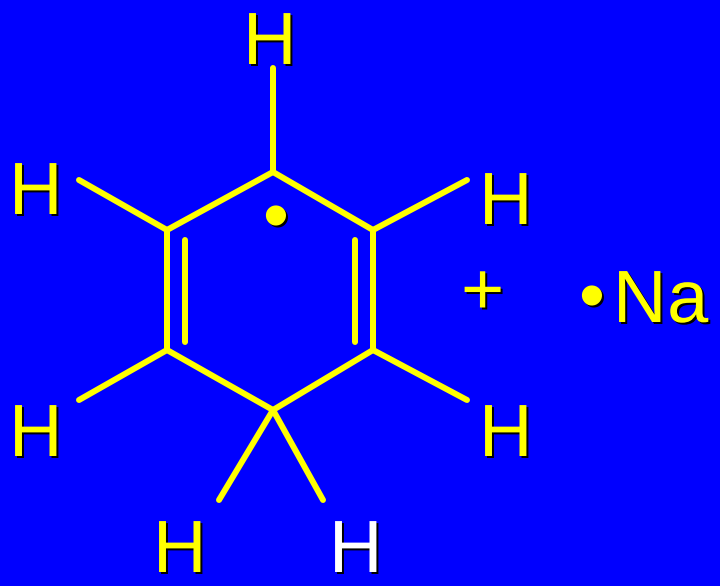
Mechanism of the Birch Reduction (Figure 11.8)

Step 2: Proton transfer from methanol



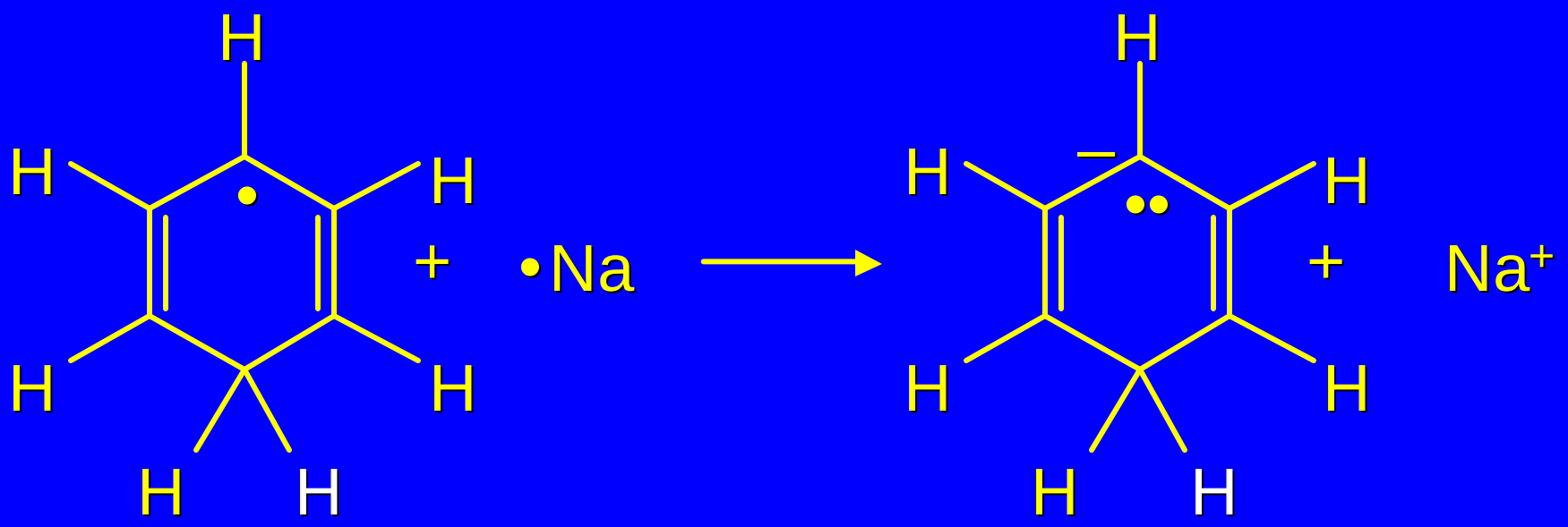
Mechanism of the Birch Reduction (Figure 11.8)

Step 3: Electron transfer from sodium



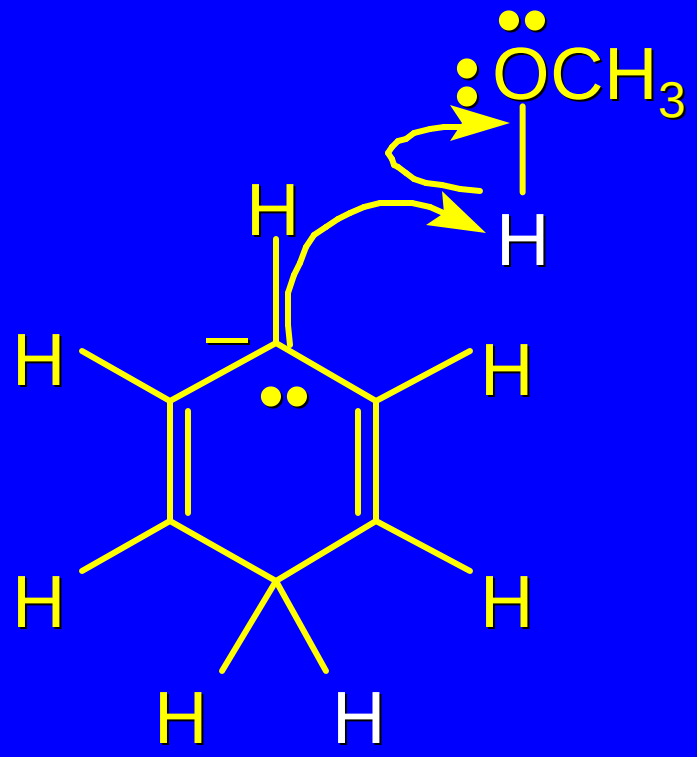
Mechanism of the Birch Reduction (Figure 11.8)

Step 3: Electron transfer from sodium



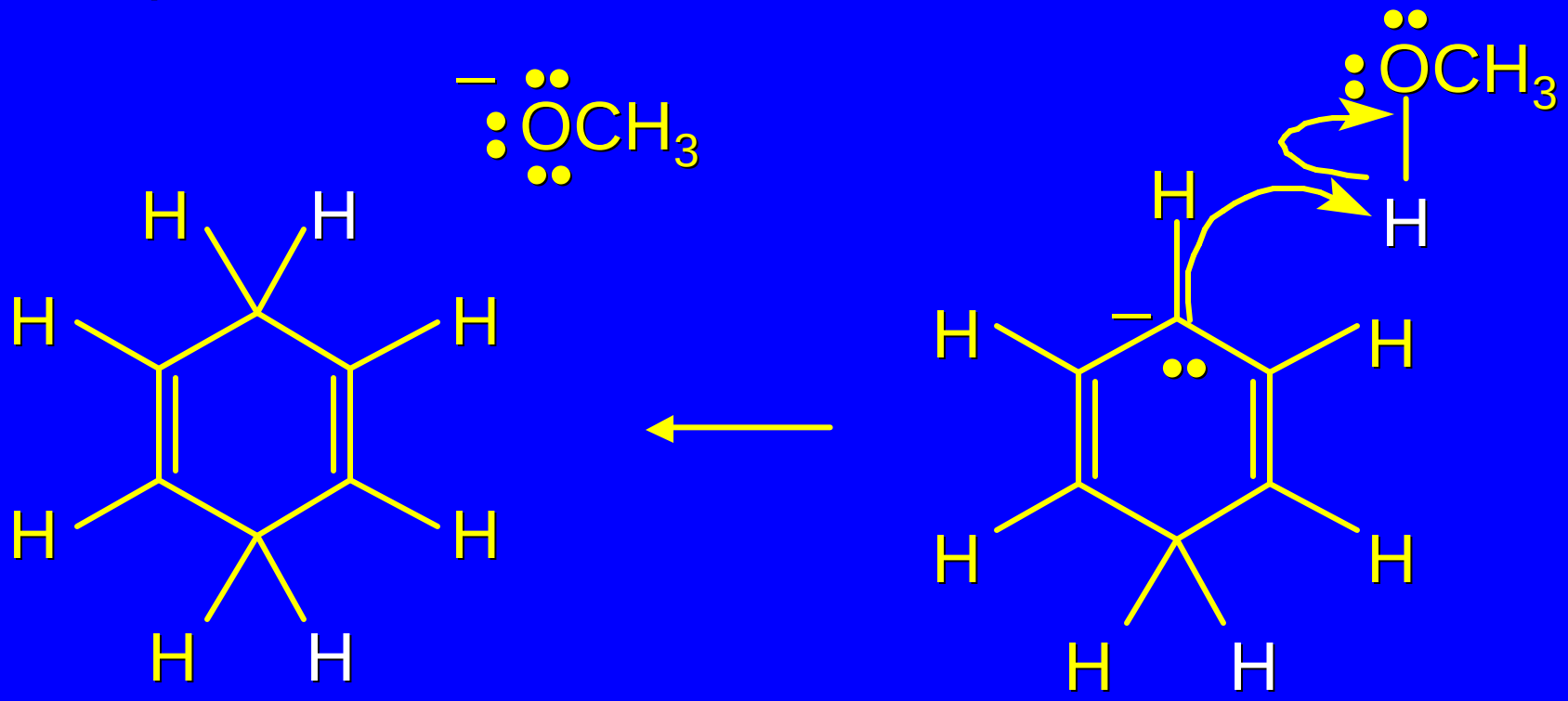
Mechanism of the Birch Reduction (Figure 11.8)

Step 4: Proton transfer from methanol

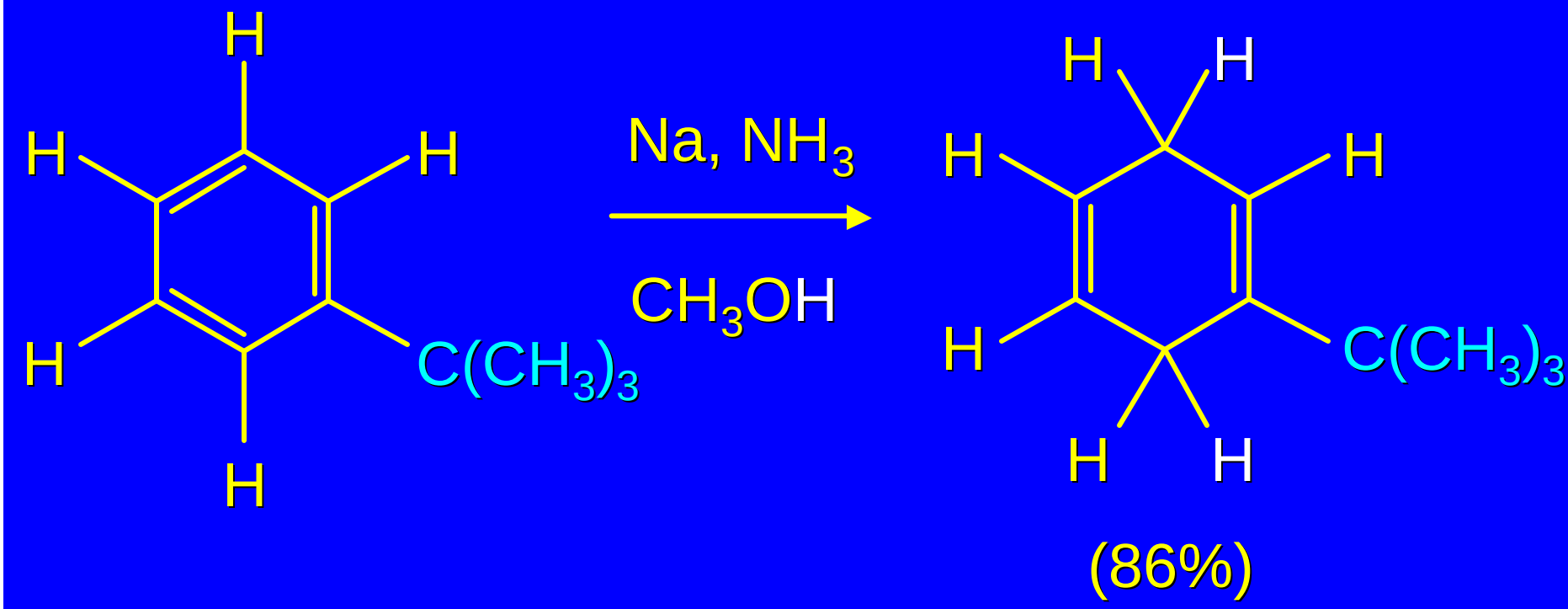


Mechanism of the Birch Reduction (Figure 11.8)

Step 4: Proton transfer from methanol



Birch Reduction of an Alkylbenzene



(86%)

If an alkyl group is present on the ring, it ends up as a substituent on the double bond.