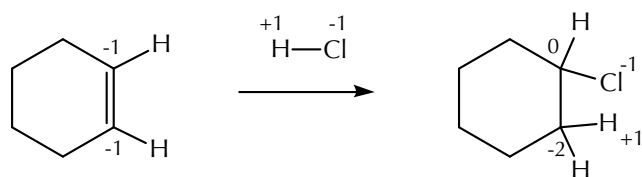
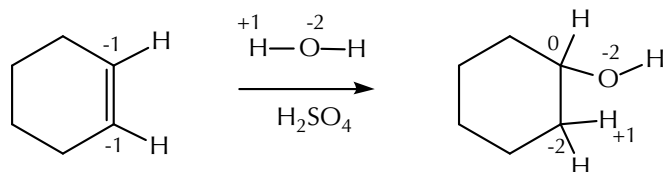


Figure 1105

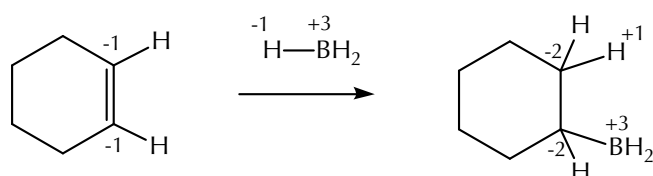
Addition reactions (Chapter 8): looking at oxidation number.



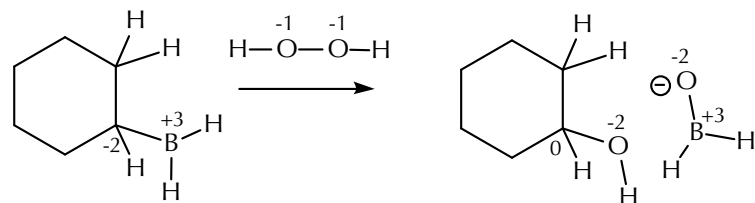
one C in cyclohexene is oxidized (-1 to 0)
 one C in cyclohexene is reduced (-1 to -2)
 no change for the atoms in HCl
 no redox reaction for either partner



one C in cyclohexene is oxidized (-1 to 0)
 one C in cyclohexene is reduced (-1 to -2)
 no change for the atoms in H₂O
 no redox reaction for either partner



each C in cyclohexene is reduced (-1 to -2)
 the H in BH₃ is oxidized (-1 to +1)
 cyclohexene is the oxidizing agent
 BH₃ is the reducing agent



the C in cyclohexene is oxidized (-2 to 0)
 each O in H₂O₂ is reduced (-1 to -2)
 the alkyl borane is the reducing agent
 H₂O₂ is the oxidizing agent

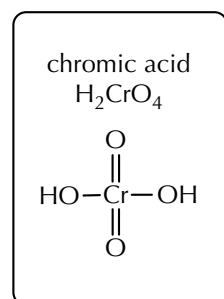
The overall process for the hydroboration-oxidation reaction is an addition of water, too, and so this overall process cannot be a net redox if the simple addition of water (above) is not. But quite plainly, the second word in “hydroboration-oxidation” is oxidation. To get no net change upon the addition of water, it must mean that the hydroboration step is a reduction, and the analysis (Figure 1105) bears that out.

B. Chromic Acid Reagents

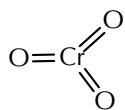
Chromic acid solutions (H₂CrO₄; connectivity (HO)₂CrO₂) is formed by various Cr⁺⁶ compounds, typically in aqueous sulfuric acid (H₂O, H₂SO₄). The original laboratory preparation, using chromium trioxide, is called the Jones reagent after a 1946 report on its use in organic chemistry. Two other sets of reaction conditions, one using sodium chromate and the other using potassium dichromate, also result in chromic acid solutions. The structures and formulas for these chromic acid sources are shown in Figure 1106.

Figure 1106

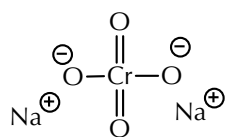
Three laboratory preparations for chromic acid solutions.



chromium trioxide,
CrO₃,
in H₂O, H₂SO₄
Jones reagent



sodium chromate,
Na₂CrO₄,
in H₂O, H₂SO₄



potassium dichromate, K₂Cr₂O₇,
in H₂O, H₂SO₄

