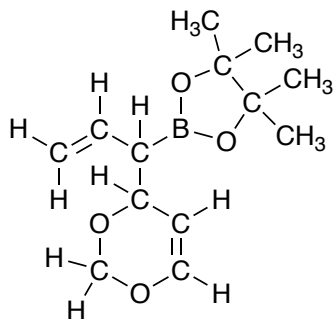
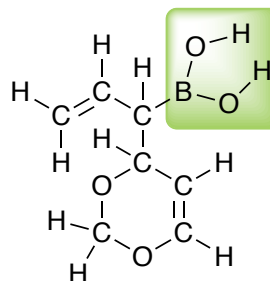


Quiz 1: Intro & Chem Principle Review

Phenalamide A₂ belongs to a class of natural products that are of interest because of their antibiotic, antifungal, and antiviral activity. In the first total synthesis of this compound, the following boronate ester was utilized, which is drawn as **1**. When phenalamide A₂ is hydrolyzed, one of the products is shown as **2**:



1



2

- Determine the hybridization state of the boron atom in **1**.
- Predict the O – B – O bond angle in **1** and then suggest a reason why the actual bond angle might deviate from the predicted value in this case.
- The lone pairs in **1** have not been drawn. Draw all of them. (**Hint:** Note that the structure has no formal charges.)
- The shaded part in **2** can be classified by using Brønsted-Lowry acid & base theory. Determine whether this part is an acid, a base, the both, or the neither.
- Suppose there is a strong base (represented as :B^-), using curly arrows to represent the acid & base reaction between :B^- and the shaded part.
- The shaded part has a $\text{pK}_a \approx 9$. Calculate the ΔG° of the reaction that R-B(OH)_2 losses a proton, and thus determine whether this reaction is spontaneous or not. ($R = 8.314 \text{ J} \cdot \text{mol}^{-1} \cdot \text{K}^{-1}$)