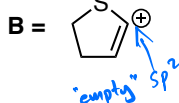
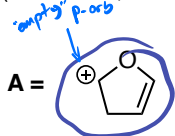


1. Consider the carbocations shown below.

1a. 3 pts. Which do you expect to be more stable, **A** or **B**, or do they have the same relative stability?

Circle the most stable carbocation.
(circle both, if they are equally stable)

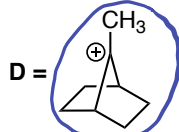
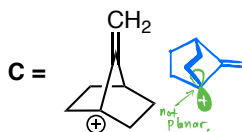


Briefly explain why: Carbocation A is stabilized by resonance since the lone-pair e^- s from the p-orbital of the sp^2 oxygen can be delocalized, placing the \oplus charge on oxygen. Carbocation B, however, cannot delocalize its charge because the empty orbital is in an sp^2 carbon.

Resonance:

1b. 3 pts. Which do you expect to be more stable, **C** or **D**, or do they have the same relative stability?

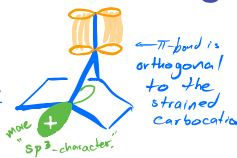
Circle the most stable carbocation.
(circle both, if they are equally stable)



Briefly explain why: D is a planar, sp^2 , 3° carbocation stabilized by hyperconjugation.

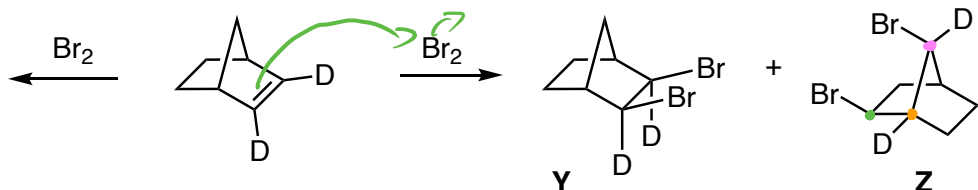
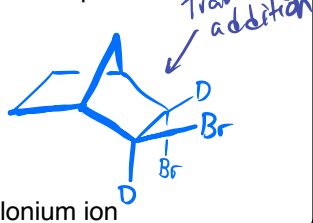
C is a strained, bridgehead carbocation.

Its empty p-orbital is not aligned to participate in resonance with the neighboring alkene.

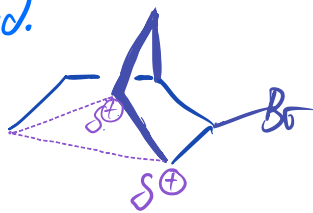
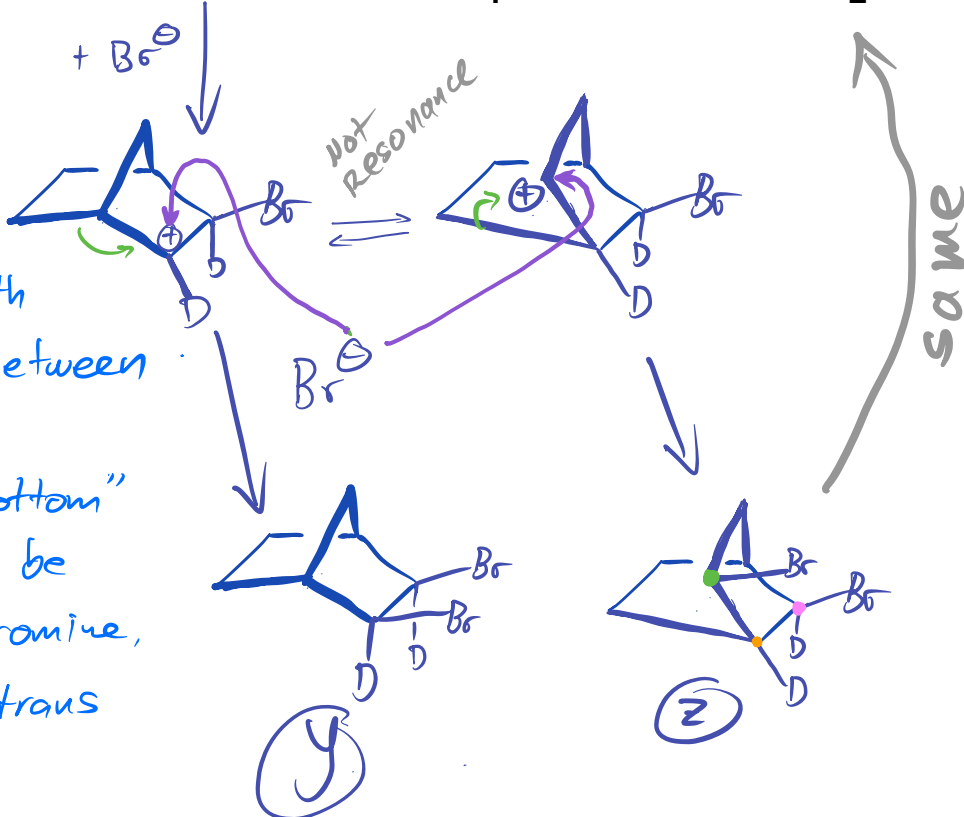


1c. 6 pts. We learned that bromination of alkenes occurs via a bromonium ion. In the box below, draw the structure of the expected product, **X**, resulting from the conventional mechanism. Unfortunately, norbornene is the one exception to the bromonium path that you will see in this class. Instead of obtaining compound **X**, we actually observe a mixture of compounds **Y** and **Z** (no bromonium ion formed). Draw a suitable mechanism for the formation of compounds **Y** and **Z**.

X. Expected product



This "equilibrium" leads to a delocalized carbocation that is prone to be attacked by a nucleophile on both sites. The equilibrium between both norbornyl carbocations effectively blocks the "bottom" site that would normally be attacked opposite to the bromine, which would lead to the trans product expected.



2. 8 pts. Draw the mechanism that accounts for the formation of the product below.

