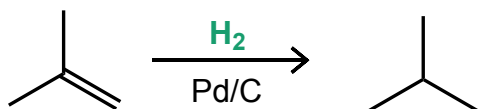


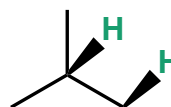
## Addition to Alkenes ( $\pi$ bonds)

As noted in the Additions Core Concepts, the mechanism of a reaction determines the selectivity observed in the product (Markovnikov vs. anti-Markovnikov regioselectivity or syn vs. anti stereospecificity of addition).

In some cases, primarily with linear (acyclic) alkenes, the selectivity is not apparent in the product. An example is given below:

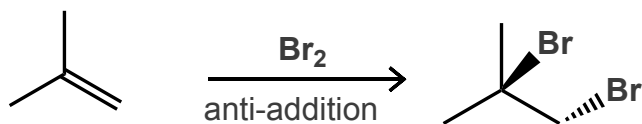


Some students may draw the product as:



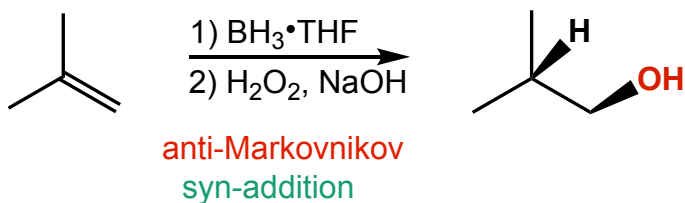
Although the structure above clearly shows a **syn addition**, this level of detail is not included in the line structure because 1) C—H bonds are not shown in line structures; 2) C—C single bonds can rotate freely, so the C—H bonds are not locked in place

1. Correct the product structures shown below, and explain why the new line structure you draw still indicates the correct selectivity observed in these reactions.



line structure

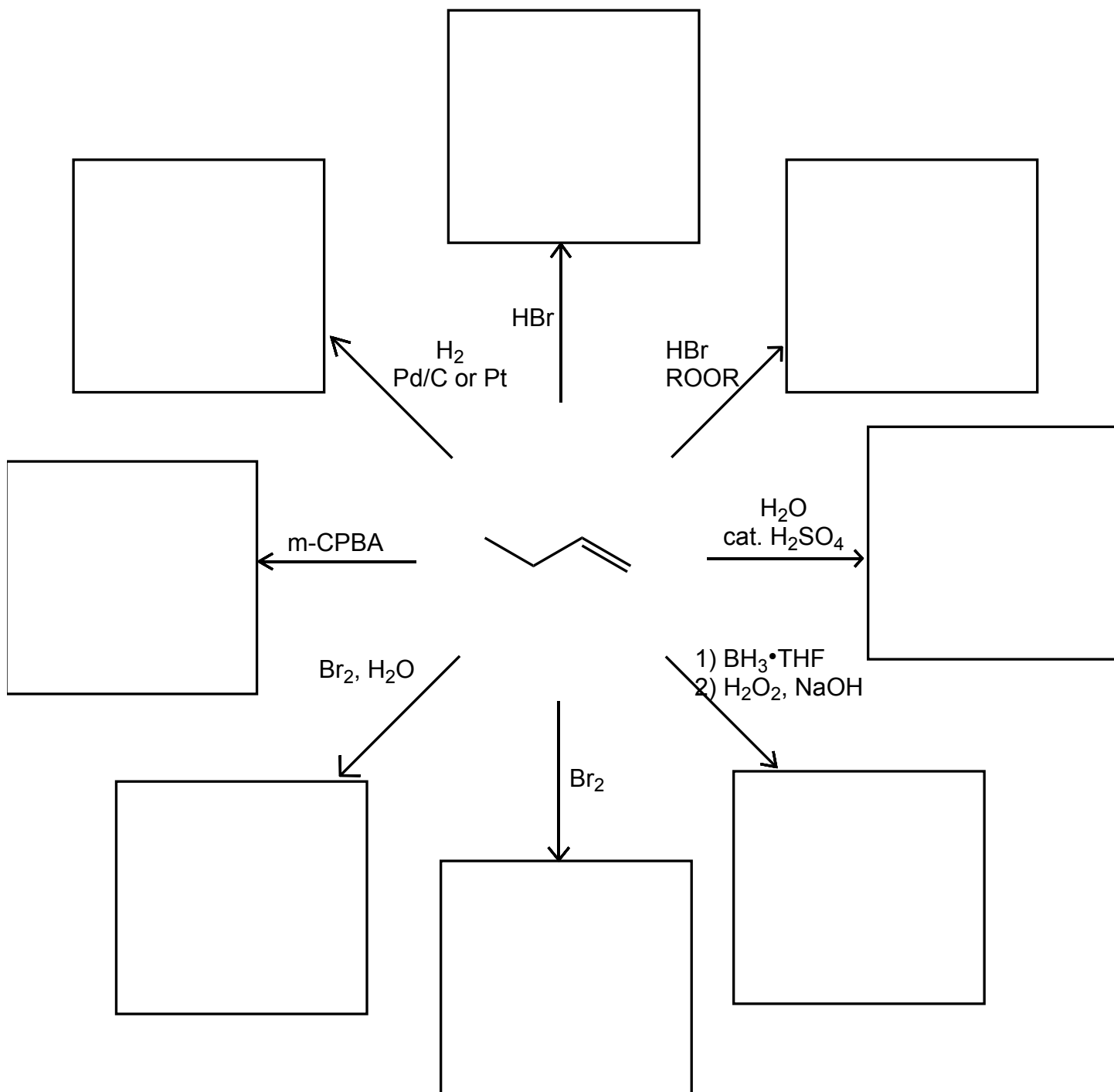
Explanation:



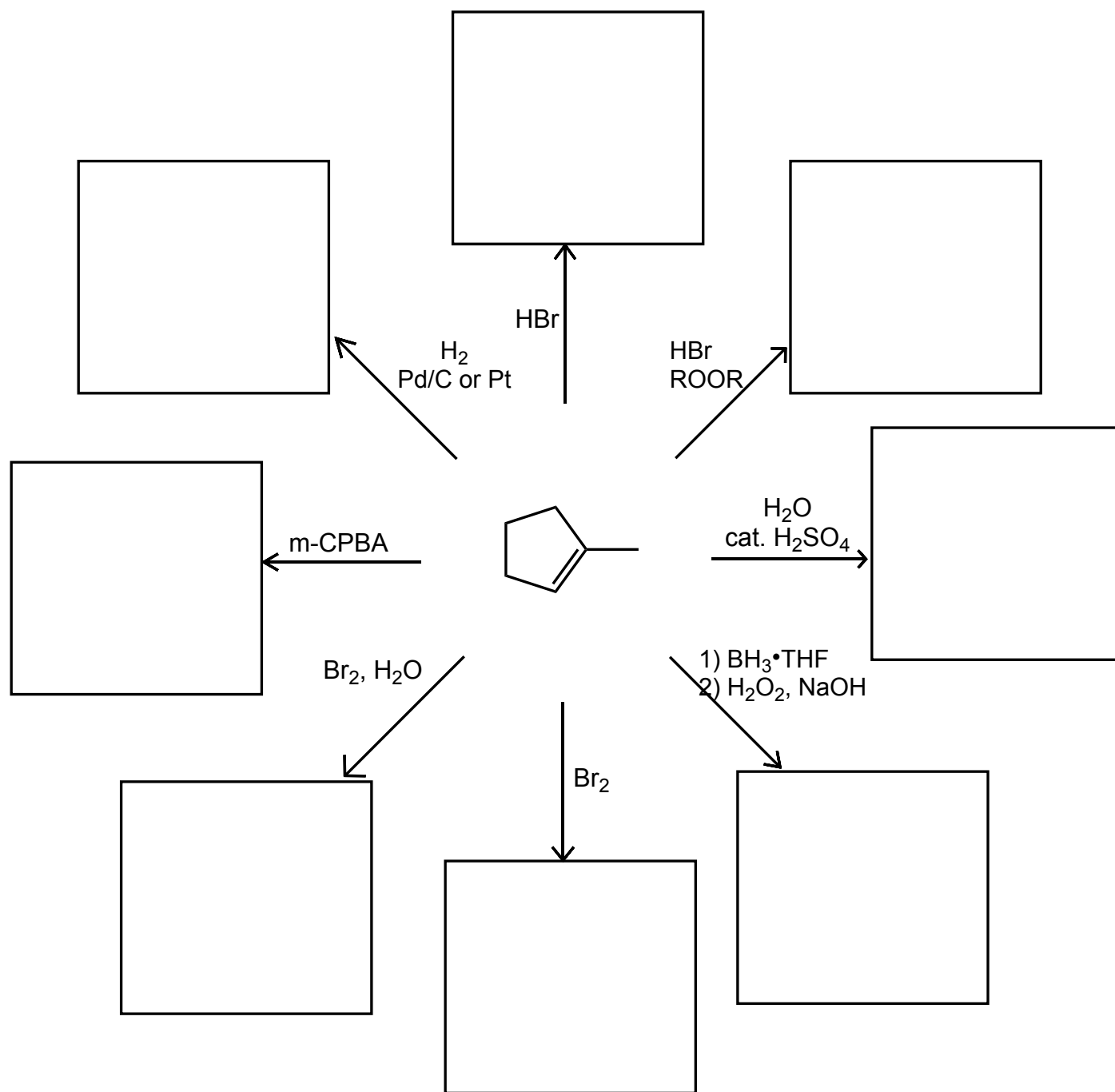
line structure

Explanation:

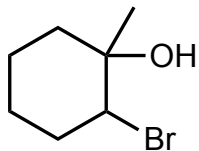
2. Reaction wheels are a great way to compartmentalize the multiple reactions that one specific functional group can undergo. What follows are two reaction wheels, one for an acyclic alkene, and one for a cyclic alkene. For these wheels, draw a line structure for the major organic product (using dash/wedge when necessary) and where appropriate, characterize the reactions using the terminology from the Additions Core Concepts (Markovnikov/anti-Mark.; syn/anti).



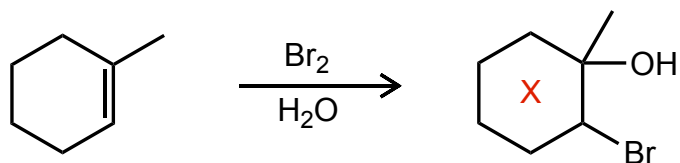
2. Reaction wheel (continued)



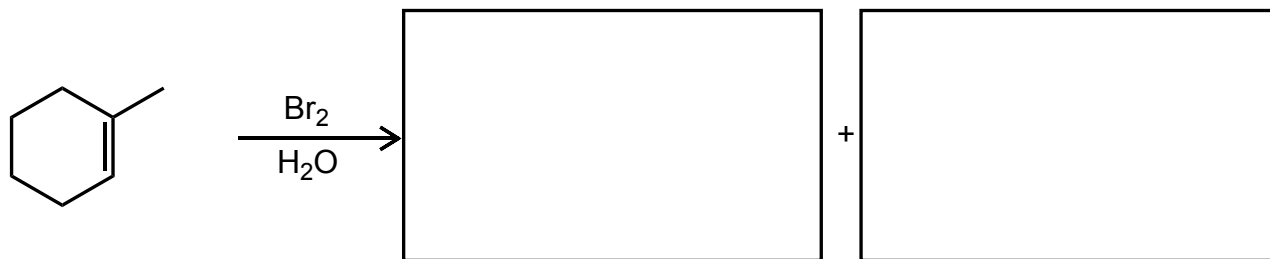
3. In the boxes provided, **draw the stereoisomers** that exist for the bromohydrin shown below.




4. A common mistake is to draw the product of the following reaction as shown below. From the stereoisomers you drew above, **draw the only two stereoisomers which can be formed from this reaction** in the boxes provided below. What is their relationship to each other (enantiomers or diastereomers)?

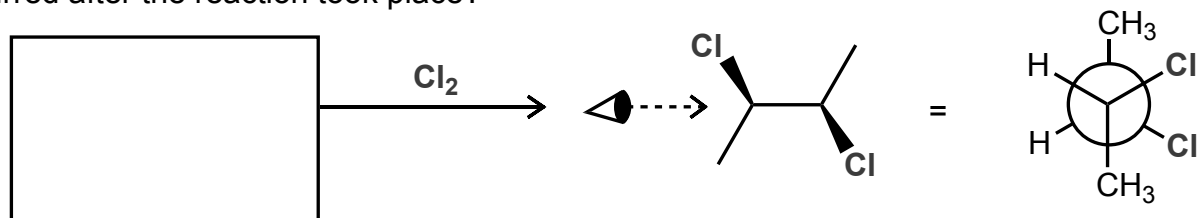


incorrect representation



enantiomers or diastereomers?

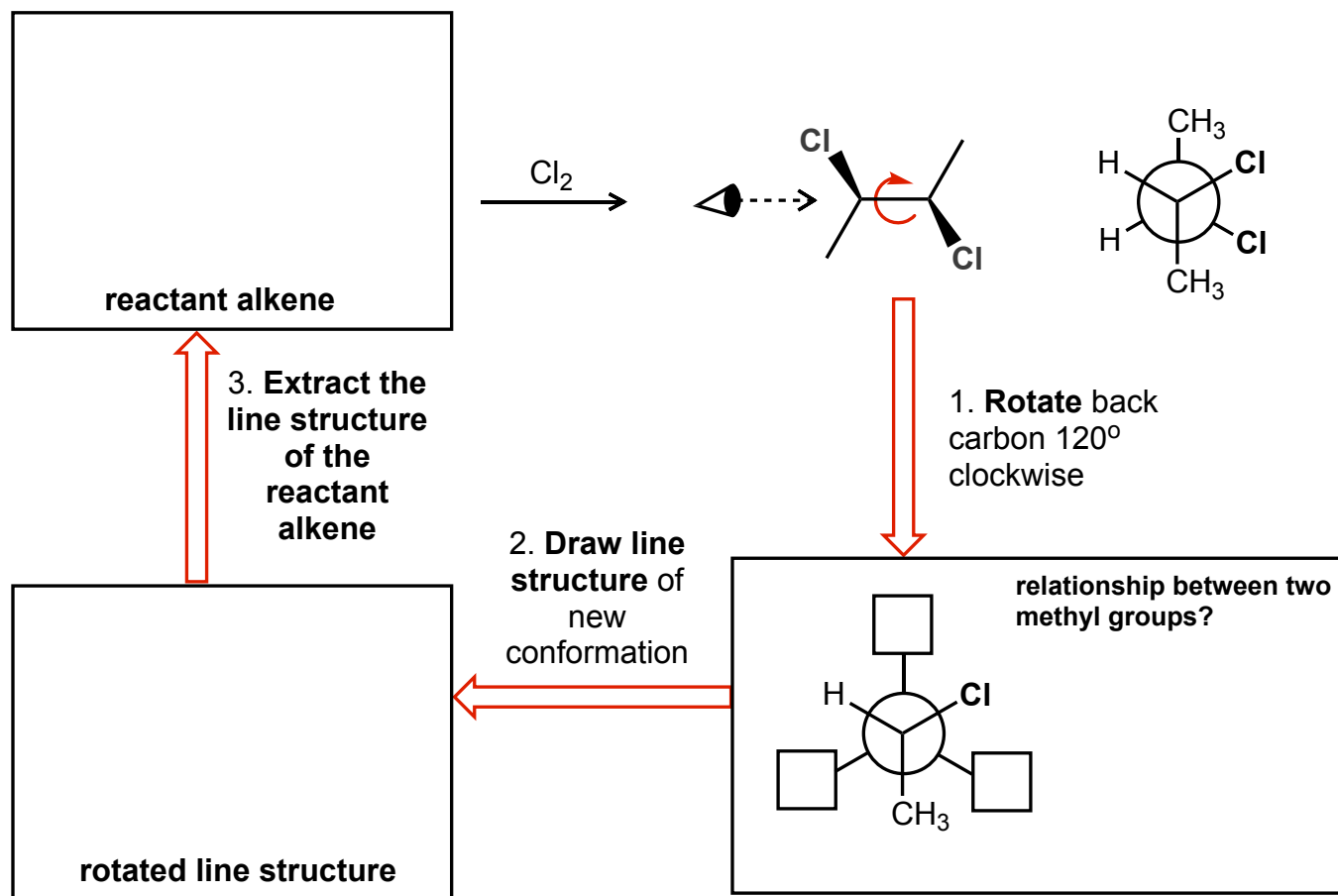
5. When determining the reactant used in an addition reaction, **bond rotation in the product must be considered**. As an example, consider the reaction shown below. Given the Newman projection shown on the right, how do you know that a bond rotation has occurred after the reaction took place?



**Explanation:**

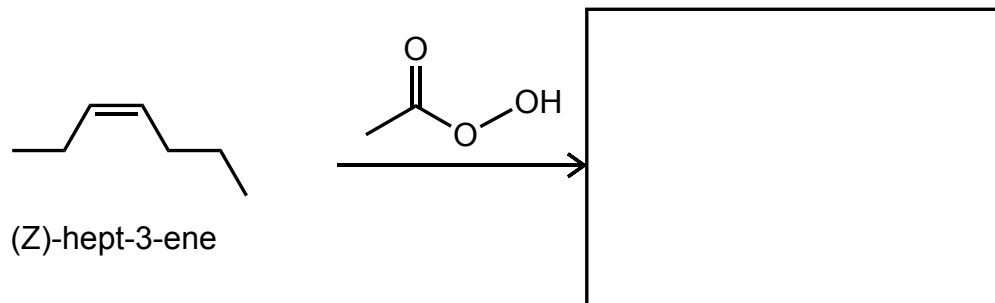
A. To answer this, 1) **rotate the Newman projection so that the Cl atoms are anti to one another**. Keeping in mind the stereochemistry shown, add in the missing groups on the back carbon after an appropriate bond rotation. Then 2) draw the rotated line structure of the product and 3) draw the reactant alkene in question.

**Make note of the new relationship between the methyl groups and with this information, predict the structure of the reactant alkene.**

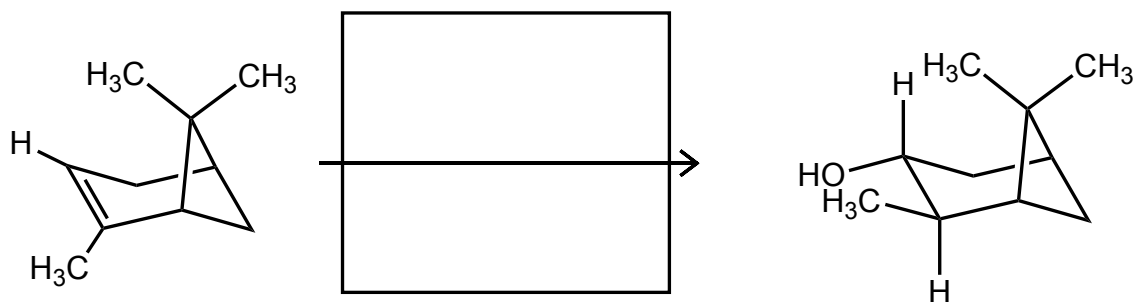


5. Provide the missing starting materials, reagents, or products of each reaction below.

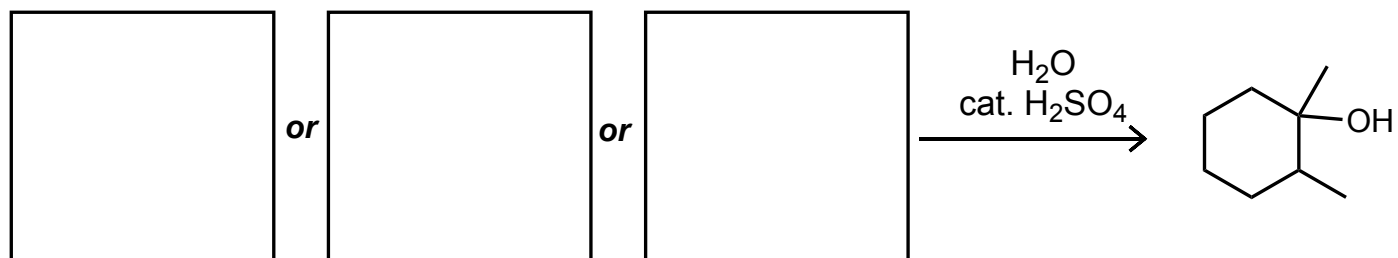
A.



B.

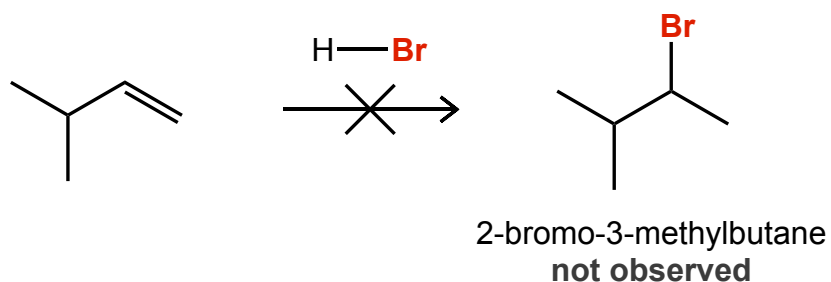


C. Three reactants are possible (without carbocation shifts). Provide their structures.



6. The addition of HX is an example of a stepwise mechanism that involves the formation of a carbocation.

A. By drawing the curved arrow mechanism, explain why 2-bromo-3-methylbutane is not formed as the major product. What product is formed?



B. Propose a reaction involving a constitutional isomer of the alkene above that would result in the formation of 2-bromo-3-methylbutane.

