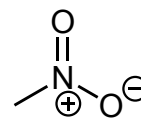
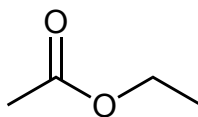
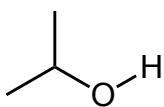




## Solvents in Organic Chemistry

1. **Classify** the following solvents as **polar protic**, **polar aprotic**, or **nonpolar**. Justify your selection.



2. For the species on the left, circle the most appropriate solvent from the choices on the right.

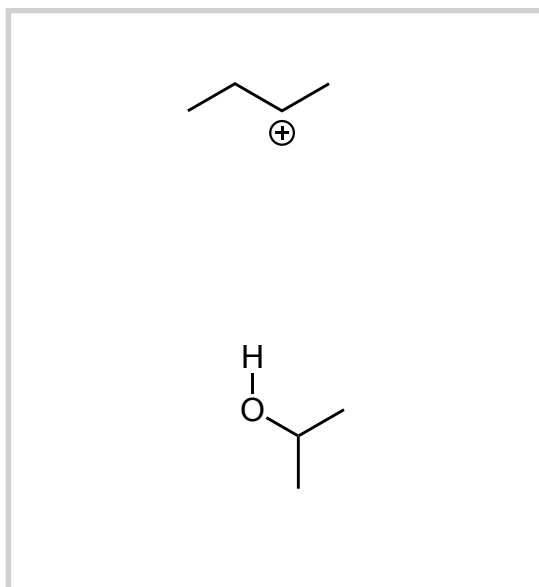
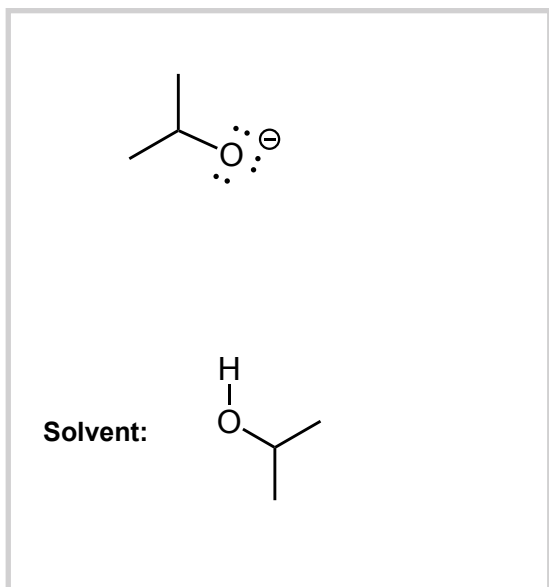
Solute(s)	Solvent choices	Explanation
A. 	hexane or <i>tert</i> -butanol	
B.  + $\text{Br}_2$	$\text{CH}_2\text{Cl}_2$ or water	

3. As described in the **Role of Solvents #4** in the **Solvent Core Concepts**, polar protic solvents can stabilize atoms with formal charges.

A. Show how two molecules of isopropyl alcohol solvent can orient and stabilize the alkoxide anion on the left.

B. Show how the same solvent can orient and stabilize the carbocation on the right.

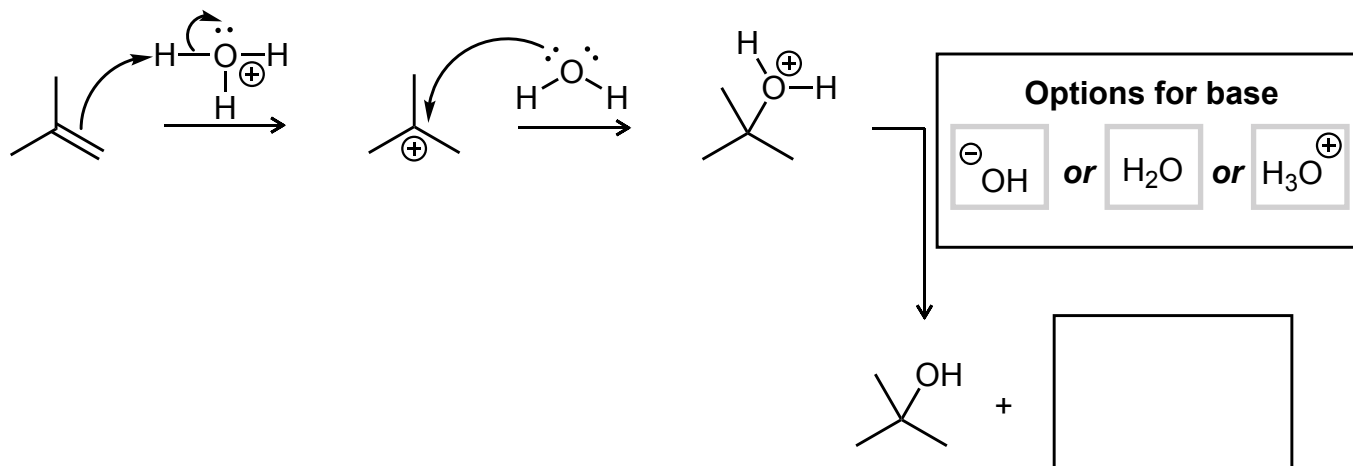
**Note:** Be sure to draw the O-H bond when orienting the solvent molecules. Dotted lines are generally used to show attractive interactions that are not true covalent bonds.



4. Shown below is a stepwise mechanism for the hydration of an alkene.

A. Why is  $\text{H}_3\text{O}^+$  being shown as the acid and not  $\text{H}_2\text{SO}_4$ ?

B. For the final mechanistic step, **select the appropriate base** from the three shown. Then **draw the mechanism for the last step of the reaction** and **provide the missing by-product**.



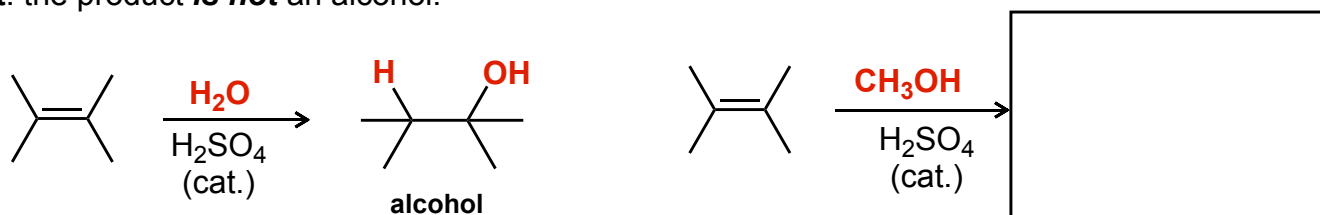
C. Why is  $\text{H}_3\text{O}^+$  (or rather  $\text{H}_2\text{SO}_4$ ) referred to as a **catalyst** in this reaction?

5. Water is not the only molecule that can act as a solvent **and** a reactant in a reaction. The hydration reaction from the Solvent Core Concepts is shown below.

A. Use this reaction as a guide to **draw the structure of the product** for the reaction on the right.

B. What **functional group** is generated?

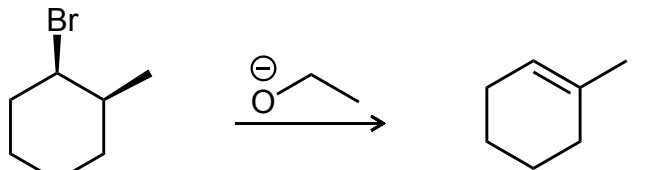
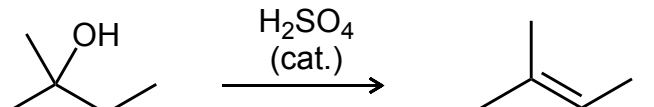
**Hint:** the product **is not** an alcohol.



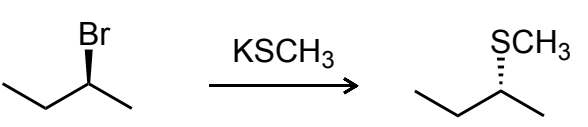
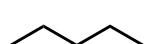
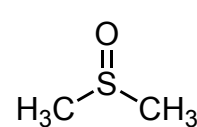
C. In the reaction on the left, *water* reacts with  $\text{H}_2\text{SO}_4$  in solution to create  $\text{H}_3\text{O}^+$ , which acts as the acid in solution. In the box provided below, **draw the structure of the acid** for the reaction on the right, considering that *methanol* reacts with  $\text{H}_2\text{SO}_4$ ?



6. In some situations, the solvent is not explicitly written, but is implied based on the reactants involved in the reaction. **Use context clues to identify the solvent (or a likely solvent choice) for the reactions shown below.**

Reaction	Solvent
<p>A. </p>	
<p>B. </p>	

7. An example of an  $S_N2$  reaction is shown below. **Answer the questions below** given the options of the solvents below.

Reaction	Solvent choices
	<p> <b>or</b> <math>\text{CH}_3\text{OH}</math> <b>or</b> </p>

a) Which solvent results in the fastest rate of reaction? Why? Describe the class of solvent in your answer.

b) Which solvent is not suitable for this reaction? Why? Describe the class of solvent in your answer.