
Alcohols & Ethers Worksheet
Part B

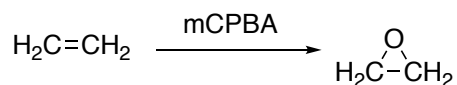
Name:

In the last worksheet we learned about the reactions and synthesis of alcohols and ethers but we're not quite done. There is a special type of ether called an oxirane or an epoxide, that has the ether oxygen between two carbons in a three-atom ring, like this simplest example.



Typically, oxirane are prepared by the treatment of alkenes with a special reagent used only for the purpose of making oxiranes. It's "code name" is mCPBA and whenever you see that you should immediately think "oxirane." It's not used for anything else.


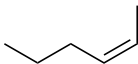
For example, the simplest case:



Write a reaction fact card that you can use to help remember this reaction.

Read section 11.13B – the reaction is called stereospecific. Explain what this means.

Write the oxirane products that would form when the following alkenes react with mCPBA

Ethers are generally fairly stable especially in the presence of nucleophile or bases . This is one reason that diethyl ether and THF are used as solvents in a number of reactions. A substance isn't really a solvent if it is likely to react!

There are some situations in which ethers will react. One is when treated with strong acid. They will undergo a reaction called *ether cleavage*. Read about it in section 11.12A.

Draw the *mechanism* that occurs in example 11.16a on page 513.

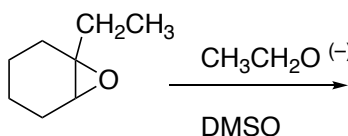
Try problem 11.18 on page 514. It covers a lot of important concepts!

Create a reaction fact card for ether cleavage.

The cleavage reaction is usually not a preferred way to make alkyl halides. Why not?

Epoxides are an exception to ether stability; unlike most ethers, they react easily with bases. What is it about an epoxide that makes it especially reactive?

Show what happens when this epoxide reacts with ethoxide ions in DMSO.



- Draw arrows to the *two carbons* to which a nucleophile would be attracted.
- Consider which of those carbons is the *most likely* to react and draw the product.

Things change dramatically, if we perform the same reaction in ethanol to which a drop of sulfuric acid has been added. In that case the first step in the mechanism is a fast acid/base reaction as an H ion attaches to one of the atoms in the starting material. Which one?

After that atom is protonated it becomes a cation and strongly pulls electrons from its neighbors forming partials positive charge. One of the atoms in the structure has more positive charge than the others not including the oxygen). Which one and why is it more positive than its neighbors?

Draw the product that would form after the weak nucleophile, methanol, attaches to the more positive atom.

Compare the products – how are they related to one another?

Read section 11.15. Fill in the missing reactants and reagents or products to complete the following transformations.

