

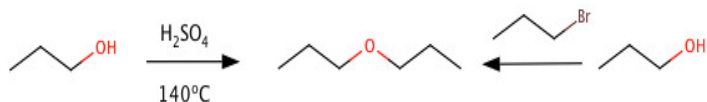
Chem 12B Objective 3. Apply substitution and elimination concepts to ethers and epoxides.

1. An ether can behave like a base. What is the pK_a of the conjugate acid of an ether? Is the conjugate acid a strong acid or weak acid?

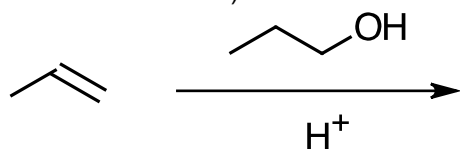
2. a. ROH is a poor leaving group. It can be made into a better leaving group by ____.

b. ROR is a poor leaving group. It can be made into a better leaving group by ____.

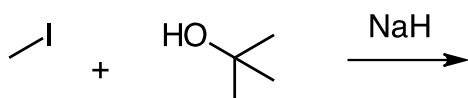
3. Show the mechanism of each reaction. Identify the nucleophile and electrophile in each step. Use curved arrows to show bonds breaking and forming. Draw intermediate structures as needed.



4. Predict the product of the reaction. Identify the nucleophile and electrophile in each step. Use curved arrows to show bonds breaking and forming. Draw intermediate structures as needed. (Hint: react the alkene with H^+ first.)



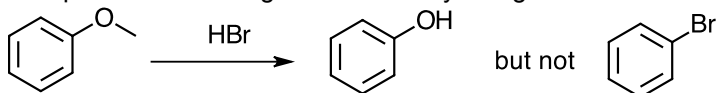
5. a. Predict the product of the reaction. Identify the nucleophile and electrophile in each step. Use curved arrows to show bonds breaking and forming. NaH is sodium hydride. Hydride = H^- . Is hydride a nucleophile or electrophile.



b. Propose a synthesis of the ether. Hint: there are at least two ways to accomplish this synthesis. Identify the functional groups that can form an ether.

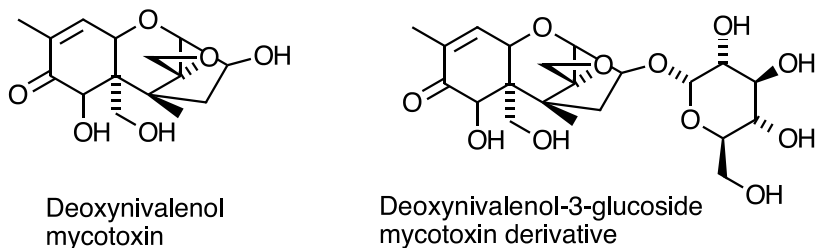


6. Explain the following observation by using curved arrows to show how bonds break and form.



7. CEN, 2/11/13 "Gut Bacteria Free Hidden Toxins", p. 9

Fungal toxins (mycotoxins) cause ailments from diarrhea to cancer. Plants modify these toxins to protect themselves, e.g., add a sugar or sulfate group, ==> "masked" mycotoxin derivative. Gut bacteria converts masked derivative to toxin.

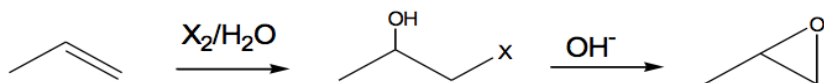


a. Show how Deoxynivalenol reacts with glucose to form Deoxynivalenol-3-glucoside.

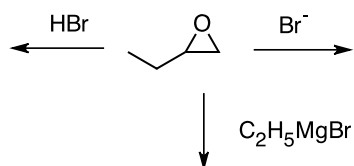
b. Show how Deoxynivalenol-3-glucoside is converted to Deoxynivalenol.

8. Epoxides are more reactive and much more useful in organic synthesis than ethers. Identify the nucleophile and electrophile in each step. Use curved arrows to show bonds breaking and forming.

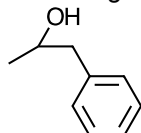
a.



b. Predict the product of each reaction. Use curved arrows to show bonds breaking and forming.



c. Starting from an epoxide and a Grignard reagent, show how to make this compound.



d. Ethylene oxide and propylene oxide (the two simplest epoxides) are used to make ethylene glycol (used in antifreeze), polyethylene glycol (PEG, many applications from medicine (as a laxative) to skin creams (as a lubricant) to industrial uses), and polyether polyols (used to make polyurethane plastics and epoxy resins). If interested, use as your Biology or Industrial Reaction Application project.

9. Predict the product or propose a synthesis. In the 3rd reaction, Mg is another reactant. Use curved arrows to show bonds breaking and forming.

