

9.6: OXIDATIVE CLEAVAGE OF ALKYNES

OBJECTIVES

After completing this section, you should be able to

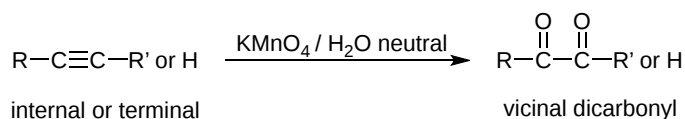
- write an equation to represent the oxidative cleavage of an alkyne with potassium permanganate or ozone.
- identify the products that result from the oxidative cleavage of a given alkyne.
- identify the reagents needed to carry out the oxidative cleavage of an alkyne.
- use the results of an oxidative cleavage to determine the identity of an alkyne of unknown structure.

STUDY NOTES

Compare the oxidative cleavage of alkynes with the oxidative cleavage of alkenes, discussed in Section 8.8.

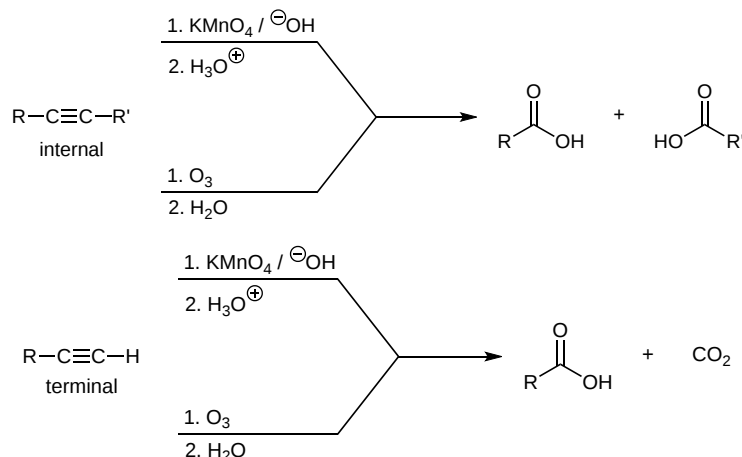
Alkynes, similar to alkenes, can be oxidized gently or strongly depending on the reaction environment. Since alkynes are less stable than alkenes, the reaction conditions can be gentler. For example, alkynes form vicinal dicarbonyls in neutral permanganate solution.

Gentle Alkyne Oxidation



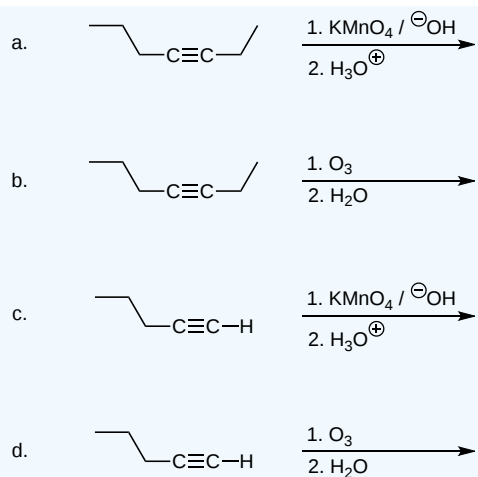
Strong Alkyne Oxidation - Oxidative Cleavage

During strong oxidation with ozone or basic potassium permanganate, the alkyne is cleaved into two products. Because at least one of the reaction products is a carboxylic acid, it is important to consider the acid-base chemistry of the product in the reaction solution. Carboxylic acids are deprotonated in basic solutions to carboxylates. A second reaction step is required to protonate the carboxylate to the neutral form of the carboxylic acid.

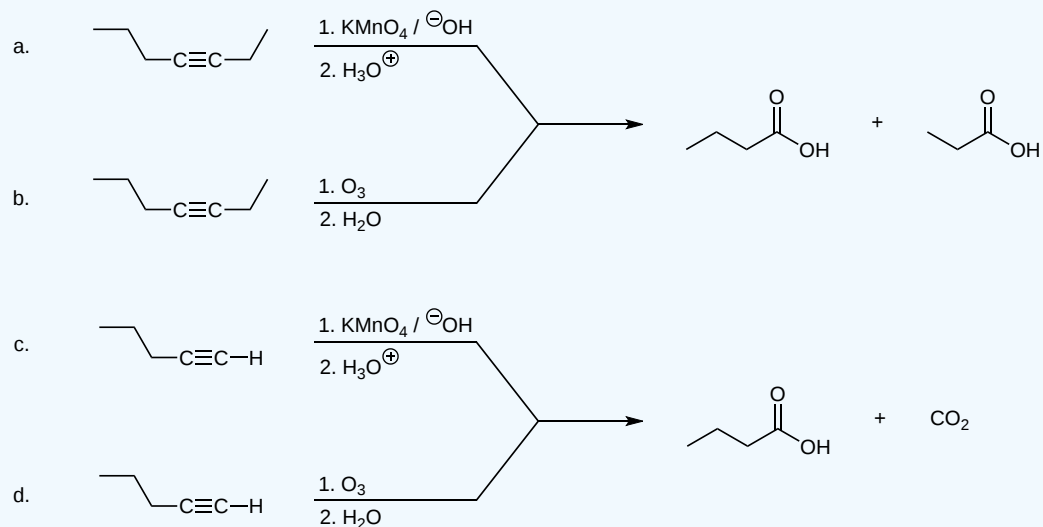


? EXERCISE 9.6.1

Draw the bond-line structures for the product(s) of the following reactions.



Answer



Oxidative cleavage of alkynes produces carboxylic acids and/or carbon dioxide. Aldehydes are not produced.

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