14.0: INTRODUCTION

OBJECTIVE

After completing this section, you should be able to determine whether or not a molecule contains a conjugated system, given its Kekulé, condensed or shorthand formula.

KEY TERMS

Make certain that you can define, and use in context, the key terms below.

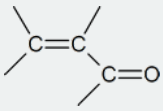
- conjugated diene
- conjugated double bonds
- diene
- enone
- polyene

STUDY NOTES

Conjugated double bonds are double bonds which are separated by one carbon-carbon single bond. Thus the double bonds in butadiene, $\ce{\sf{CH2=CH-CH=CH2}}$, are conjugated, and this compound is an example of a *conjugated diene*.

Just as the term *diene*indicates the presence of two carbon-carbon double bonds in a compound, so the term *polyene* is used to describe compounds containing many carbon-carbon double bonds.

An *enone* is a compound containing a carbon-carbon double bond (ene) and a carbonyl group (one). A conjugated enone contains the structural unit:



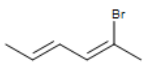
CONJUGATED DIENES

A diene is a hydrocarbon chain that has two double bonds that may or may not be adjacent to each other. This section focuses on the delocalization of π systems by comparing two neighboring double bonds. The arrangements of these double bonds can have varying affects on the compounds reactivity and stability.

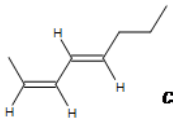
NAMING DIENES

First identify the longest chain containing both carbons with double bonds in the compound. Then give the lowest possible number for the location of the carbons with double bonds and any other functional groups present (remember when naming alkenes that some groups take priority such as alcohols). Do not forget stereochemistry or any other orientation of the double bond such as (E/Z,cis or trans).

Examples:

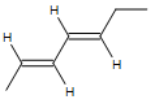


2-Bromo-2,4-hexadiene



***cis*-2-*trans*-4-octadiene**

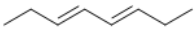
1,3-cyclopentadiene



***trans*-2,4-heptadiene**

CONJUGATED VS. NONCONJUGATED VS. CUMULATED DIENES

Conjugated dienes are two double bonds separated by a single bond

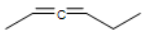


3,5-octadiene

Nonconjugated (Isolated) dienes are two double bonds are separated by more than one single bond.

2,5-heptadiene

Cumulated dienes (allenes) are two double bond connected to a carbon atom.



2,3-hexadiene

The reactivity of these molecules is substantially different from that of alkenes which have isolated C=C. These molecules are thus considered a different class of organic molecule. Conjugated dienes, especially butadiene, are very important materials in the production of rubber, and thus for the tires of our cars.
