

Chapter 2

Understanding a 5th Step of IUPAC

Nomenclature:

Describe Stereochemistry

Key Concepts

When a carbon has **FOUR DIFFERENT GROUPS** attached to it, its specific stereochemistry is described as either **R OR S**.

If an **ALKENE** has **TWO DIFFERENT GROUPS ATTACHED TO EACH VINYLIC CARBON**, its stereochemistry is described as **E OR Z**.

In these two cases, the appropriate label is determined after assigning priorities to the atoms directly attached to the chiral carbon or to each vinylic carbon. **PRIORITIES ARE BASED ON ATOMIC NUMBER**. A higher atomic number means a higher priority (#1). If a tie needs to be broken, the next layer of atoms is assessed.

To assign a stereochemistry designation of R or S, the number 4 priority atom or group must be in the back. For a **PERSPECTIVE FORMULA**, it means the number 4 priority must be on a **HATCHED LINE**. For a **FISCHER PROJECTION**, it must be on a **VERTICAL LINE**. If a number 4 priority must be moved to the required location, the stereochemistry label must also be changed when it is moved back to the original position.

An alkene has an **E** stereochemistry if the #1 priority atoms or groups are on **EPPOSITE** sides of the plane running through the pi bond. The alkene is said to have a **Z** configuration if the #1 priority atoms or groups are on the **ZAME ZIDE** of that plane.

In a few very specific cases, the stereochemistry of **CYCLIC COMPOUNDS** or of **ALKENES** can alternately be described as **CIS OR TRANS**.

ENANTIOMERS are enamored with each other (**NON-SUPERIMPOSABLE MIRROR IMAGES**). **DIASTERIOMERS** are disasters (**NON-SUPERIMPOSABLE, BUT NOT MIRROR IMAGES**).

What You Need to Learn, Understand, and Apply

1. How to define and recognize chirality.
2. How to interpret perspective formulas and Fischer projections.
3. How to interpret and appropriately assign the stereochemistry designations R and S.
4. How to define and recognize meso, threo, and erythro structures.
5. How to define and recognize prochirality.
6. How to assign and interpret the designations Pro-R, Pro-S, H_a, and H_b.

7. When the designations *cis* and *trans* can be assigned to alkenes and how to interpret those designations.
8. How to interpret and assign the designations E and Z to alkenes.
9. How to interpret and assign the designations *cis* and *trans* to cyclic compounds.
10. How to define and recognize enantiomer and diastereomer pairs.
11. When to apply R/S, *cis/trans*, or E/Z designations.
12. How to include information about stereochemistry in the IUPAC name of a compound.
13. The skills needed to apply the material and to avoid common errors.