

Activity 19: Stereoisomers and Chiral Centers

Learning Objectives

Part 1 *Distinguish between cis–trans isomers and the same molecule*

Part 2 *Identify chiral and achiral objects*

Identify chiral centers in a molecule

Estimated Completion Time 90 Minutes

Instructor Information

The activity will require model kits (one per group). It is important that the instructor ask each group which enantiomer of glyceraldehyde they built so that all students have the ability to “see” the difference between two enantiomers in three dimensions, even though they may at first appear the same on paper. If you have a large class, visiting every group may not be possible, so showing samples on a PowerPoint slide after all the groups have built an enantiomer can be done.

ANSWERS TO QUESTIONS

Part 1. Cis–Trans Stereoisomers

- Cycloalkane cis-isomers have the substituents on the same side of the ring, while the trans-isomers have the substituents on opposite sides of the cycloalkane ring.
 - Alkene cis-isomers have the substituents on the same side of the alkene double bond, while the trans-isomers have the substituents on opposite sides of the alkene double bond.
- Cis–trans isomers have the same name, except for the word cis or trans at the beginning of the name.
- Yes
 - No
 - No
 - No
 - Yes
 - No
- Stereoisomers have the carbons connected in the same way with different spatial arrangements, whereas structural isomers have the carbons connected differently.

Part 2. Chiral Objects and Chiral Centers

Chiral Objects

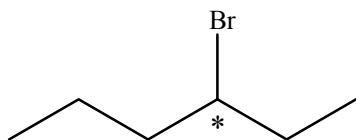
1. The glasses are identical as three-dimensional objects.
2. The two sneakers are mirror images of each other.
3. Answers will vary.

Chiral Centers

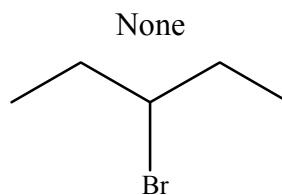
During the Activity, students will build either D- or L-glyceraldehyde with models and compare their model to that of another group to see a pair of enantiomers.

1. The horizontal groups are in front of the plane of the paper; the vertical groups are behind the plane of the paper.
2. The central carbon should be asterisked.
3. Wedge
4. Dash
- 5.

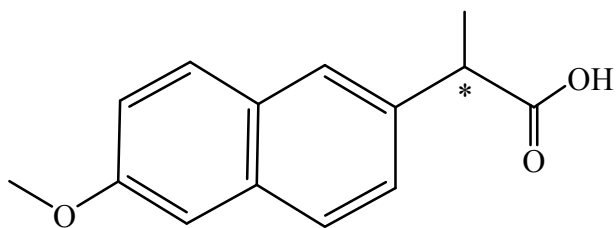
a.



b.

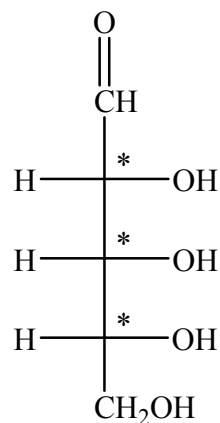


c.



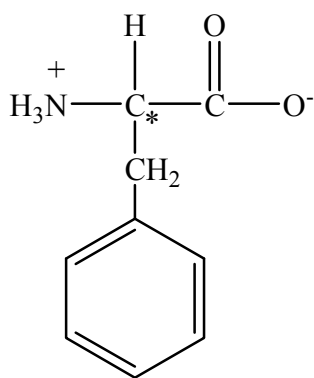
Naproxen (Aleve, Naprosyn)
An anti-inflammatory

d.



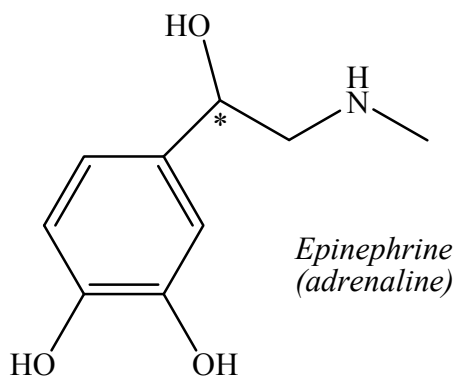
D-Ribose

e.



Phenylalanine
An amino acid

f.

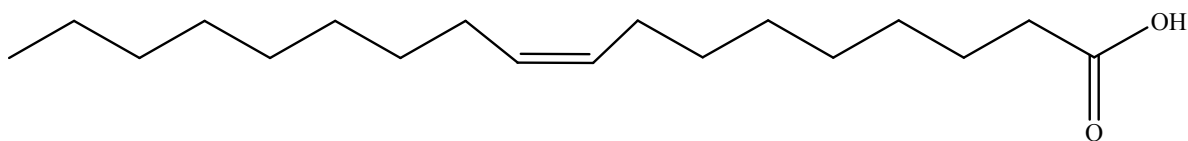


Epinephrine
(adrenaline)

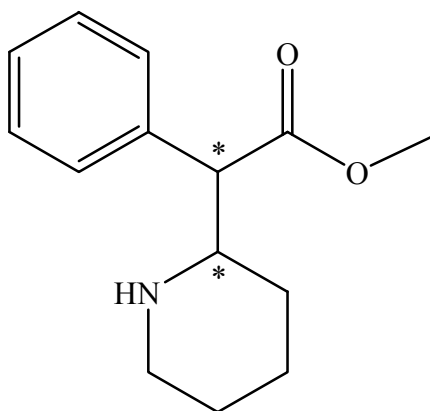
Activity 19: Skill Development—Chiral Objects and Chiral Centers

1.

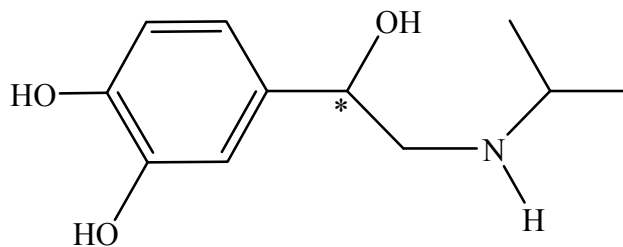
None



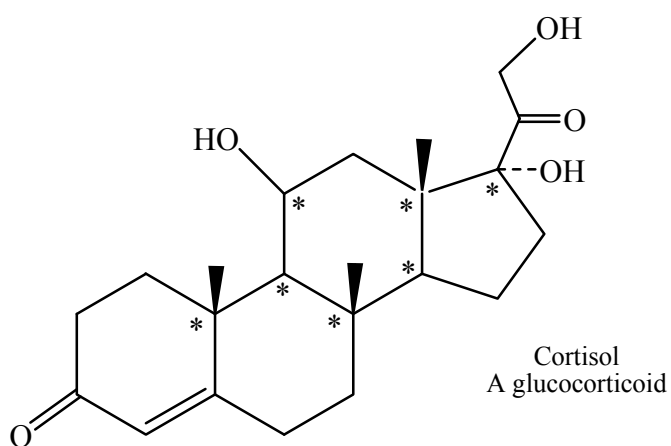
Oleic acid, a fatty acid



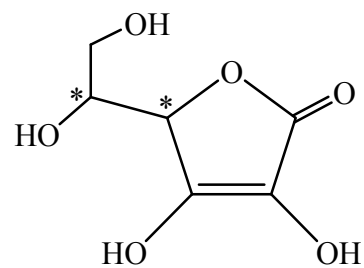
Ritalin
Used to treat ADHD



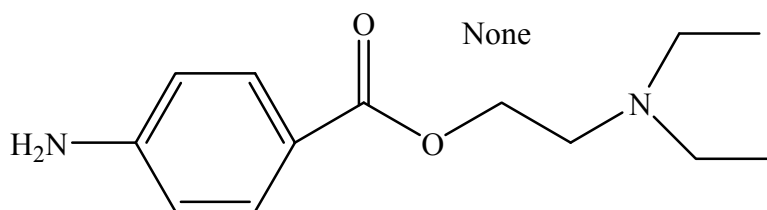
Isoproterenol, a bronchodilator



Cortisol
A glucocorticoid



Vitamin C



Novocaine
A local anesthetic