
   ![Lewis structure](image1)
   ![Perspective structure](image2)
   ![Newman projection](image3)
   ![Rotate front C clockwise](image4)

2. Draw conformational isomers using Newman projections for each of the following. Which is the most stable conformer?
   a. butane (rotate along C₁-C₂ bond)

   ![Antiperiplanar](image5)
   ![Gauche](image6)
   ![Gauche with bulky groups eclipsed](image7)
   anti > gauche > gauche w/bulky groups eclipsed

   b. 1-bromopentane (rotate along C₁-C₂ bond)

   ![Antiperiplanar](image8)
   ![Gauche](image9)

   c. 2-chloro-3-methylpentane (rotate along C₂-C₃ bond)

   ![Antiperiplanar](image10)
   ![Gauche](image11)
3. Draw the chair conformers and determine relative stability for each of the following.
   a. *cis*-1,2-dimethylcyclohexane
   
   ![cis-1,2-dimethylcyclohexane](image)

   equally stable

   b. *cis*-1,3-dibromocyclohexane
   
   ![cis-1,3-dibromocyclohexane](image)

   first more stable

   c. *trans*-1-chloro-3-isopropylcyclohexane
   
   ![trans-1-chloro-3-isopropylcyclohexane](image)

   first more stable

4. Draw the following using Kekule-Lewis structures. They should all contain what feature? **All end in –ene so should have a double bond**
   a. 2-methyl-3-ethyl-2-hexene
   
   ![2-methyl-3-ethyl-2-hexene](image)

   b. 3-bromo-1-tert-butylcyclopentene
   
   ![3-bromo-1-tert-butylcyclopentene](image)

   c. *cis*-3-heptene
   
   ![cis-3-heptene](image)
d. *trans*-3-chloro-3-hexene

![cis-3-heptene](image)

![trans-3-chloro-3-hexene](image)

e. (Z)-1-bromo-2-methyl-1-butene

![Z-1-bromo-2-methyl-1-butene](image)

f. (E)-3-isopropyl-1,3-pentadiene

![E-3-isopropyl-1,3-pentadiene](image)

Additional Information:

**Lewis Structures or Kekule-Lewis structures**
See handout on Lewis structures and be sure to draw molecular geometry and include all lone pairs.

**Perspective Structures**
Used to indicate 3-dimensionality of molecules/represent molecular geometry
- Wedged line (\_\_\_\_\_): bond coming out-of-page/towards viewer
- Hashed line (\_\_\_\_\_): bond going in-to-page/away from viewer
- Solid line (\_\_\_\_\_): bond in-page/in plane of paper

**Newman Projection**
Used to look at rotation in a molecule along a specific C-C bond
- Front C is the intersection of 3 lines (bonds, sp³) and back C is a circle w/3 lines radiating from it (bonds, sp³).

![Staggered Newman Projection](image)

![Eclipsed Newman Projection](image)

Eclipsed (subs on front and back C are overlapping, shown here at slight angle for clarity)
EX. Draw Newman projections for the following

a. 

b. 

c. 

Cyclohexane

**Chair Conformations** (pg. 107)

Steps to draw them

1. Draw 2 parallel lines of the same length slanting right.

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   /   
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2. Connect the tops w/ a V that has a longer left side.

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   /   
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3. Connect the bottoms w/ a ^ that has a longer right side.

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   /   
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4. Place axial bonds vertically starting on the C on the upper right up, down, up, down, clockwise/counter-clockwise (or starting on lower left C down, up, down clockwise/counter-clockwise). *Hs not shown for simplicity.

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5. Place **equatorial bonds** pointing outward from ring on a slant (if axial is up – slant down; if axial is down – slant down). Equatorial bonds should be parallel to two ring bonds. *Hs not shown for simplicity.
To flip…
1. Reverse angle of 2 parallel lines (slant left) and long sides of the V and ^

2. Flip axial (and equatorial) bonds (same relative positions, but substituents that were axial are now equatorial and vice versa). *Hs not shown for simplicity.

Boat Conformations (pg. 109)
1. Draw 2 parallel lines horizontally, the top one shorter and centered relative to the bottom one.

2. Connect both ends with an ^ longer on the front side (Hs are not axial or equatorial and are not shown for simplicity).

Fig. 2.10 pg shows all conformers and relative Es for cyclohexane.

EX. Draw chair conformers for …
Fischer Projections

Helpful for drawing structures w/ stereocenters. Horizontal lines represent bonds coming out of the plane of the paper & vertical lines represent bonds going into the paper (away from viewer).

More important to be able to interpret Fischer projections and be able to assign R,S configurations.