Report Sheet: Molecular Models — CHEM 110

CAPILANO UNIVERSITY
Department of Chemistry

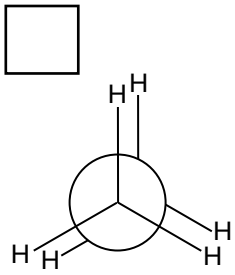
LAST NAME: _____ SEC # _____ LOCKER # _____

FIRST NAME: _____

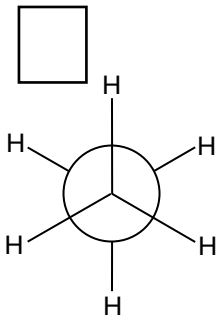
- **Go to the website** **www.molview.org**
- **At the search window in the upper-left**, enter in the **compound name** for questions below. *In all cases, you can just copy/paste the name directly from this PDF file into the website.*
- Rotate the 3D model onscreen if necessary. Answer the **questions** on the report sheet. All blue-purple shaded boxes are places to write answers or checkmark (☑) choices.

Part 1 – Bond Rotation and Conformers

1. **Ethane** *Select the **correct name** for each conformation. **Check (☑)** the conformation of lower energy. **Which conformation** did the website generate?* _____



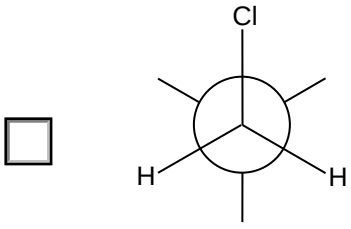
select your answer:
- gauche
- eclipsed
- staggered
- anti



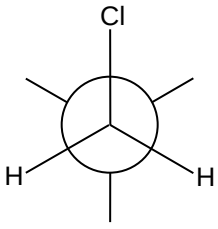
select your answer:
- gauche
- eclipsed
- staggered
- anti

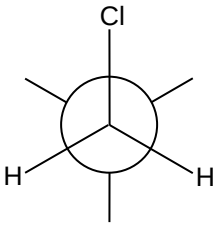
2. **1,2-Dichloroethane**

*Complete the three Newman projections for the staggered conformations by **writing in the second chlorine atoms** in the correct spot. **Check (☑) the conformation** of lower energy.*



anti



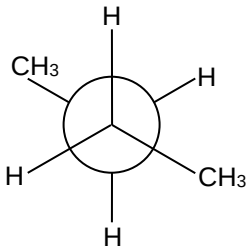


gauche

*Which conformation did the website generate, **anti or gauche**?* _____

***What colour spheres** did the website use to represent chlorine atoms?* _____

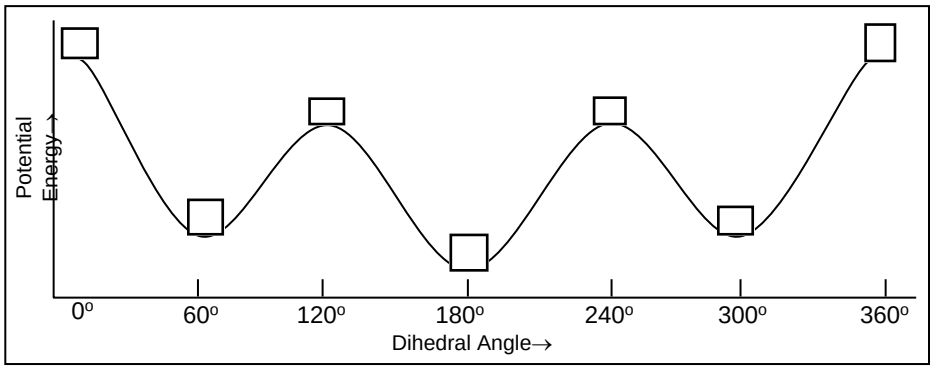
3. **Butane** *The website generates a specific conformer. Rotate the 3D model to look straight down the C-C bond between carbon 2 and 3, as shown in the diagram below. Fill out the blank with the* ***correct name for this conformation****. The four choices are:*



- anti
- gauche
- eclipsed
- staggered

Conformation is: _____

Check (☑) the position*(s) where the above conformation would be on this energy curve:*

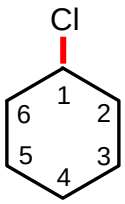


5. **Cyclohexane** *Rotate the 3D model online.*
Is this the ***boat or chair*** *conformation?* _____

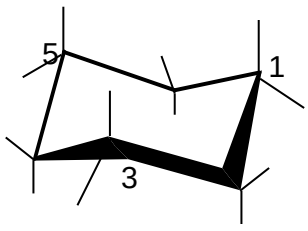
6. *Now rotate the 3D model online so that 3 hydrogens are pointing up in axial positions and 3 hydrogens are pointing axially down. Notice how they are located around the carbon-ring in alternating up-down positions. This is due to the sp3 hybridization. In a similar manner, you should see 6 hydogrens located in equatorial positions around the ring, alternating up and down.*

7. **Chlorocyclohexane** *The website will show the top-down diagram given below at left. Rotate the model into an edge-on position, with the chlorine-atom* ***above*** *the plane of the carbon ring.* ***Show on the edge-on diagram*** *where the chlorine is located.*

Is this an ***axial or equatorial*** *postion?* _____



website's top-down



edge-on

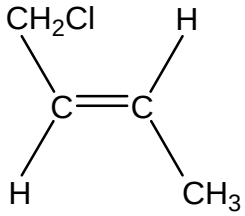
*For the top-down diagram, should the website use a "****dash" or "wedge****" to show the correct spatial-orientation of the C-Cl bond (shown in red here):*

_____

Part 2 – Geometrical Isomerism

1. ***Check* (☑) *the correct name*** *of the compound drawn below. You can use the website if you want, but it is not required here.*

☐ **1-chloro-*cis*-2-butene** ☐ **1-chloro-*trans*-2-butene**

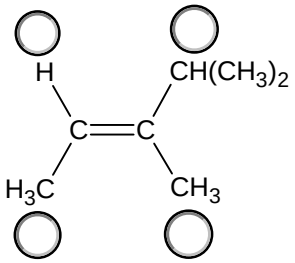


*Specify the configuration (**E or Z**) of the compound: _____*

*Is it possible to convert this to the other isomer without breaking any bonds? (**yes or no**) _____*

3. ***Check* (☑)** *whether the geometry of each alkene is E or Z. **First**, determine which group (or atom) on each C of the double bond has the higher priority. Show this by **clicking on 2 of the 4 round buttons** for **each** molecule. If you want to use the website, the names are given in blue.*

2-isopropyl-2-butene

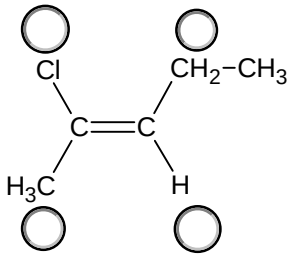


☐ ***E***

or

☐ ***Z***

2-chloro-2-pentene

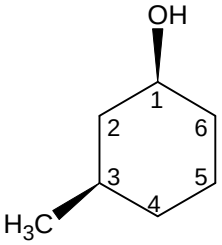


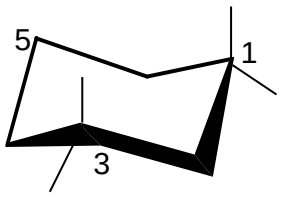
☐ ***E***

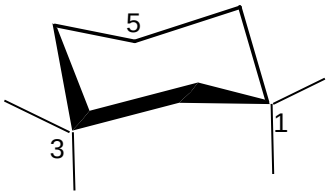
or

☐ ***Z***

5. ***cis*-3-methylcyclohexanol** *The diagram at left below matches the website. Complete the two chair conformations, **showing the position of the hydroxyl and methyl groups only**. Do **not** include the hydrogens. Are the groups in **axial or equatorial** positions? **Fill in the blanks**.*







-OH and -CH_3 located in: _____ positions _____ positions

axial or equatorial *axial or equatorial*

Part 3 – Optical Isomerism

1. **Bromochloromethane** CH_2ClBr

*Does the online model have a plane of symmetry? (**yes or no**)* _____

*Would a second molecule of CH_2ClBr be superimposable on the first? (**yes or no**)* _____

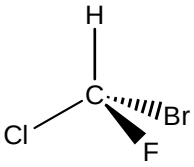
*Is CH_2ClBr **chiral or achiral**?* _____

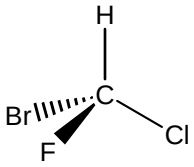
2. **Bromochlorofluoromethane** CHClBrF

The online model will likely be positioned with the C-H bond going behind the screen, and the Br, Cl, and F atoms coming towards the viewer.

*Is the online model showing the **R or S enantiomer**?* _____

***Check (☑)** which one diagram shown below matches the online model:*

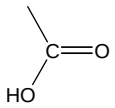
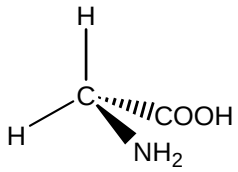
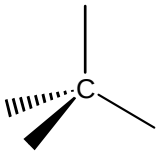
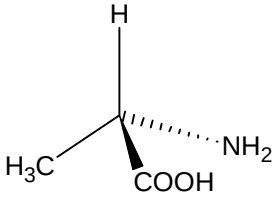
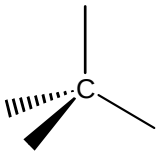
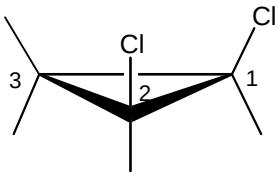
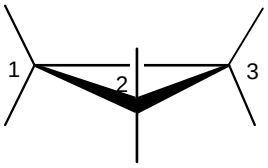
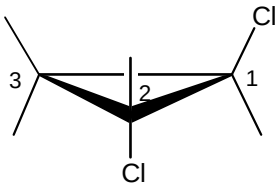
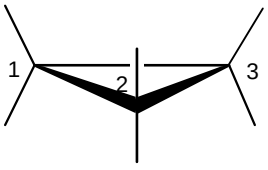
☐ 

☐ 

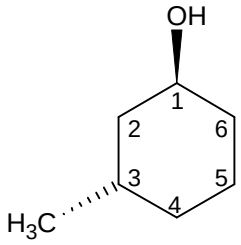
*Would a second molecule of CHClBrF be superimposable on the first? (**yes or no**)* _____

Part 3 – Optical Isomerism – continues on the next page.

Use models of the following compounds and then complete the table:

Compound	Online Model *Rotate it to match the diagram shown below*	Sketch of the Mirror Image *Fill out the diagrams below showing the mirror images.* *The red line is the mirror plane.*	Is Mirror Image Superimposable? *(yes/no)*	Internal Plane of Symmetry? *(yes/no)*	Number of Chiral Centres
3.1 **Glycine** COOH means:  	 The model shows how planar this molecule is.	 This compound is achiral.			
3.2 **Alanine** This compound is chiral.	 **Is this R or S ? ____**	 **Is this R or S ? ____**			
4.1 ***cis*-1,2-dichloro-cyclopropane**	 **Is carbon atom 1 R or S ? ____**	 **Is carbon atom 1 R or S ? ____**			
4.2 ***trans*-1,2-dichloro-cyclopropane**	 **Is carbon atom 1 R or S ? ____**	 **Is carbon atom 1 R or S ? ____**			

5. **trans-3-methylcyclohexanol**



*How many **chiral centres** does it have?* _____

*Is there a **plane of symmetry**? (yes/no)* _____

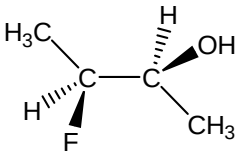
*What is the **R/S configuration** at carbon 1?* _____

6. **3-fluorobutan-2-ol** **CH$_3$CHF-CH(OH)CH$_3$** **Fill in the blanks below:**

*The online model will likely match stereoisomer **(d)** shown below. Answer that one first.*

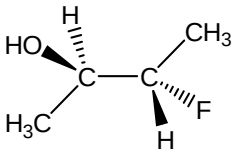
In all diagrams, the -OH group is attached to carbon 2 and the -F group is on carbon 3.

***Show the configuration (R or S)** at carbons 2 & 3 on stereoisomers (b), (c) & (d) below:*



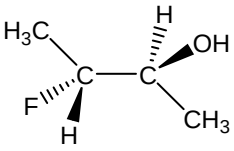
2S,3S

(a)



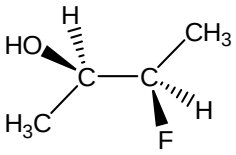
2___,3___

(b)



2___,3___

(c)



2___,3___

(d)

Refer to the bottom of page 172 of the lab manual for these questions:

***Give the letter** (b, c or d) of **one** enantiomer of conformer (a):* _____

***Give the letters** (a, b, d) of **two** diastereomers of conformer (c):* _____ *and* _____

Please save this PDF and submit to your lab instructor as per their instructions.