CHE 251
Take Home Quiz 8 (25 points)

I. Stereoisomers

A Newman projection is used to represent or visualize conformations of carbon-carbon bonds within a molecule. Newman projections are used to represent the relationship between two carbons in a molecule; however, the molecule of interest may contain more than only two carbons.

For instance, consider the example of 2,3-dichlorobutane:

\[
\begin{align*}
\text{H} & \quad C_{(2)} \quad C_{(3)} \quad C_{(4)} \quad \text{H}_3 \\
\text{Cl} & \quad C_{(2)} \quad C_{(3)} \quad C_{(4)} \quad \text{H}_3 \\
\end{align*}
\]

looking at the \(C_{(2)} - C_{(3)}\) bond in 2,3-dichlorobutane, one Newman projection could be,

\[
\begin{align*}
\text{Cl} & \quad C_{(3)} \quad C_{(4)} \quad \text{H}_3 \\
\text{H} & \quad C_{(3)} \quad C_{(4)} \quad \text{H}_3 \\
\end{align*}
\]

while looking at the \(C_{(3)} - C_{(4)}\) bond, another Newman projection could be,

\[
\begin{align*}
\text{H} & \quad C_{(2)} \quad C_{(3)} \quad C_{(4)} \quad \text{H}_3 \\
\text{Cl} & \quad C_{(2)} \quad C_{(3)} \quad C_{(4)} \quad \text{H}_3 \\
\end{align*}
\]

In each of these representations, the molecules have been drawn in an eclipsed conformation, with the bonds on the front and back carbons aligned. These molecules could also be represented in a staggered conformation, where each C—H (or C—Cl) bond on one carbon bisects an H—C—H (or Cl—C—H) angle on the other carbon. See below.
Other representations we may use include the “dash-wedge” or “sawhorse” representation. For the $C_2-C_3$ bond of 2,3-dichlorobutane (in eclipsed conformation), these three representations would all be valid:

![Newman projection](image1)

![Dash-wedge representation](image2)

![Sawhorse representation](image3)

Answer the questions below:

1. Draw a Newman projection for 1,2-dibromoethane in the conformation shown below. What conformation is this?

![Eclipsed conformation](image4)

2. Draw a sawhorse projection for 1,2-dibromoethane in the conformation shown below. What conformation is this?

![Staggered conformation](image5)

3. Draw a dash-wedge representation for $C_1-C_2$ of 2,2-dimethylpentane in eclipsed conformation.

![Eclipsed conformation](image6)

The correct placement of the propyl group is what is important in this structure. If $C_1$ is on the left, the propyl should come out of the page (wedge). If you placed the $C_2$ on the left, the propyl group would go into the page (dashed line).
Draw the carbon-carbon bonds listed for the pentose sugar, D-2-deoxyribose, below. You may use a line segment drawing to show how the two carbons connect in a ring. See the example (4) below.

4. C$_2$—C$_1$ using a Newman projection

5. C$_2$—C$_1$ using a sawhorse projection

For number 5, it’s important that you be able to accurately draw the given molecule using a different projection. This means making sure that your carbons are connected in the correct order. For example, Carbon 1 (C$_{(1)}$) should be bonded to Carbon 2 and to the oxygen that is bonded to Carbon 4. A question like this will not be on Exam 3.

II. Organic Reactions

Read ChemActivity33 “Reactions of Organic Molecules” on pages 132 and 133 of your text, General, Organic, and Biological Chemistry to answer the questions below.

Write the appropriate letter beside each reaction description. Terms may be used more than once; all terms may not be used.

a. acid-base
b. addition
c. elimination
d. oxidation
e. reduction
f. condensation
g. hydrolysis
1. Reaction involving the transfer of a H⁺
2. Reaction that couples two molecules together
3. Reaction that adds a small molecule (e.g. H₂O), usually at the site of a double bond
4. Reaction that involves the addition of an oxygen molecule
5. Reaction that involves the removal of 2 hydrogen atoms
6. Reaction that involves the addition of electrons
7. Reaction that splits apart one molecule into two molecules
8. Reaction that removes a small molecule (e.g. H₂O), sometimes creating a double bond

On the line given, write the type of reaction that is shown below.

9. _______________________

10. _______________________

11. _______________________

Answers to 1-11:

1. A
2. F
3. B
4. D
5. D
6. E
7. G
8. C
9. Addition (of a small molecule, in this case water)
10. Oxidation (by the loss of 2 hydrogen atoms)
11. Hydrolysis (via addition of water)