Chapter 4

1. Give the IUPAC name for each of the following structures. (Problem 4.23, 4.8, 4.12)

   A. 

   B. 

2. Draw the structure that corresponds with the IUPAC names given. (Problem 4.12)
   A. 1,1,2,3,4-pentamethylcycloheptane
   B. 4-ethyl-1,2-dimethylcyclohexane
3. Which of the following is or are possible Newman projections for 2-methylpentane. (Problem 4.15)

![Newman projections](image)

4. Rank the following conformations in order of increasing energy. (4.18)
Questions to consider: Which one is lowest in energy? Which one is highest? Why

![Conformations](image)
5. Draw all 6 different Newman projection conformations of butane (Figure 4.9)

6. Draw both chair conformations for 1-ethyl-1-methylcyclohexane. Which one is more stable? (Problem 4.24)
Chapter 5

7. What is the difference between configurations and conformations?

8. Locate the stereogenic centers in each molecule. Each structure may have none, 1, or more. (Problem 5.6)

A.

B.

C.

9. Label each compound as R or S. (Problem 5.13)

A.
10. For each pair of compounds, identify their relationship (enantiomers, diastereomers, constitutional isomers, identical, or not related at all) (Problem 5.27)

A.

\[
\text{Br} \quad \begin{array}{c}
\text{OH} \\
\text{Br}
\end{array}
\quad \text{and} \quad \begin{array}{c}
\text{Br} \\
\text{HO}
\end{array}
\]

B.

\[
\begin{array}{c}
\text{HO} \\
\text{OH}
\end{array}
\quad \text{and} \quad \begin{array}{c}
\text{HO} \\
\text{OH}
\end{array}
\]

C.

\[
\begin{array}{c}
\text{HO} \\
\text{OH}
\end{array}
\quad \text{and} \quad \begin{array}{c}
\text{HO} \\
\text{OH}
\end{array}
\]

D.

11. Draw 2-chloro-3-hexanol.
   A. Identify the stereocenters
   B. Calculate how many stereoisomers are possible
   C. Draw all possible stereoisomers
D. Label the stereoisomers R or S configuration.

E. Which pairs are enantiomers? Which pairs are diastereomers?

12. Draw the enantiomer and diastereomer for each compound

![Chemical structures](image-url)
13. Amygdalin, a compound isolated from the pits of apricots, peaches, and wild cherries, is sometimes called laetrile. Although it has no known therapeutic value, amygdalin has been used as an unsanctioned anticancer drug both within and outside of the United States. One hydrolysis product formed from amygdalin is mandelic acid, used in treating common skin problems caused by photo-aging and acne.

![Chemical Structures]

a. How many stereogenic centers are present in amygdalin? What is the maximum number of stereoisomers possible?
b. Draw both enantiomers of mandelic acid and label each stereogenic center as R or S.
c. Pure (R)-mandelic acid has a specific rotation of -154. If a sample contains 60% of R isomer and 40% of its enantiomer, what is the [α] of this solution?
d. Calculate the ee of a solution of mandelic acid having [α] = +50. What is the percentage of each enantiomer present?
e.
Chapter 6

14. Classify each transformation as substitution, elimination or addition

a.

b.
15. Draw the products of homolysis or heterolysis of each indicated bond. Use electronegativity differences to decide on the location of charges in heterolysis reactions. Classify each carbon reactive intermediate as radical, carbocation, or carbanion.

a. Homolysis of

\[
\text{H}_3\text{C} - \text{C} - \text{H} \\
\text{H}_3\text{C} - \text{MgBr}
\]

b. Heterolysis of

\[
\text{H}_3\text{C} - \text{O} - \text{H} \\
\text{H}_3\text{C} - \text{O} - \text{H}
\]

c. Heterolysis of
16. Explain why the bond dissociation energy for the C-C sigma bond in propane is lower than the bond dissociation energy for the C-C sigma bond in propene, CH₃CH=CH₂.

![Bond Energies]

17. Given each value, determine whether the starting material or product is favored at equilibrium.
   a. \( K_{eq} = 0.5 \)
   b. \( \Delta G^\circ = -100 \text{ kJ/mol} \)
   c. \( \Delta H^\circ = 8.0 \text{ kJ/mol} \)
   d. \( \Delta S^\circ = -8 \text{ J/(K*mol)} \)
18. Consider the following energy diagram for the conversion of A →G

a. Which points on the graph correspond to transition states?
b. Which points on the graph correspond to reactive intermediates?
c. How many steps are present in the reaction mechanism?
d. Label each step of the mechanism as endothermic or exothermic.
e. Label the overall reaction as endothermic or exothermic.