Week 5 Worksheet

1. Give the IUPAC name for each compound.
   a. 
   b. 
   c. 
   d. 

   (Smith 6th Ed., Ch. 4, #38)

   ANSWER:
   a. 
   Answer: 8-ethyl-4-isopropyl-2,6-dimethyldecane
b. 

\[ 
\text{Answer: 1-sec-butyl-2-isopropyl} 
\]

c. 

\[ 
\text{Answer: 2-sec-butyl-5-ethyl-1,1-dimethylcyclohexane} 
\]

d. 

\[ 
\text{Answer: 8,9-diethyl-7-isopropyl-4-methyltridecane} 
\]
2. Draw the structure corresponding to each IUPAC name.
   a. 3-ethyl-2-methylhexane
   b. 4-isopropyl-2,4,5-trimethylundecane
   c. 4-butyl-1,1-diethylcyclooctane
   d. trans-1-tert-butyl-4-ethylcyclohexane

(Smith 6th Ed., Ch. 4, #39)

ANSWER:

a.

```
  6  4  3  2  1
  \  |  /  |
   5  3  2  1
      \  |
         ethyl
```

b.

```
  1  2  3  4  5  6  8  9  10  11
  |  |  |  |  |  |  |  |  |  |
methyl methyl methyl isopropyl methyl methyl
```

c.

```
  8  1  2  3
  \  |  /  |
   7  3  2  1
      \  |
         butyl
  6  5  4
```

```
3. For each compound drawn below:
   a. Label each OH, Br, and CH₃ group as axial or equatorial
   b. Classify each conformation as cis or trans
   c. Translate each structure into a representation with a hexagon for the
      six-membered ring, and wedges and dashed wedges for groups above and below
      the ring
   d. Draw the second possible chair conformation for each compound

   (Smith 6th Ed., Ch. 4, #53)

   ANSWER:
4. Considering rotation around the bond highlighted in red in each compound, draw Newman projections for the most stable and least stable conformations

a. 

b. 

**ANSWER:**
5. Rank the following Newman Projections in order of increasing energy.

ANSWER:
Lowest: D<B<A<C Highest energy
Projection A: Staggered; two gauche interactions (largest groups adjacent to each other)-highest energy for staggered conformation
Projection B: Staggered with two ethyl groups; one gauche interaction between ethyl groups
Projection C: Eclipsed conformation is highest in energy - high steric hindrance
Projection D: Staggered with ethyl groups anti so lowest in energy since the two largest groups on opposite sides

6. Convert each of the following structures to its more stable chair form. One structure represents menthol and one represents isomenthol. Menthol, the more stable isomer, is used in lip balms and mouthwash. Which structure corresponds to menthol?

(Smith 6th Ed., Ch. 4, #56)
ANSWER:

The isopropyl group is equitorial upward, the hydroxyl group is equitorial downward, and the methyl is equitorial downward. This structure must be menthol because all equitorial positions indicate heightened stability and less steric hindrance with larger groups.

The methyl group is axial, indicating increased steric strain.