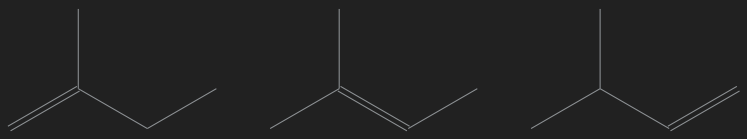
Contents

Week 6

Monday, November 9 - Quiz 16

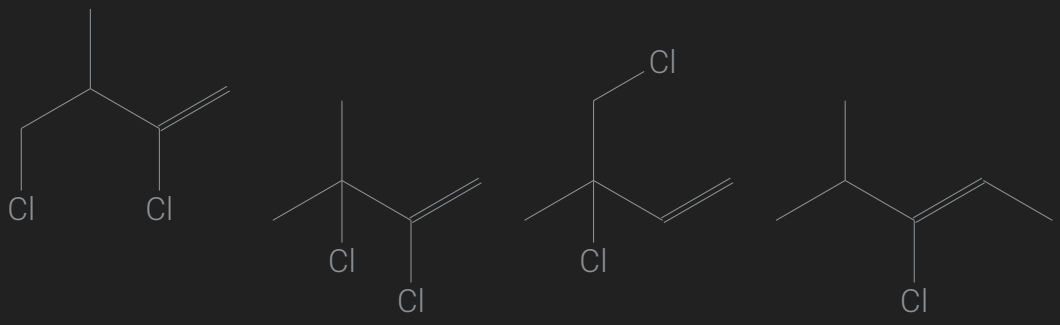
1. Which of the following molecules is not capable of existing in cis and trans isomeric forms?



   ▷ **All of the above**

   - Option 1 and 3 both have a π bonded carbon (sp^2), which has two hydrogens as the substituents—compounds with same substituents on both sides are unable to be cis–trans.
   - Likewise, option 2, has CH_3 on both sides of one end of the π bond, making them the have same substituents.

2. Which of the following molecules corresponds to a cis isomer?



   ▷ **D**

   - A, B, and C all cannot be cis–trans isomers due to double hydrogen substituents.

3. What condition causes a carbon center to be classified as asymmetric?

   ▷ **The C must have four different groups bonded to it**

   - Asymmetric carbon center = **chiral center**, i.e., a tetrahedral carbon that bears four different groups.

4. Suppose a sample of 2-methyl-1-butanol (see lecture notes), when placed in plane polarize light, showed a rotation of $-4.32°$. What is the enantiomeric excess of the enantiomer that rotates light to the left?

   ▷ **75.1%**

   - $\%\ ee = \dfrac{|\text{observed } (\alpha)|}{|\text{specific } [\alpha]|} \times 100\%$
   - (from slides) 2-methyl-1-butanol: specific $[\alpha]_D^{20\,^\circ C} = \pm 5.75$; observed $(\alpha) = -4.32$.
   - $ee = \dfrac{4.32^\circ}{5.75^\circ} \times 100\% = 75.1\%$

5. While nature, i.e., enzymes, synthesize molecules with chiral centers in 100% enantiomeric purity, that often proves very difficult for synthetic organic chemists to do. What most often results in the lab is a mixture containing equal concentrations of both enantiomers. What term is used to describe this mixture?
    - ▷ **Racemic mixture**
        - (from notes) **Racemic mixtrue**: a solution containing equal amounts of both enantiomers, resulting in an optically inactive appearance.
6. What physical properties distinguish the R enantiomer from the S enantiomer of a molecule?
    - ▷ **they rotate plane polarized light in equal, but opposite, directions**
    - ▷ Relevant notes:
        - Specific rotation for enantiomers are equal in magnitude but opposite in direction.
            - **dextrorotaory**: a compound exhibiting positive rotation.
            - **levorotatory**: a compound exhibiting negative rotation.
            - No direct relationship between R/S system of nomenclature, as that is independent of conditions, but dependent on observation angle.
            - The direction of polarized light, however, is dependent on conditions, and can change based on temperature or wavelength even with the same given configuration.