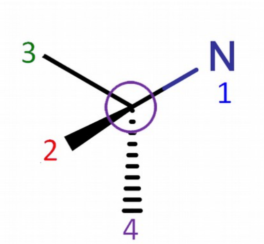
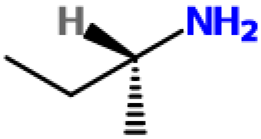
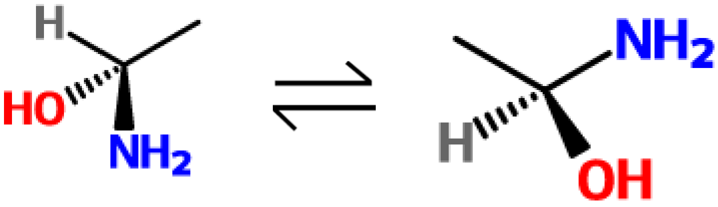
- Labeling R and S stereocenters
  - Please refer to this link to learn how to prioritize substituents. http://chemwiki.ucdavis.edu/Organic_Chemistry/Chirality/Absolute_Configuration,_R-S_Sequence_Rules
  - Given dash, wedge structure:
    - lowest priority group is dashed:
      - number substituents using priority system
      - draw a steering wheel from 1 to 3
      - if the steering wheel is clockwise, it is R. If the steering wheel is counterclockwise it is S.
        - In the picture below, draw a steering wheel from 1 to 2 and to 3. Wen you do this, you will see that you are going in a clockwise direction. So this stereocenter is S.



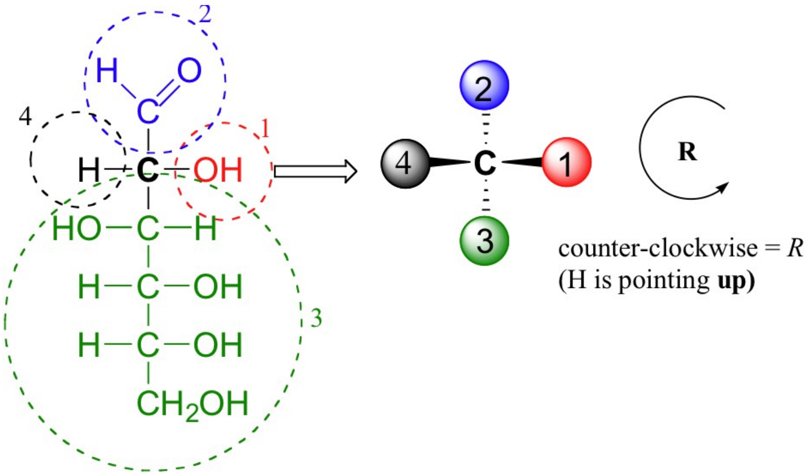
    - lowest priority group is wedged:
      - number substituents using priority system
      - draw a steering wheel from 1 to 3
      - REVERSE! If the steering wheel is clockwise, it is S. If the steering wheel is counterclockwise it is R.
        - In the picture below, NH_2 is priority 1, CH_2CH_3 is priority 2, CH_3 is priority 3, and H is priority 4. When you draw the steering wheel, you will see a clockwise direction. So the stereocenter is R!



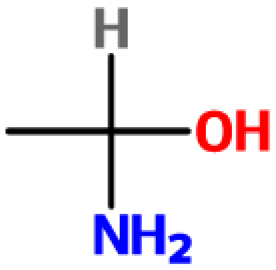
    - Lowest priority group is neither dashed nor wedged:
      - rotate molecule (in either direction) so that the lowest priority group is dashed
      - number substituents using priority system
      - draw a steering wheel from 1 to 3
      - REVERSE! If the steering wheel is clockwise, it is S. If the steering wheel is counterclockwise it is R.
        - In the picture below, H is priority 4 and is neither dashed nor wedged. So here, rotate the molecule (do so with least amount of turns needed) to get H in dashed. Rotating the molecule counterclockwise does the trick (figure on the right). Then assign priorities, do steering wheel, and REVERSE. The stereocenter here is R.



  - Given Fischer projection
    - lowest priority group is horizontal:
      - number substituents using priority system
      - draw a steering wheel from 1 to 3
      - REVERSE! If the steering wheel is clockwise, it is S. If the steering wheel is counterclockwise it is R.

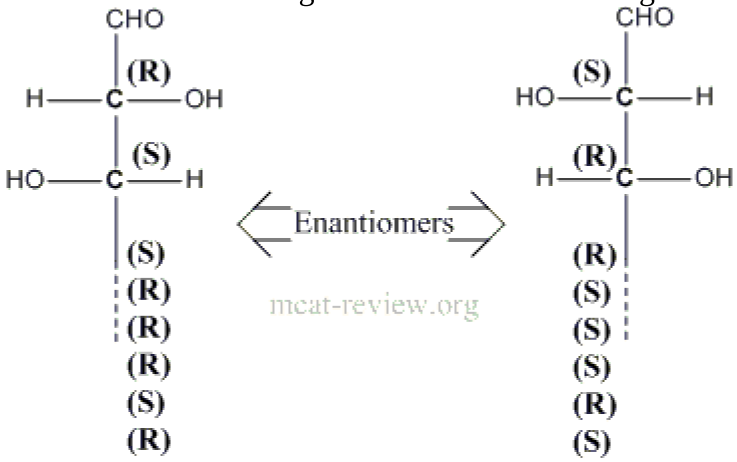


    - lowest priority group is vertical:
      - number substituents using priority system
      - draw a steering wheel from 1 to 3
      - if the steering wheel is clockwise, it is R. If the steering wheel is counterclockwise it is S.
        - In the figure below, hydrogen is the lowest priority substituent and it is in a vertical position. Simply number the substituents and steering wheel. The stereocenter here is R as the steering wheel is clockwise.

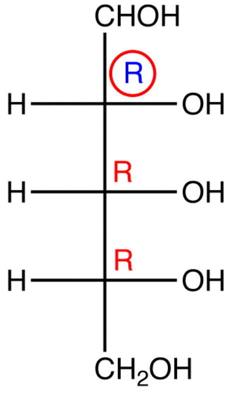


    - If there are 2+ centers of chirality in the fischer projection, consider each center separately
  - Newman projections
    - Watch this youtube video on how to convert a newman projection into a fischer projection https://www.youtube.com/watch?v=fXPrBMFovIs
    - Once you converted into the fischer projection, use the fischer projection rules to assign the stereocenters.
  - Chair structure
    - Convert chair back into ring (remember wedge = up and dashed = down)
    - Find stereocenter with dash, wedge structure you created
- Definitions
  - **Chiral molecules** have at least one stereocenter and is not a meso compound or a racemic mixture. Rotates plane-polarized light.

    - A **stereocenter** is a tetrahedrally arranged carbon bound to 4 asymmetric substituents.
    - Total number of stereoisomers = 2^n n = number of stereocenters
- **Enantiomers** are non-super imposable images.
    - The way I view enantiomers is that every stereocenter has oppositely assigned R, S values. So if molecule A has R configuration at C1 and S configuration at C2, then the enantiomer would have S configuration at C1 and R configuration at C2.



    - Enantiomers are equal in all of their physical properties except for optical rotation. They rotate plane-polarized light with the same magnitude but in opposite directions (so opposite signs).
- A **racemic mixture** is a 1:1 ratio of enantiomers. They are **achiral** (do not rotate plane-polarized light) because the equal ratios of enantiomers cancel out the rotations.
- A **meso compound** is a molecule with at least one stereocenter and is symmetrical. Meso compounds are achrial.
- A **diastereomer** is anything but an enantiomer.
    - The way I view diastereomers is that at least one of the stereocenters have been changed, but not all of them. In the molecules below, note that only one stereocenter has been swapped and the other two remain the same.



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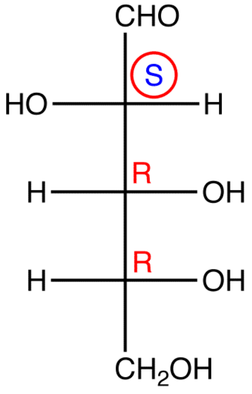

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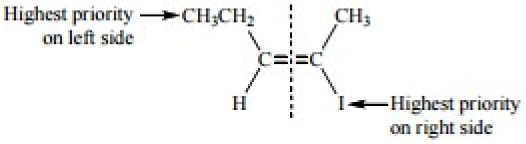
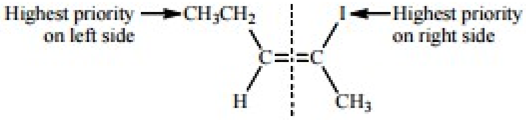
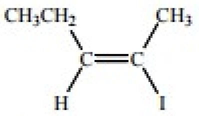
    - Diastereomers are characteristically different in their physical properties and thus can be easily separated by conventional separation techniques.

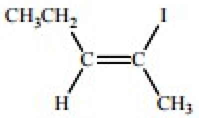
- Determining cis (Z) and trans (E)
    - 1) Split the alkene in half
    - 2) Determine the highest priority groups bound to each carbon that participates in the double bond. Priority is determined in the same way when assigning R/S stereocenters.
    - 3) If the highest priority groups are on the same side, use the “Z” notation (think **on ze zame zide**). If the highest priority groups are on the opposite side, use the “E” notation.







E-2-Iodo-2-pentene



Z-2-Iodo-2-pentene

    - Cis and trans isomers have different physical properties and thus can be easily separated by conventional separation techniques.
        - In general, the <u>trans</u> <u>isomer</u> has the higher melting point whereas the <u>cis</u> <u>isomer</u> has the higher boiling point.