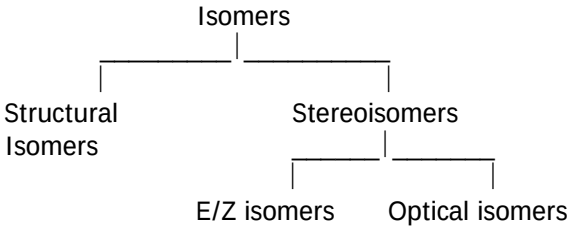
Topic 10a – Stereoisomerism
Notes

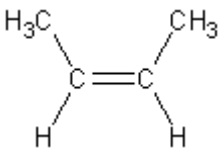
1) Stereoisomerism



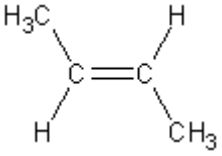
- Stereoisomers have the same structural formulae but different 3-dimensional arrangements
- There are two types of stereoisomerism: E/Z isomerism, which occurs in alkenes, and optical isomerism, which occurs when a carbon atom is attached to four different groups

2) E/Z isomers

- E/Z isomers occur in alkenes because of restricted rotation about a double bond
- For E/Z isomers to occur, the two groups at each of the double bond must be different e.g. but-2-ene has E and Z isomers because there is a CH_3- and an H- at each end of the double bond.



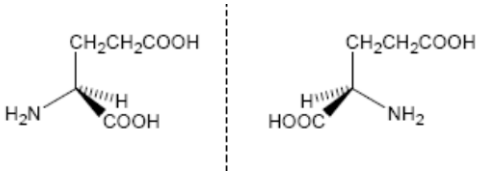
Z-but-2-ene



E-but-2-ene

3) Optical isomers

- An optical isomer is one that cannot be superimposed on its mirror image
- This occurs when a carbon is attached to four different groups. Such a carbon is known as a chiral centre
- Optical refers to the ability of these molecules to rotate plane-polarised light. D isomers rotate light to the right and L isomers rotate light to the left.
- Most amino acids display optical isomerism e.g. glutamic acid



The central carbon is a chiral centre because it is attached to four different groups: $-NH_2$, -H, -COOH and $–CH_2CH_2COOH$

Topic 10b –Synthesis
Notes

1) General

- A synthesis is a series of reactions giving a desired chemical product
- Answering questions on synthesis requires a good knowledge of the reactions in the current module and the relevant parts of Module F322 (first year)

2) Synthesis of pharmaceuticals

- Compounds produced naturally in living systems will often be present as one optical isomer only e.g. our bodies only contain L-amino acids
- The synthesis of pharmaceuticals often requires the production of chiral drugs containing a single optical isomer
- Molecules synthesised in a laboratory often contain a mixture of optical isomers whereas molecules of the same compound produced naturally by enzymes in living systems will often be present as only one optical isomer
- Synthesis of a single optical isomer of a pharmaceutical increases costs due to the difficulty in separating the optical isomers but has the benefits of reducing side effects and improving pharmacological activity
- Modern synthesis of a single optical isomer of a pharmaceutical is often carried out:
    - Using enzymes or bacteria which promote stereoselectivity
    - Using chemical chiral synthesis or chiral catalysts
    - Using natural chiral molecules, such as L-amino acids or sugars, as starting materials