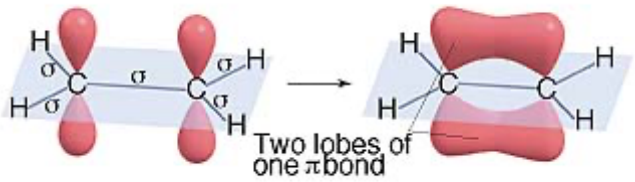
E-Z ISOMERISM

The π bond

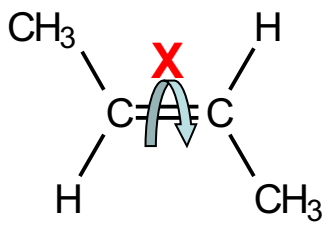
- There are two covalent bonds between the two C atoms.
  - Bond 1 = σ covalent bond (electrons are between the two C atoms)
  - Bond 2 = π covalent bond (electrons above and below the plane of the 6 central atoms – formed from overlap of p orbitals on the C atoms)



Types of isomerism

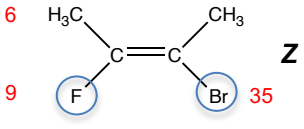
Type	**Structural isomerism**	**Stereoisomerism**
Definition	Molecules with the same molecular formula but a different structural formula	Molecules with the same molecular and structural formulas but a different arrangement of the atoms in space
Examples	1 Chain isomers - caused by having a different carbon chain 2 Position isomers – caused by the functional group being in a different position 3 Functional group isomers – caused by having a different functional group	1 *E-Z* isomers - caused by molecules with a C=C with two different groups attached to each C of the C=C 2 Optical isomers – caused by C with atoms having four different groups attached leading to molecules that are non superimposable mirror images of each other

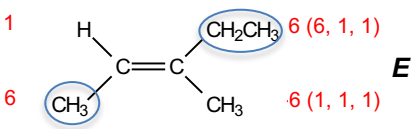
E-Z Stereoisomerism



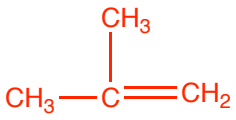
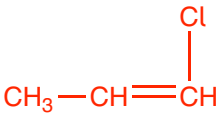
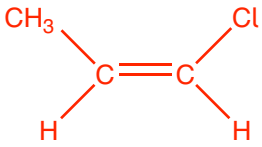
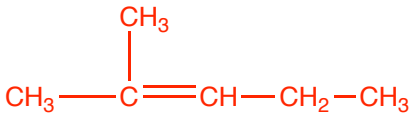
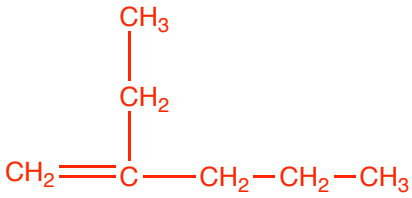
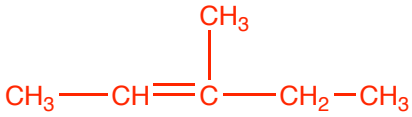
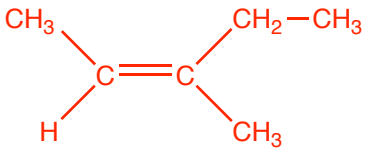
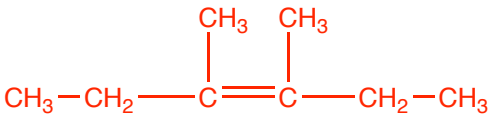
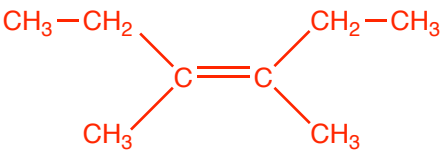
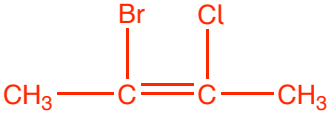
CANNOT ROTATE AROUND C=C

- Would have to break the C=C double bond to rotate around it.
- **If both C of the C=C have two different groups attached, the molecule has *E-Z* isomers**.
- The Cahn-Ingold-Prelog (CIP) priority rules are used to determine which is the *E* and which is the *Z* isomer.
  - ***E*** = *entgegan (highest priority opposite)*
  - ***Z*** = *zusammen (highest priority together) "zame zide"*
  - Assigned by priority of groups attached to C=C – the higher the atomic number of the group attached to the C's, the higher the priority (if they are the same, look at the atoms attached to those atoms)





TASK - Decide which of the following alkenes exhibit E-Z isomerism. For those that do, sketch the Z stereoisomer.

Name	Structure	E-Z isomers (✓✗)	Z isomer if stereoisomers exist
methylpropene		✗	
1-chloropropene		✓	
2-methylpent-2-ene		✗	
2-ethylpent-1-ene		✗	
3-methylpent-2-ene		✓	
but-1-ene		✗	
3,4-dimethylhex-3-ene		✓	
2-bromo-3-chlorobut-2-ene		✓