



Acids and Bases				
Relative Acid Strengths		K _a = [H	$K_a = \frac{[H_3O^+][A^-]}{[HA]}$	
Acid	pK _a		K _a	
CH ₃ CH ₂ OH	16.0	Π	10-16	
H ₂ O	15.7		10-15.7	
CH ₃ COOH	4.8		10-4.8	
HNO ₃	-1.3	increasing	101.3	
HCl	-7.0	acid strength	107	





























Introduction Bonding Hydrocarbons Stereochemistry But First a Quick Summary/Revision!















































Conformational Isomers

Angle strain

Strain due to expansion or compression of bond angles

Steric Strain

Strain due to repulsive interactions when atoms approach each other too closely

Torsional Strain

- > Strain due to eclipsing of bonds.
 - Bond = electron pairElectron pairs repel!



Conformational Isomers

- Cyclohexane
- Exists mainly in the 'chair' conformation
- All angles are 109.5° (no angle strain)
- Fully staggered (no torsional strain)









Conformational Isomers

Substituted Cyclohexanes

- > Large substituents prefer to adopt equatorial positions
- > Due to steric interactions with other axial groups
 - called 1,3-diaxial interactions

























Stereoisomers

Optical Activity

- > Chiral compounds rotate plane polarised light
- > Clockwise rotation \Rightarrow dextrorotatory (D / +)
- > Anticlockwise rotation \Rightarrow levorotatory (L / -)
- Called optical activity



Stereoisomers

The Polarimeter

Observed Rotation α

- = the angle through which the plane of light is rotated
- > Depends on the nature of the sample
 - the enantiomeric purity of the material
 - concentration
 - size of the polarimeter cell
 - wavelength of light

Stereoisomers

<u>Specific Rotation $[\alpha]_D$ </u>

- > Physical constant
- > Use standard path length and conc.

 $\begin{bmatrix} \alpha \end{bmatrix}_{D} = \alpha / I \times C$ α = observed rotation (in degrees) I = path length (in decimeters) C = concentration (in g/mL)

enantiomers

Enantiomeric excess

- More of one enantiomer than the other
- Quoted as %ee

% ee = $\frac{\text{moles of one - moles of the other}}{\text{total moles of both}} \times 100\%$

% ee = $\frac{\text{observed specific rotation}}{\text{known specific rotation of pure enantiomer}} \times 100\%$

• equal amounts of each enantiomer = 0%ee = racemic mixture



To speeny configuration

Cahn-Ingold-Prelog Rules

- > Used to describe the arrangement of groups around a chiral centre
- Chiral centres are described as R or S
 Independent of D(+) and L(-)





















Stereoisomers

Diastereomers

- Stereoisomers that are not mirror images (*i.e.* not enantiomers)
- Some (one or more) of the chiral centres have opposite configuration
- Diastereomers have different physical properties.
- > Can be separated by crystallisation, distillation, *etc*.









