CHM151: MONOSUBSTITUTED CYCLOHEXANES

2016 09 26

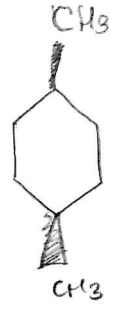
AXIAL POSITION OF CH_3

RING-FLIP

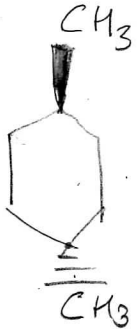
EQUATORIAL POSITION OF CH_3

THE ENERGY DIFFERENCE IS SIGNIFICANT!

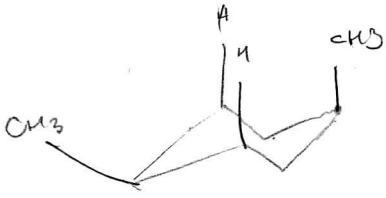
DISUBSTITUTED CYCLOHEXANES



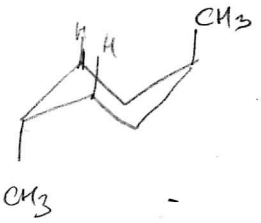
CIS-1,4-DIMETHYLHEXANE



TRANS 1,4-DIMETHYLCYCLOHEXANE



AX-EQ

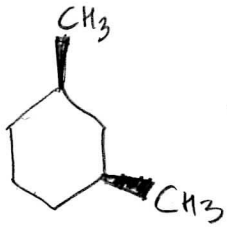


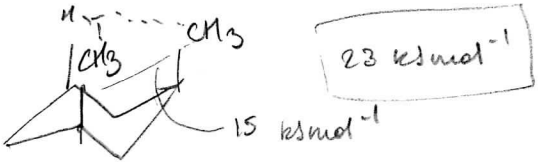
ax-ax

15.8 kJ/mol

EQ-EQ

1,3 - DISUBSTITUTED CYCLOHEXANES





23 kJ mol^{-1}

STEREOCHEMISTRY

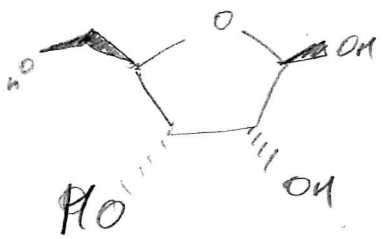
ENANTIOMERS — STEREOISOMERS THAT ARE NON-SUPERIMPOSABLE MIRROR IMAGES OF EACH OTHER.

A TETRAHEDRAL CARBON WITH FOUR DIFFERENT SUBSTITUENTS GIVES RISE TO ENANTIOMERS.

CHIRALITY — OBJECTS (OR MOLECULES) THAT ARE NON-SUPERIMPOSABLE ON THEIR MIRROR IMAGES.

AN OBJECT/MOLECULE IS NOT CHIRAL IF IT CONTAINS A PLANE OF SYMMETRY

CHIRALITY CENTRES ARE CARBONS BOUND TO 4 DIFFERENT SUBSTITUENTS.



OPTICAL ACTIVITY

A SAMPLE ABLE TO ROTATE THE PLANE OF POLARIZATION OF A BEAM OF TRANSMITTED PLANE-POLARIZED LIGHT IS SAID TO BE OPTICALLY ACTIVE.

OPTICAL ACTIVITY IS A SUFFICIENT BUT NOT NECESSARY CONDITION OF CHIRALITY.

DEXTROROTATORY (+) OPT. ACT.: LIGHT PLANE IS ROTATED TO THE RIGHT

SPECIFIC ROTATION

$$[\alpha]_D = \frac{\text{OBSERVED ROTATION}}{\text{PATHLENGTH} \times \text{CONC.}}$$

$$= \frac{\text{degrees}}{\text{dm g/ml}}$$

ASSIGNING R AND S CONFIGURATIONS

CAHN-INGOLD-PRELOG SYSTEM:

1. ASSIGN THE PRIORITIES OF THE ATOMS DIRECTLY BOUND TO THE CHIRALITY CENTRE IN ORDER OF DECREASING Z.
2. IN CASE OF IMPOSSIBILITY OF 1, MOVE SEQUENTIALLY TO THE ATOMS FURTHER FROM THE CHIR. CENTRE
3. MULTIPLY-BONDED ATOMS ARE EQUIVALENT TO THE SAME NUMBER OF SINGLE BONDED

VIEW THE COMPOUND WITH THE LOWEST-PRIORITY SUBSTITUENT POINTING OUTWARDS.
IF THE ORDER OF THE OTHER SUBSTITUENTS IS CLOCKWISE, THE CHIRALITY HAS THE R CONFIGURATION
OTHERWISE, THE CHIRALITY CENTRE HAS THE S CONFIGURATION

DIASTEREOMERS

A COMPOUND WITH n CHIRALITY CENTRES CAN HAVE AS MANY AS 2^n STEREOISOMERS.

STEREOISOMERS WHICH ARE NOT MIRROR IMAGES OF EACH OTHER.

EPIMERS

DIASTEREOMERS THAT DIFFER IN THE CONFIGURATION OF A SINGLE CHIRALITY CENTRE.