



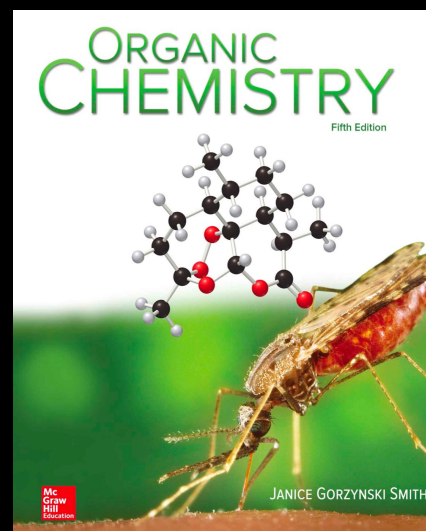
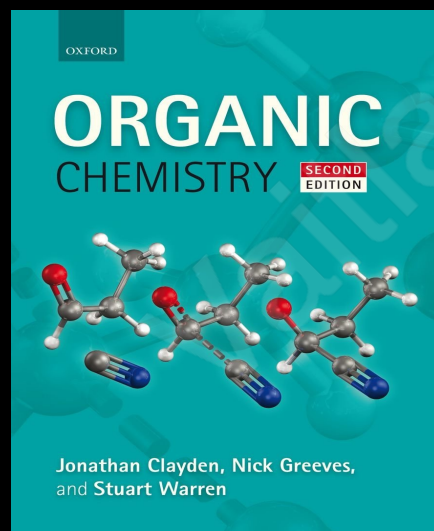
CML-101: Organic Chemistry

Instructor: Dr. Janakiram Vaitla

Phone: 011-26591559

Email: vaitla@iitd.ac.in

Reference Books

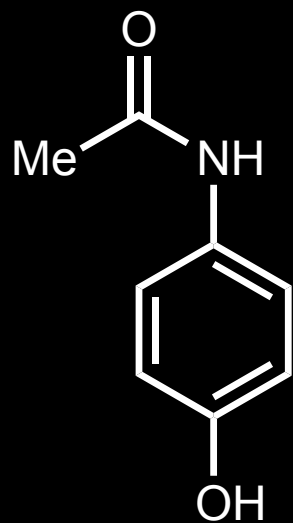


- 1) Jonathan Clayden, Nick Greeves & Stuart Warren, Organic Chemistry, Oxford, 2nd Edition (2012);
- 2) Janice Gorzynski Smith, Organic Chemistry, McGraw-Hill, 5th Edition (2017);

Revised Lecture Schedule for CML 101

MAY 2021	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
Date			4 Inorganic Lecture (SK)	5 Org. Lecture-1 (JV)	6	7 Org. Lecture-2 (JV)	8 Common+Tutorial Quiz (Inorganic) 9-10 am
Date	9 Org. Lecture-3 (Live + asynchronous) (JV)	10	11 Org. Lecture-4 (JV)	12 Org. Lecture-5 (JV)	13	14 Holiday (Eid)	15 Org. Lecture-6 (JV) (Friday Time-table)
Date	16	17	18 Org. Lecture-7 (JV)	19 Org. Lecture-8 (JV)	20	21 Org. Lecture-9 (JV)	22 Org. Lecture-10 (JV) Buffer Day
Date	23	24	25 Org. Lecture-11 (JV)	26 Holiday (Buddh Purnima)	27 Buffer Day	28 Buffer Day	29 Common+Tutorial Quiz (Organic) 9-10 am Buffer Day
Date	30 Buffer Day	31 Buffer Day					

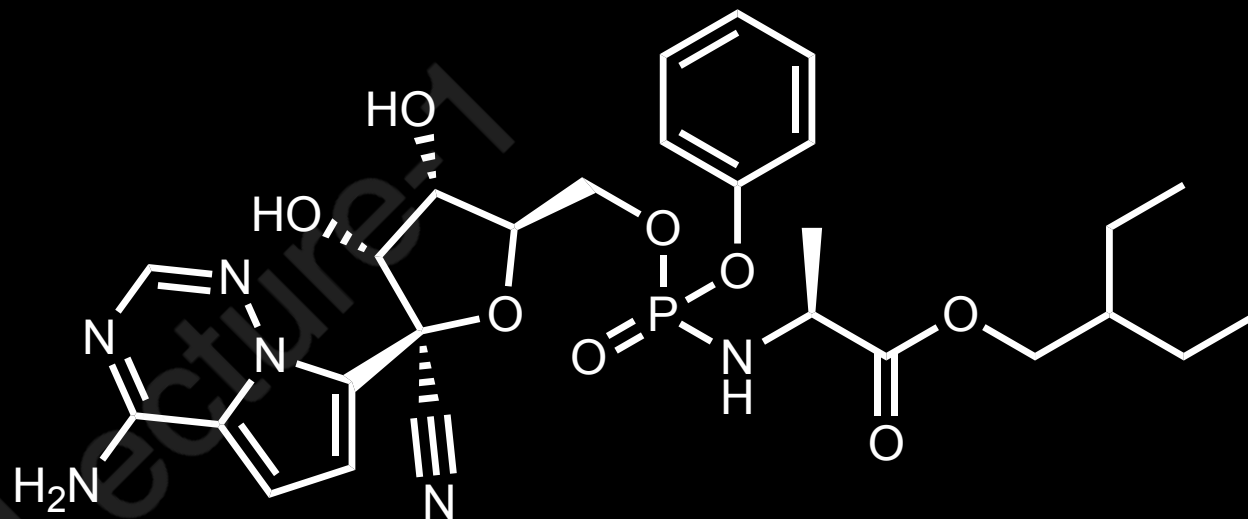
Organic structures



Paracetamol

(medication used to treat fever and mild to moderate pain)

2D structure



Remdesivir

COVID-19 medication

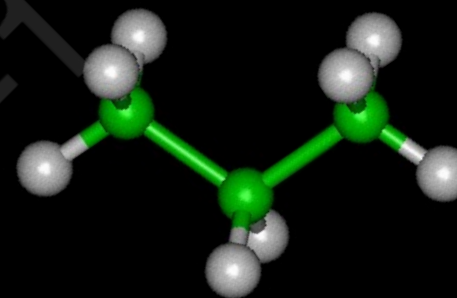
3D structure

To synthesize any 3D molecule, first we should understand the concept of stereo chemistry

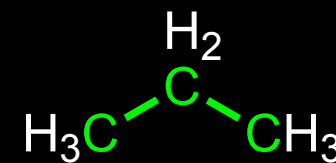
Stereochemistry

Introduction:

- ☞ Stereo (Greek word) - Space
- ☞ Stereochemistry - deals with property of molecule w.r.t 3D spatial arrangement of atoms or groups in a molecule.
- ☞ Majority of organic molecules are 3D. Because they associate with SP^3 hybrid carbon.
- ☞ Orientation of groups/atoms/orbitals around the SP^3 hybrid carbon.
- ☞ Stereochemistry deals with physical, chemical, spectral, and biological properties of 3D molecules.



3D -view



2D -view

What is Stereoisomerism?

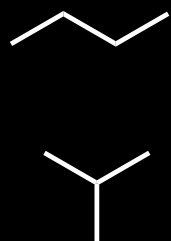
Stereochemistry

Isomers
(Same molecular formulae)

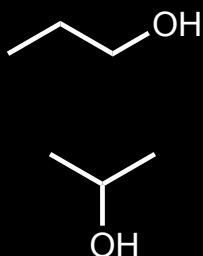
Constitutional isomers
(Different bond connectivity)

Stereo isomers
(Same bond connectivity)

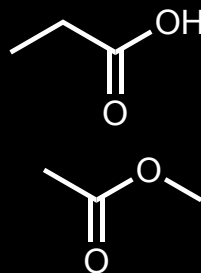
Chain



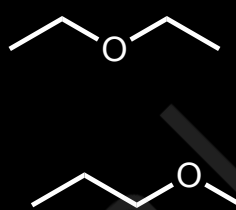
Positional



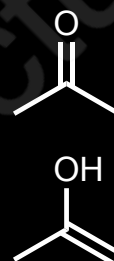
Functional Group



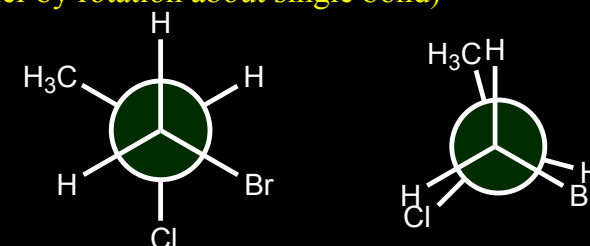
Metamers



Tautomers

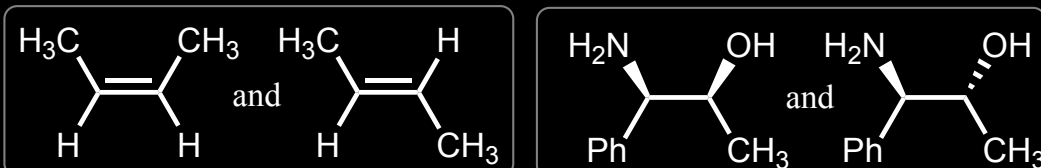


Conformational isomers
(differ by rotation about single bond)

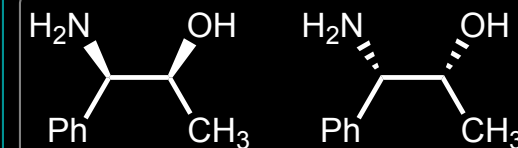


Configurational isomers
(Stereoisomers that are not conformers)

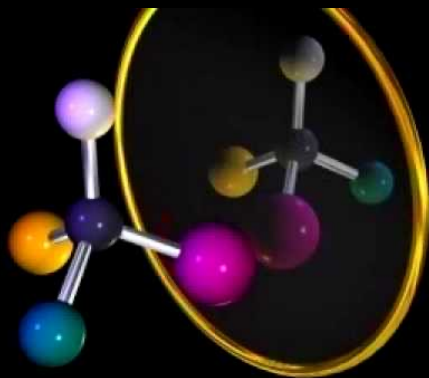
Diastereomers



Enantiomers



Stereochemistry



Enantiomers:

stereoisomers that are non-superimposable mirror images

Same chemical and physical properties but different optical properties

All enantiomers possess optical activity

Contains one or more stereo centers

Diastereomers:

stereoisomers that are not non-superimposable mirror images

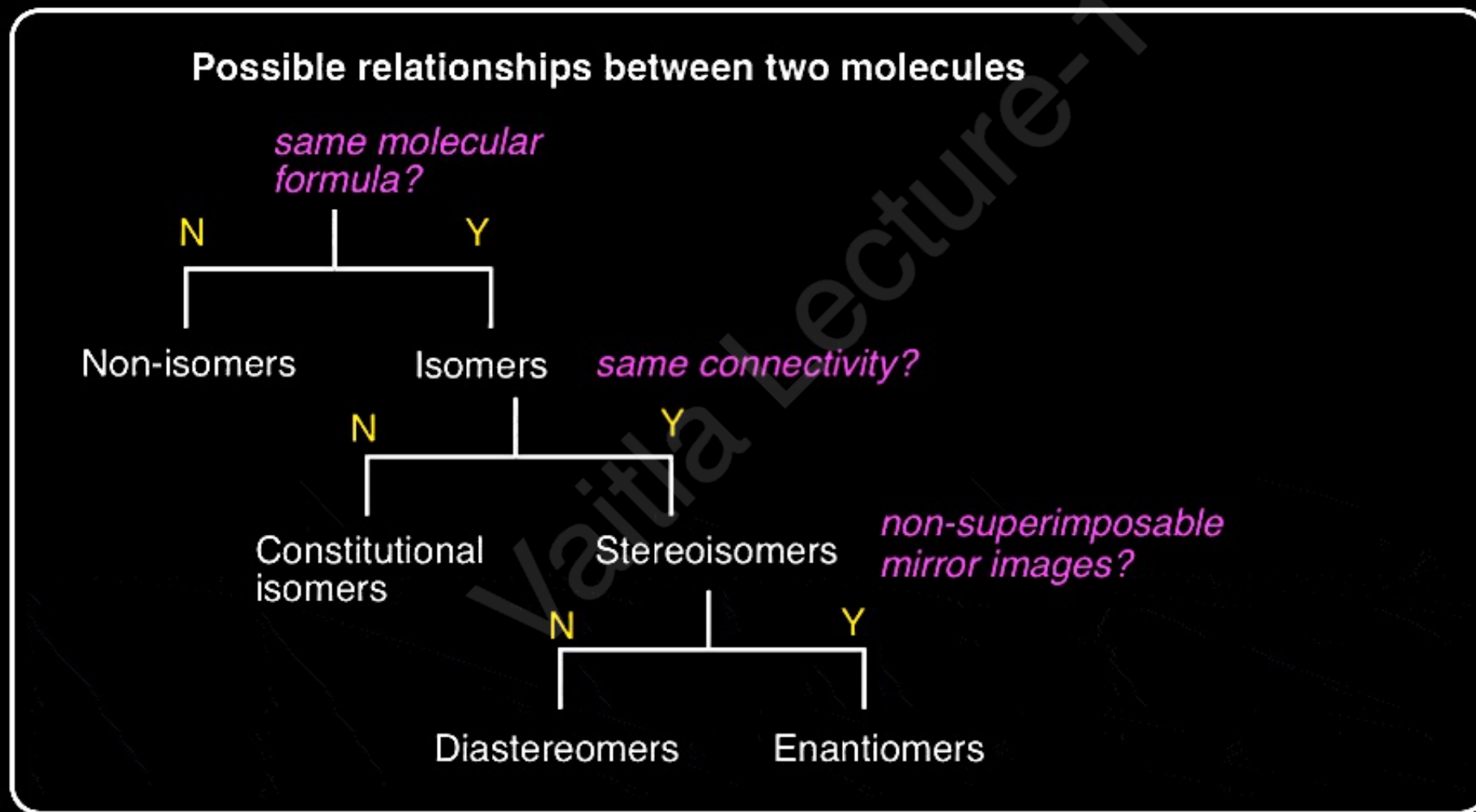
Have different chemical and physical properties

Not all diastereomers possess optical activity

Contains more than one stereo centers

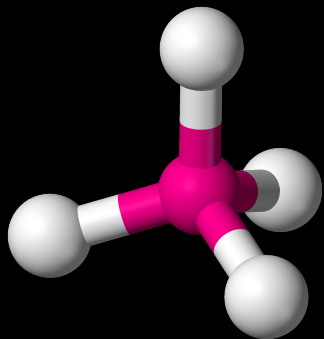
Stereochemistry

👉 We can classify isomers by asking and answering a series of questions

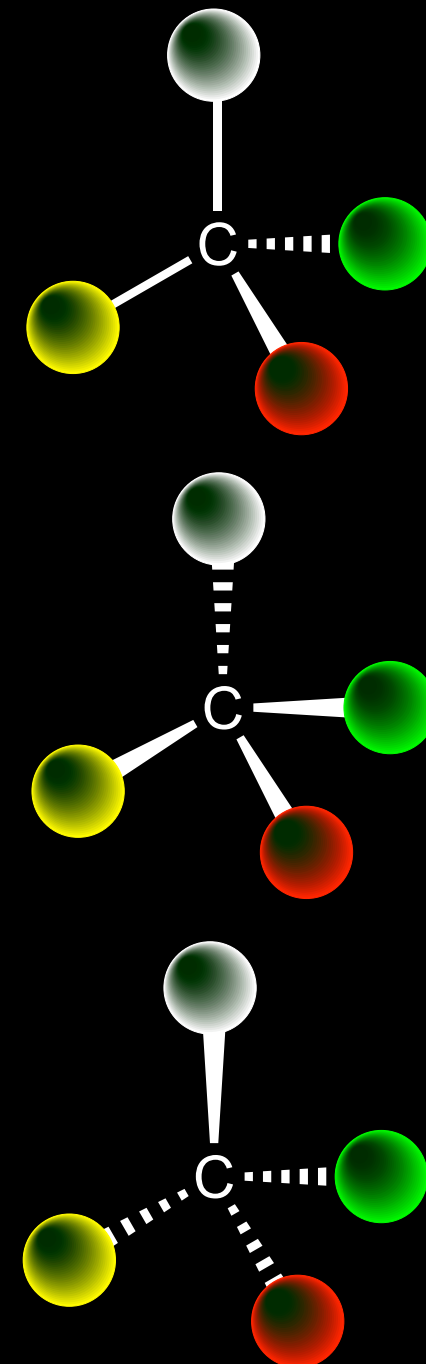
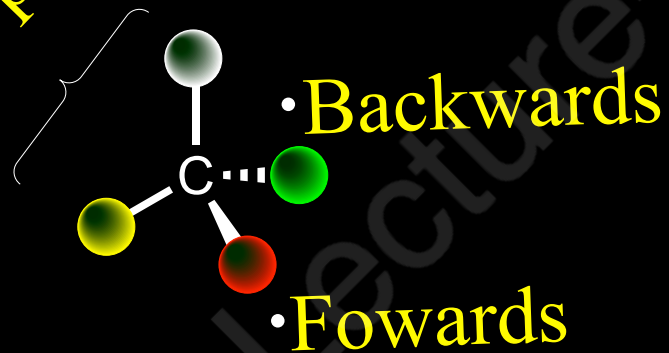


Stereochemistry

★ Tetrasubstituted carbon



in the plane

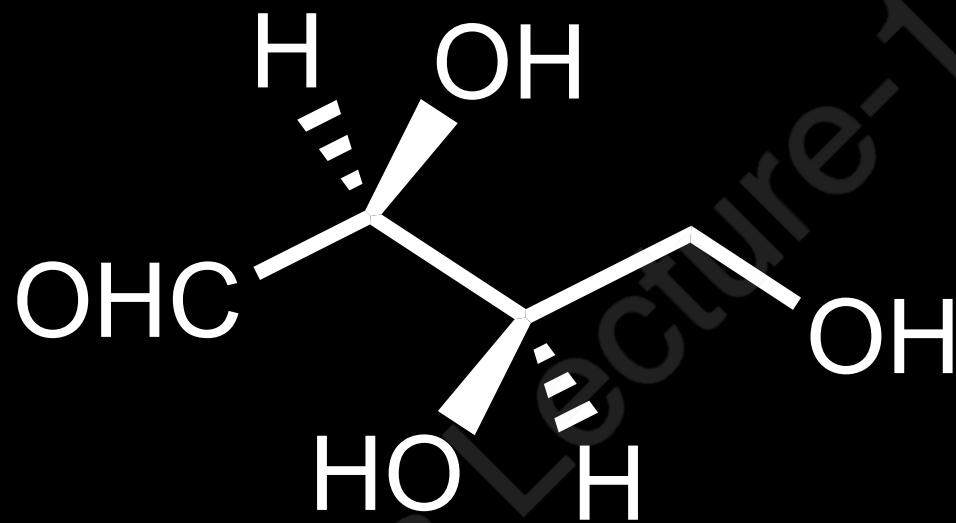


— In the plane of the page

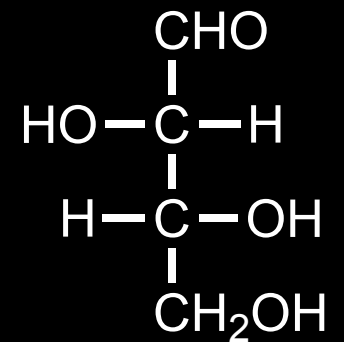
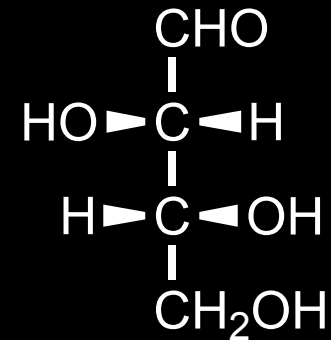
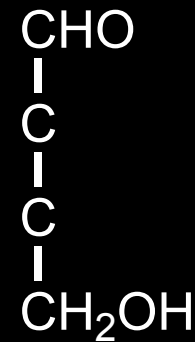
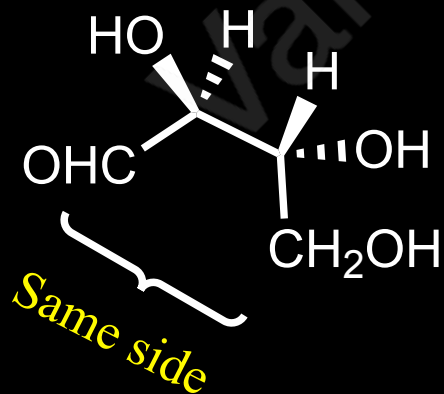
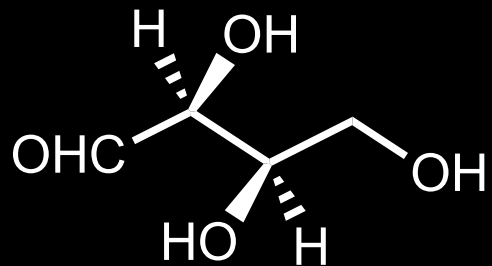
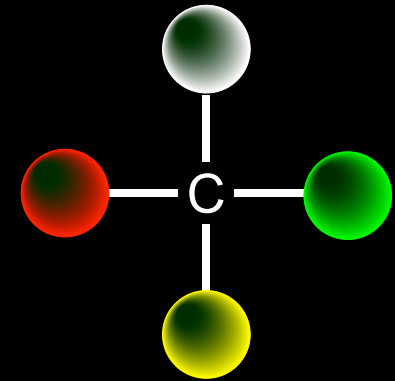
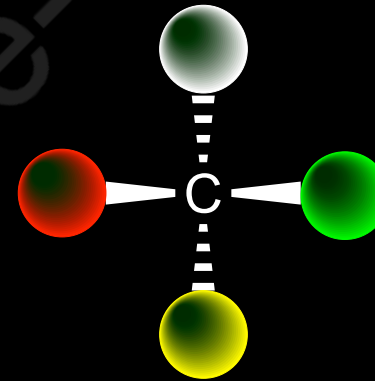
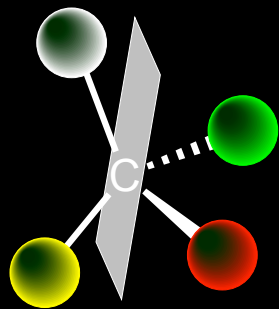
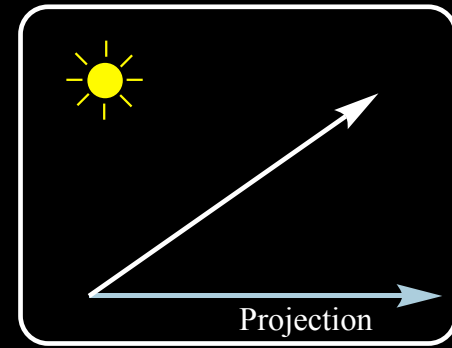
▴ Comes forward out of the plane of the page (*Infront*)

..... Goes backward out of the plane of the page (*behind*)

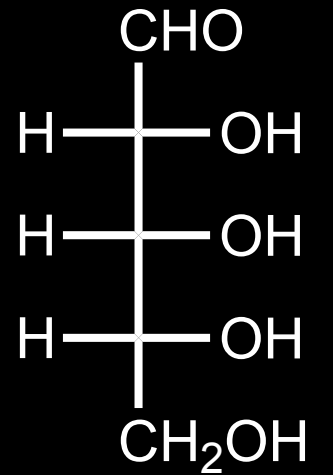
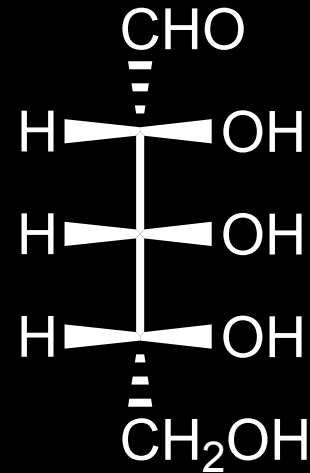
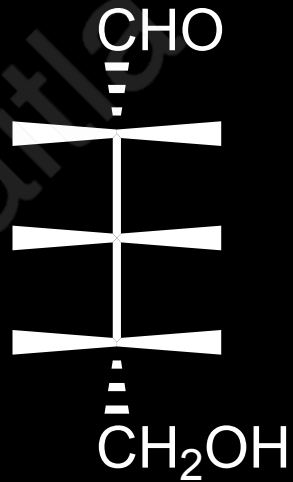
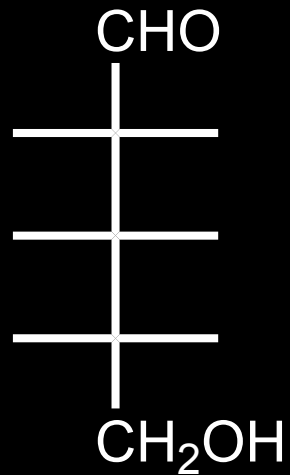
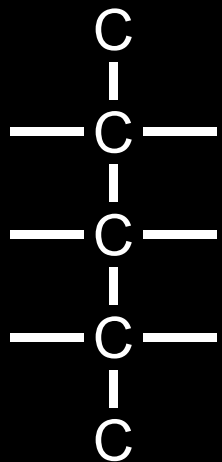
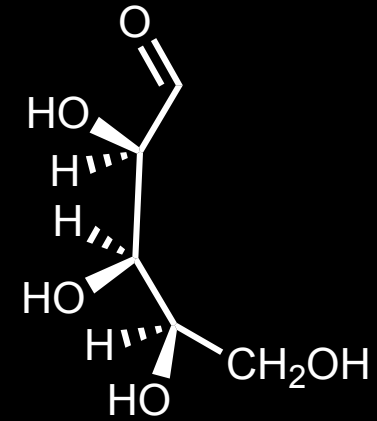
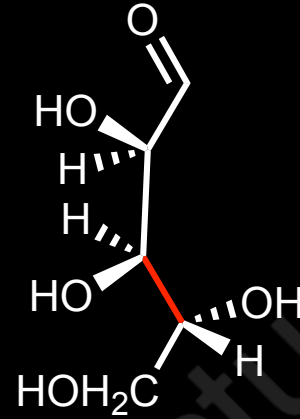
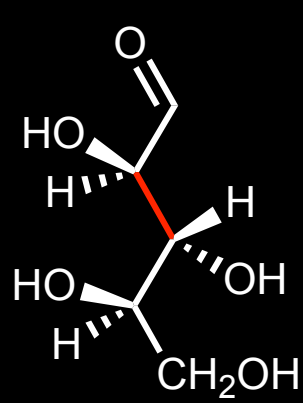
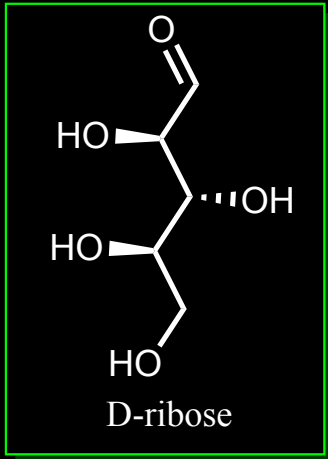




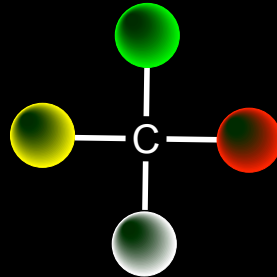
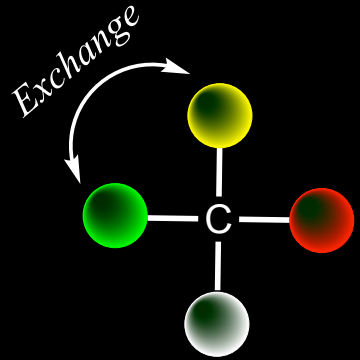
Fischer Projection



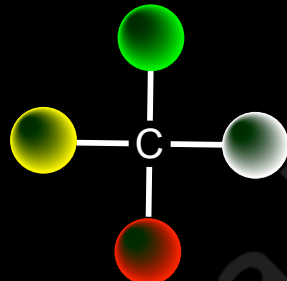
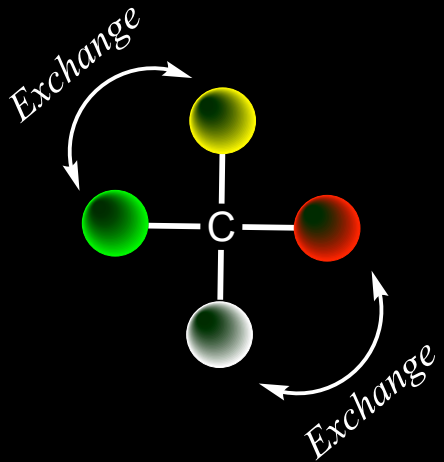
Fischer Projection



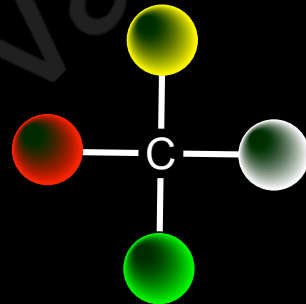
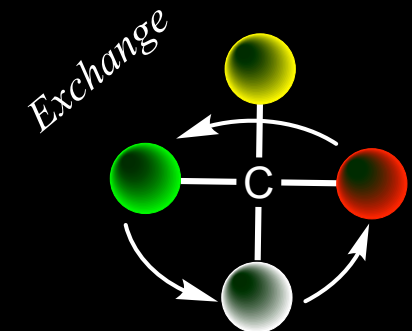
Manipulation of Fischer Projections:



* Both are enantiomers

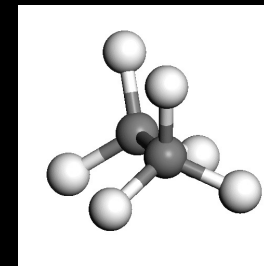


* Both are Identical



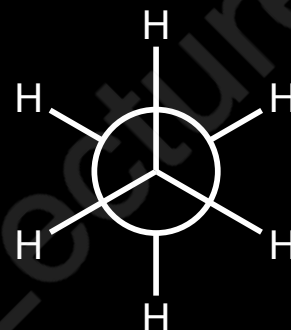
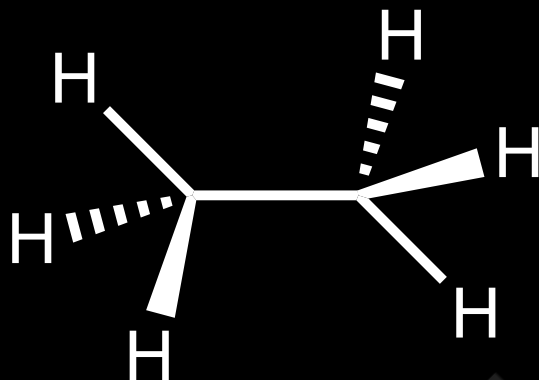
* Both are Identical

Newman Projection

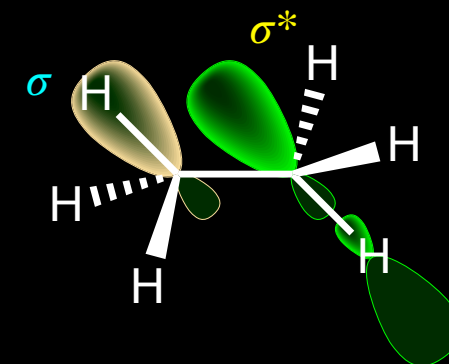


Dot is front carbon

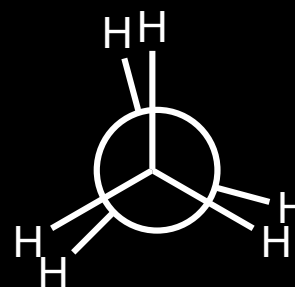
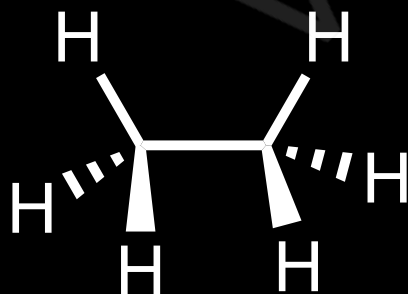
Circle is rear carbon



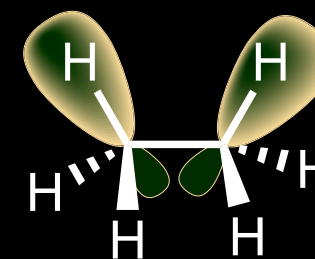
Staggered



*Stabilizing interaction
filled C-H σ bond and empty
C-H σ^* antibonding orbital*

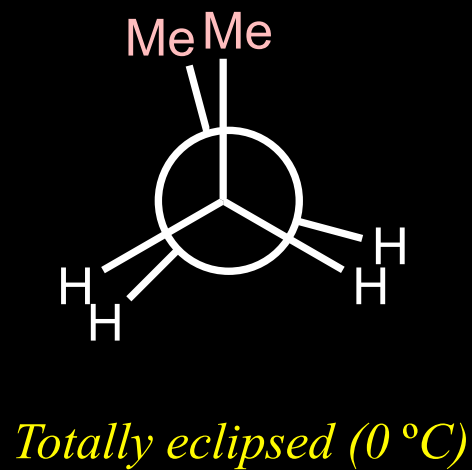
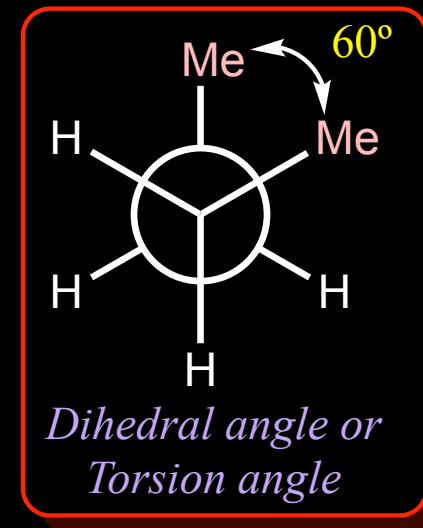
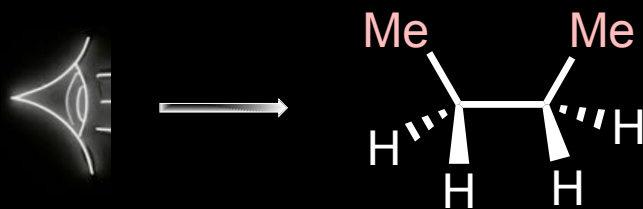


Eclipsed

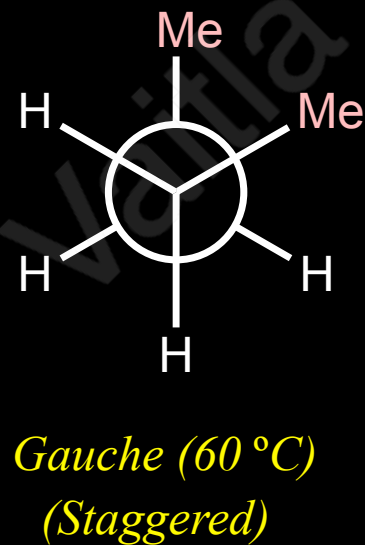


*Filled orbitals
repel each other*

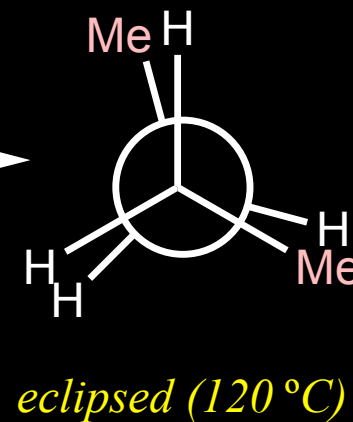
Newman Projection



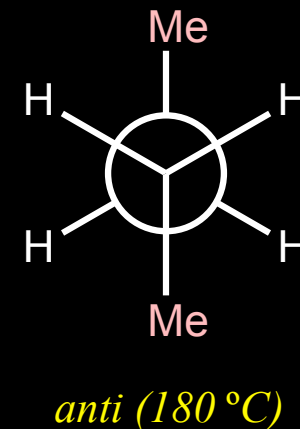
Rotate 60°



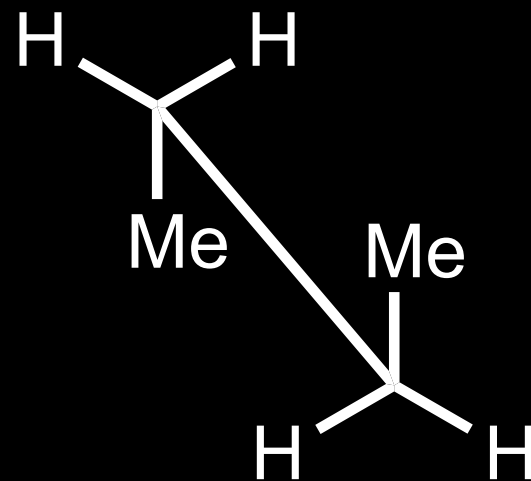
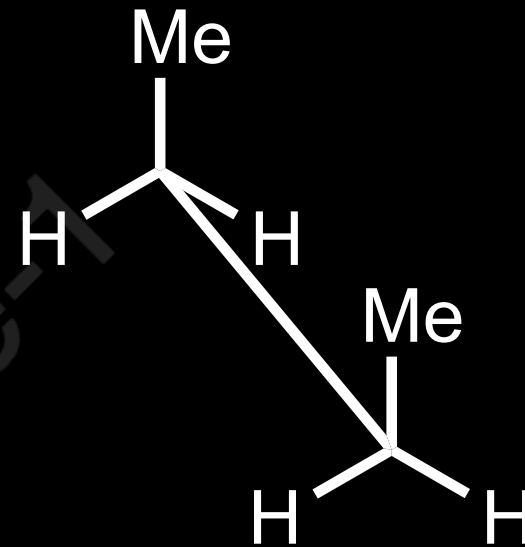
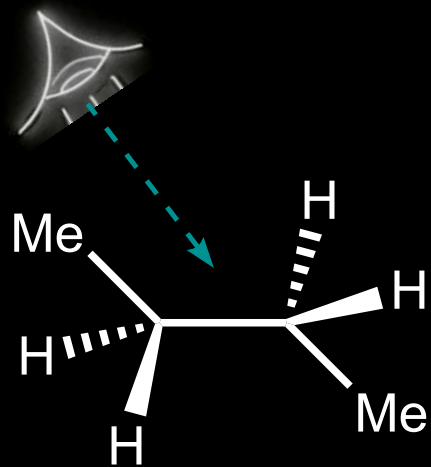
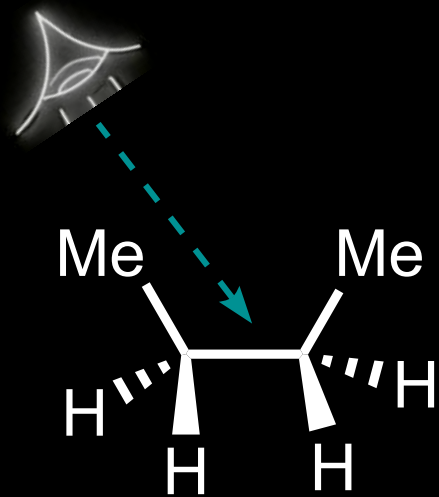
Rotate 60°



Rotate 60°

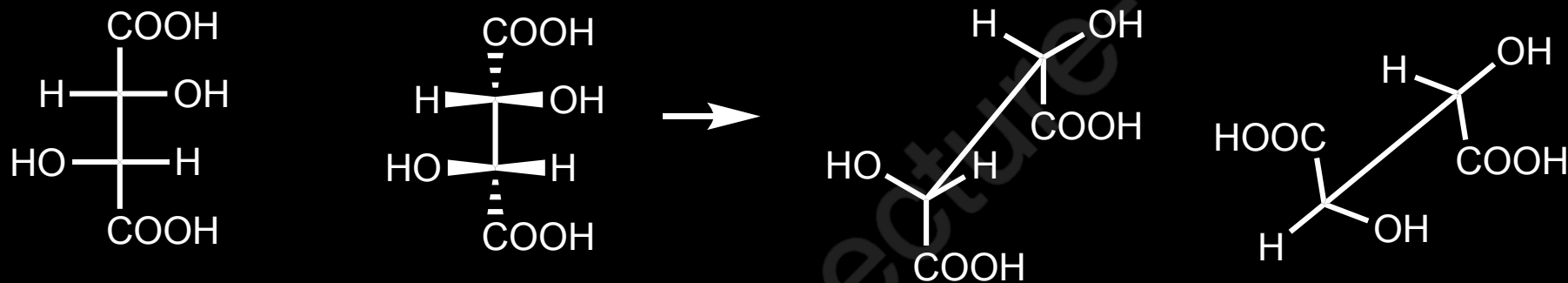


Sawhorse Projection



One to Projection another Projection

Conversion of Fischer Projection into Sawhorse Projection.



Conversion of Sawhorse to Newman to Fischer Projection

