

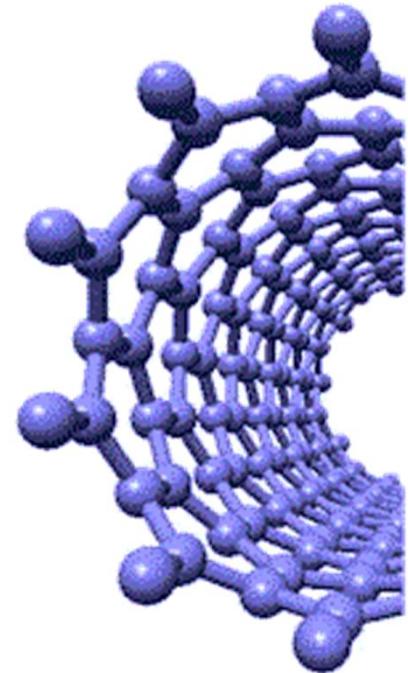


INVESTMENTS IN EDUCATION DEVELOPMENT

Innovation and Development of Study Field Nanomaterials at the Technical University of Liberec

nano.tul.cz

These materials have been developed within the ESF project: Innovation and development of study field Nanomaterials at the Technical University of Liberec



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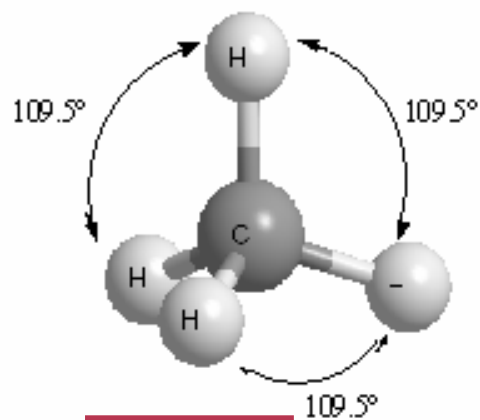


Introduction to stereochemistry

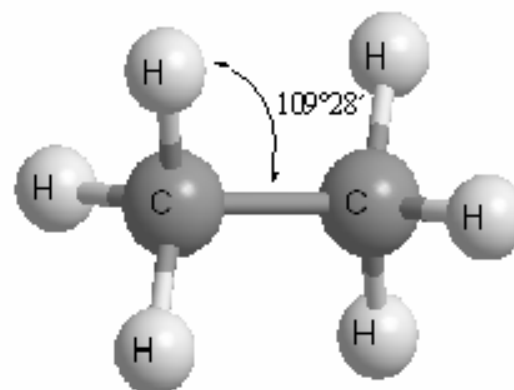
- **shape of molecules**
- **orbitals**
- **covalent bonds**
- **isomers**
- **conformation equilibria**



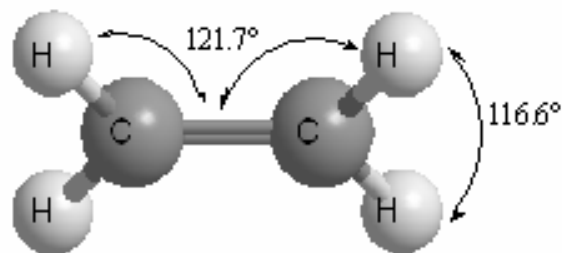
Stereochemistry



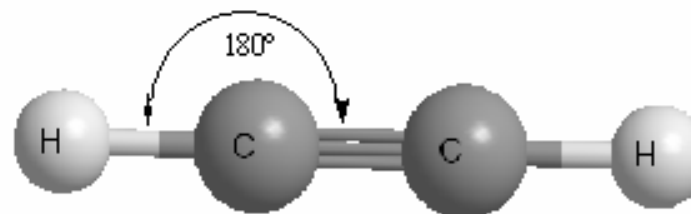
methane



ethane



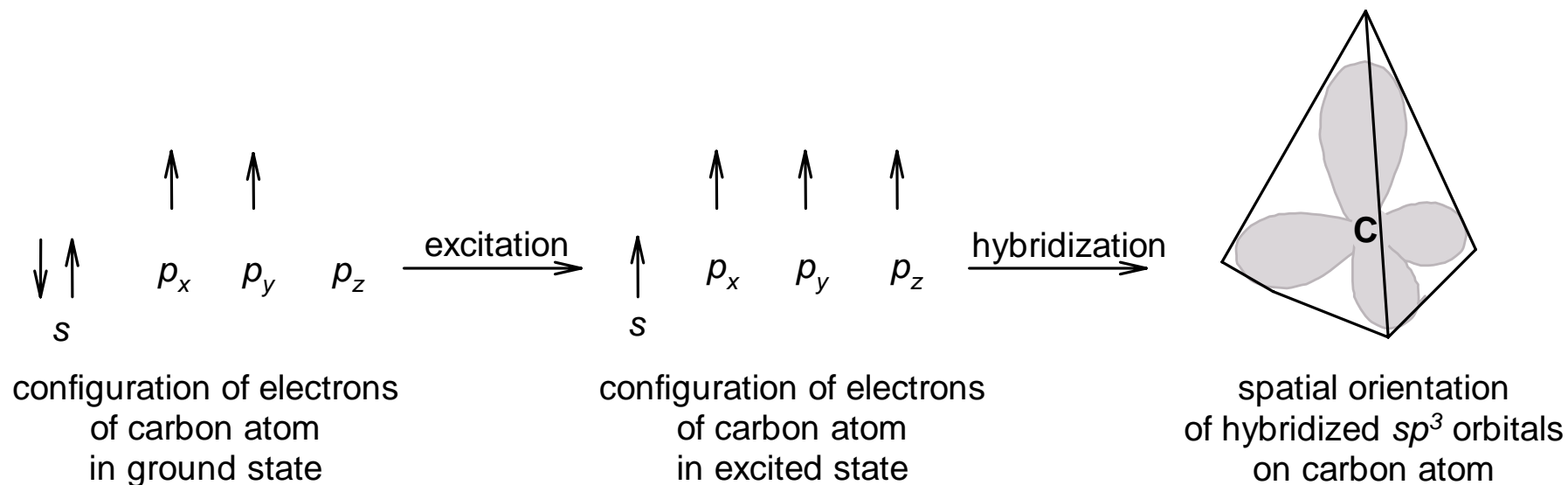
ethene



ethyne

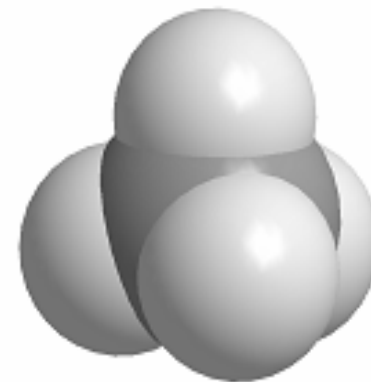
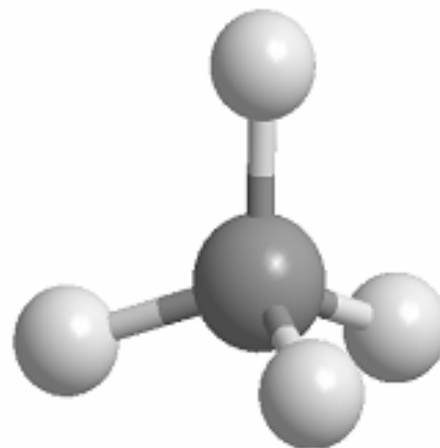
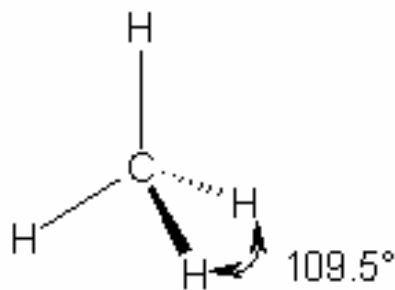
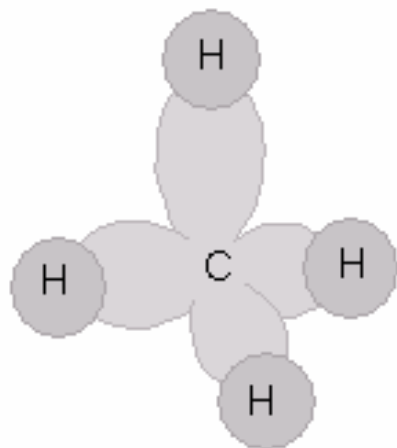


Stereochemistry – origin in orbital picture - hybridization sp^3





Stereochemistry – origin in orbital picture - hybridization sp^3



Methane in

orbital picture

perspektivní vzorec
methanu

perspective drawing
formule

drátový (Kekulého) model
molekuly methanu

ball-and-sticks model

kalotový model
molekuly methanu

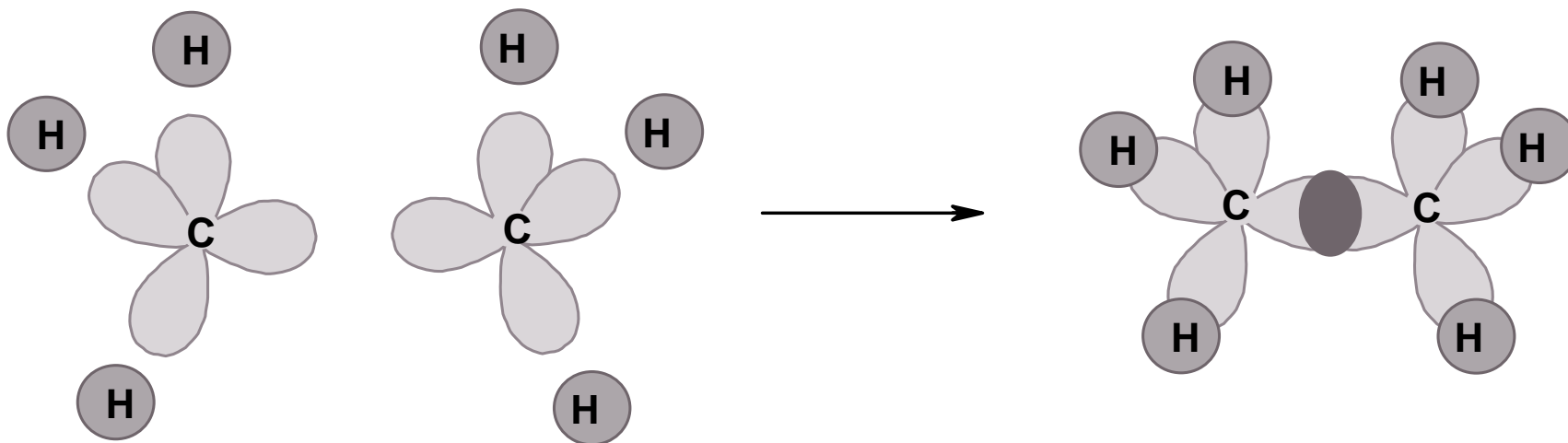
CPK models

!!! generally accepted formalism !!!



Stereochemistry – origin in orbital picture

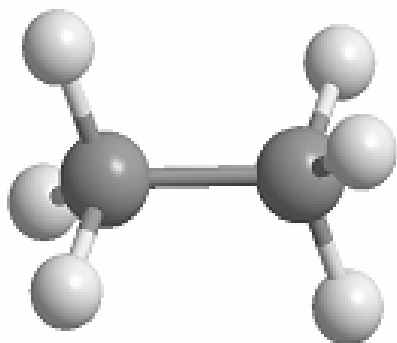
- hybridization sp^3
- bonding in ethane





Stereochemistry – origin in orbital picture

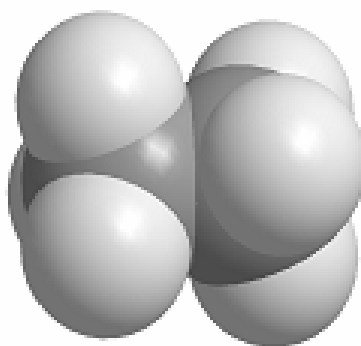
- hybridization sp^3
- bonding in ethane



Kekulého model

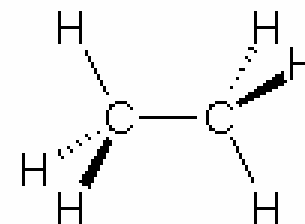
Ethane

ball-and-sticks model



kalotový model

CPK model

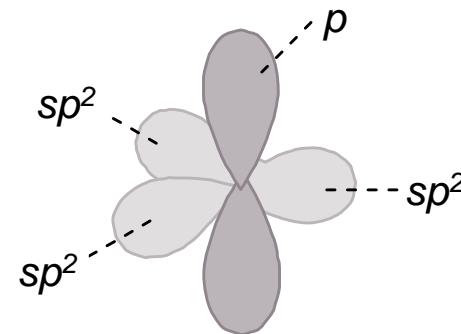
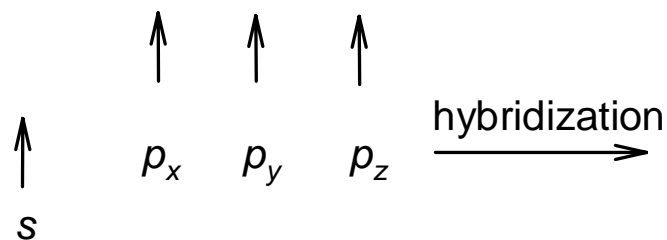


perspektivní vzorec

perspective drawing



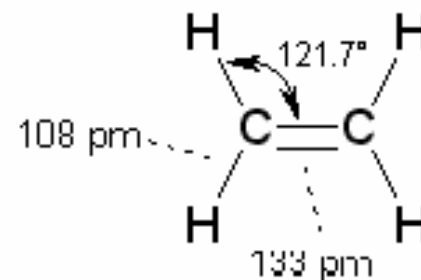
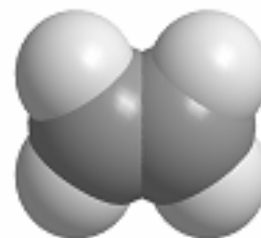
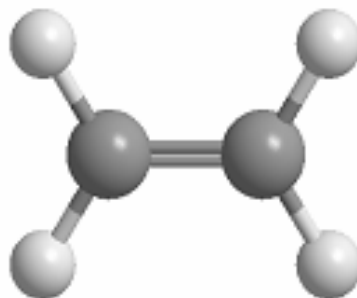
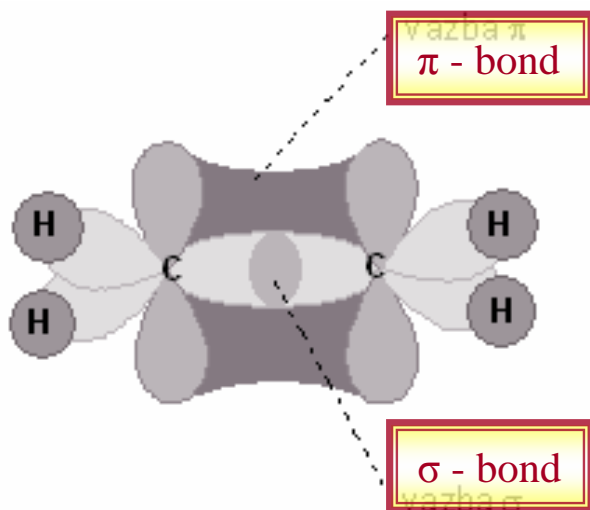
Stereochemistry – origin in orbital picture - hybridization sp^2





Stereochemistry – origin in orbital picture

- hybridization sp^2
- bonding in ethene



Ethene – ethylene

orbital picture

Kekulého model ethenu

ball-and-sticks model

kalotový model ethenu

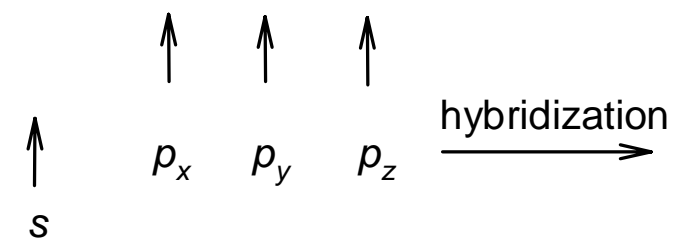
CPK model

bond angles

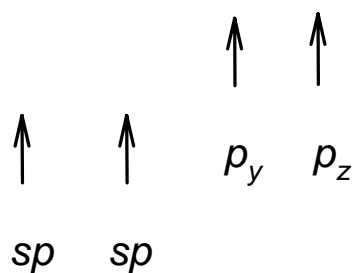


Stereochemistry – origin in orbital picture

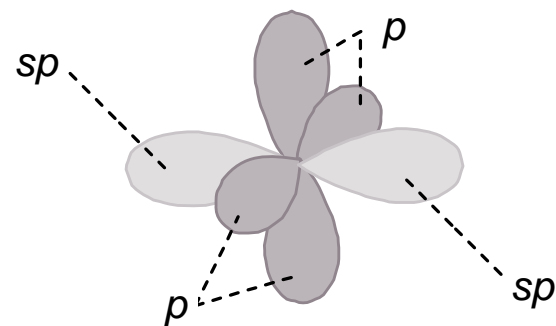
- hybridization sp
- ethyne



excited carbon atom



hybrid orbitals

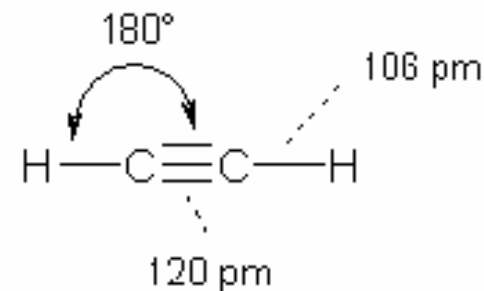
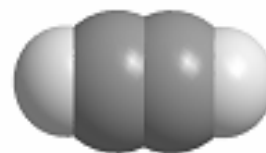
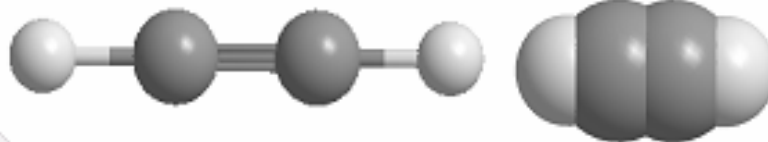
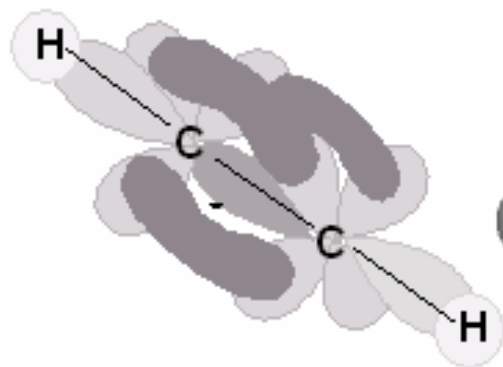


side view



Stereochemistry – origin in orbital picture

- hybridization sp
- bonding in ethyne



Ethyne – acetylene
orbital picture

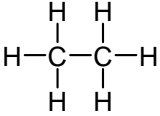
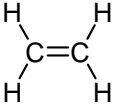
Kekulého model
ethynu
ball-and-sticks model

kalotový model
ethynu
CPK model

strukturní vzorec
ethynu
bond angles

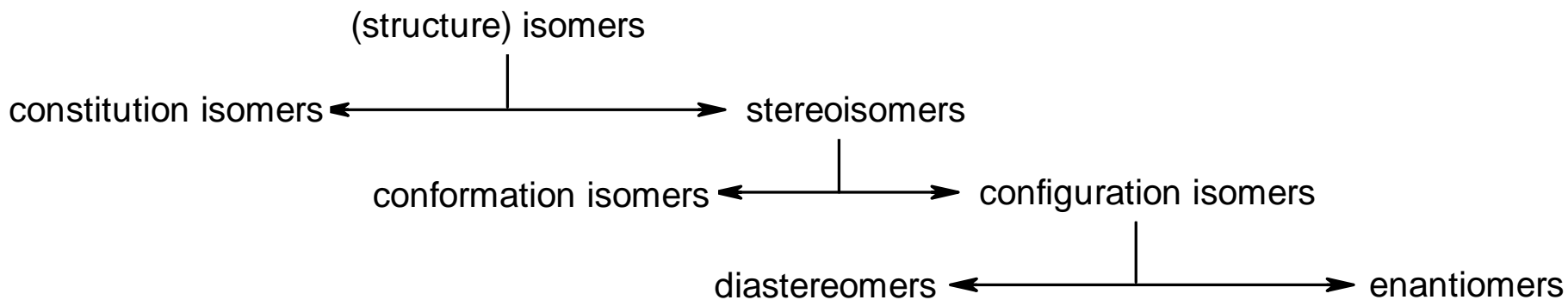


Stereochemistry – origin in orbital picture

Molecule	Hybridization on „C“	Bond angles	C–C bond (pm)	E _D C-C (kJ/mol)	C–H bond (pm)	E _D C-H (kJ/mol)
 ethan	sp^3	109.5°	154	368	110	422
 ethen	sp^2	120°	133	636	108	446
$H-C\equiv C-H$ ethyn	sp	180°	120	837	106	548

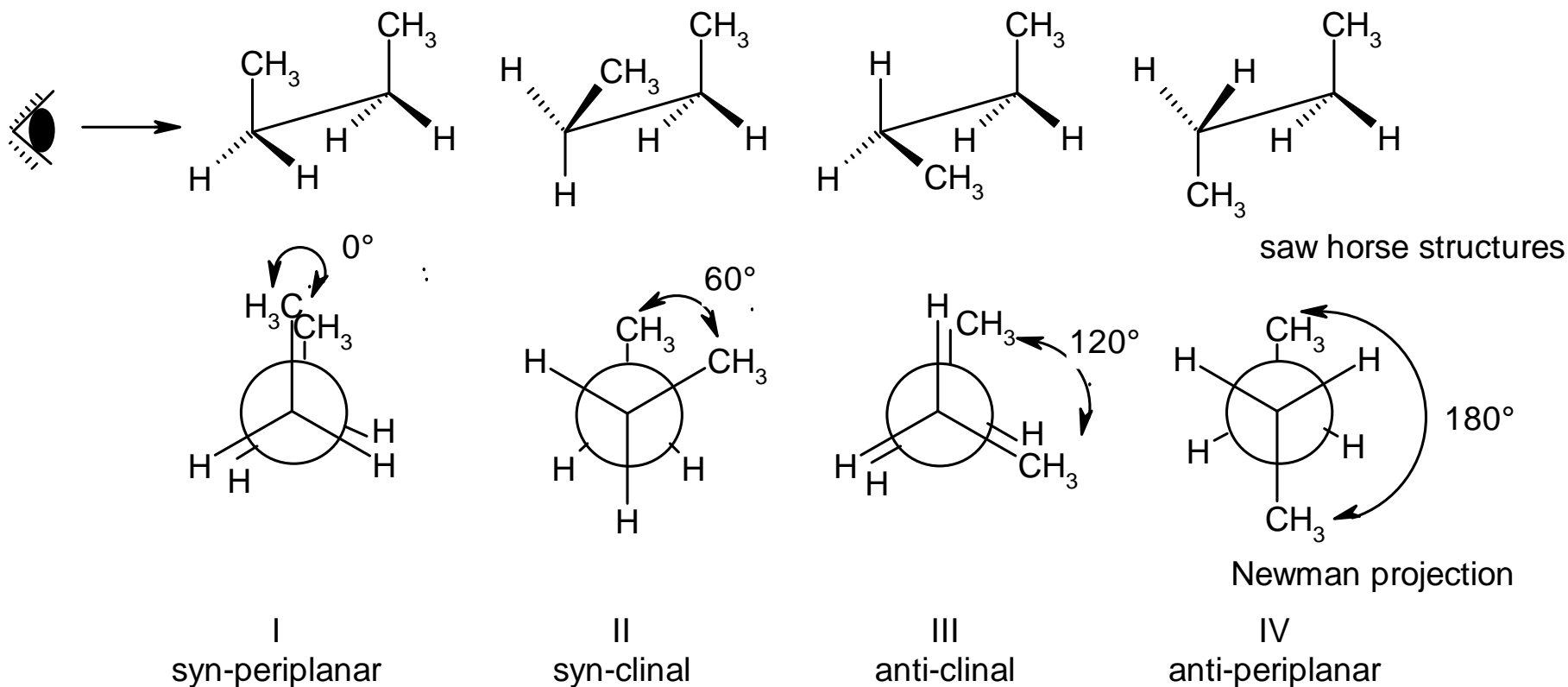


Isomers of organic compounds





Conformation of 2C-3C of butane



Staggered x Eclipsed



Organic Chemistry – molecular (carbon) scaffold



Conformation of 2C-3C of butane

