



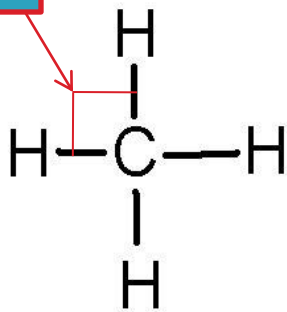
Name of Subject : Pharmaceutical Organic Chemistry III
Subject Code : BP401TT
Name of Chapter : Stereochemistry
Name of Topic : Introduction to stereochemistry,
Stereoselective and stereospecific
reactions
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Structure of Methane

90°

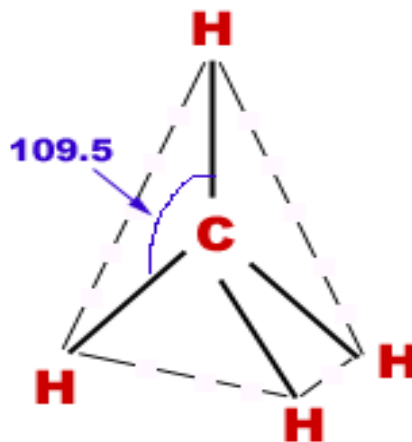


Structure of methane in 2D which shows that bond angle between H-C-H is 90°

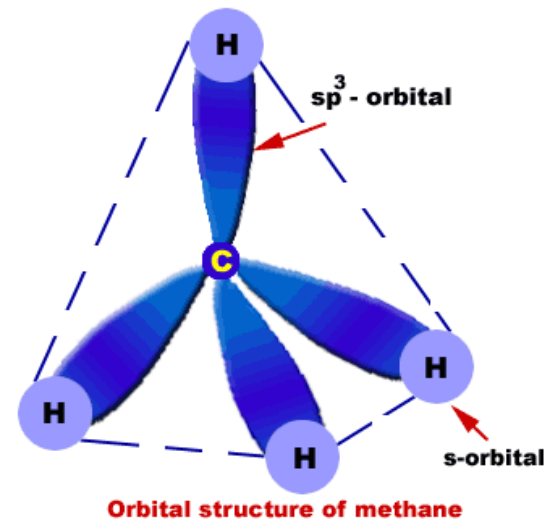
Structure of methane in 2D

WHICH IS WRONG

But the actual bond angle between H-C-H is 109°5' that can be seen by observing the structure in 3D

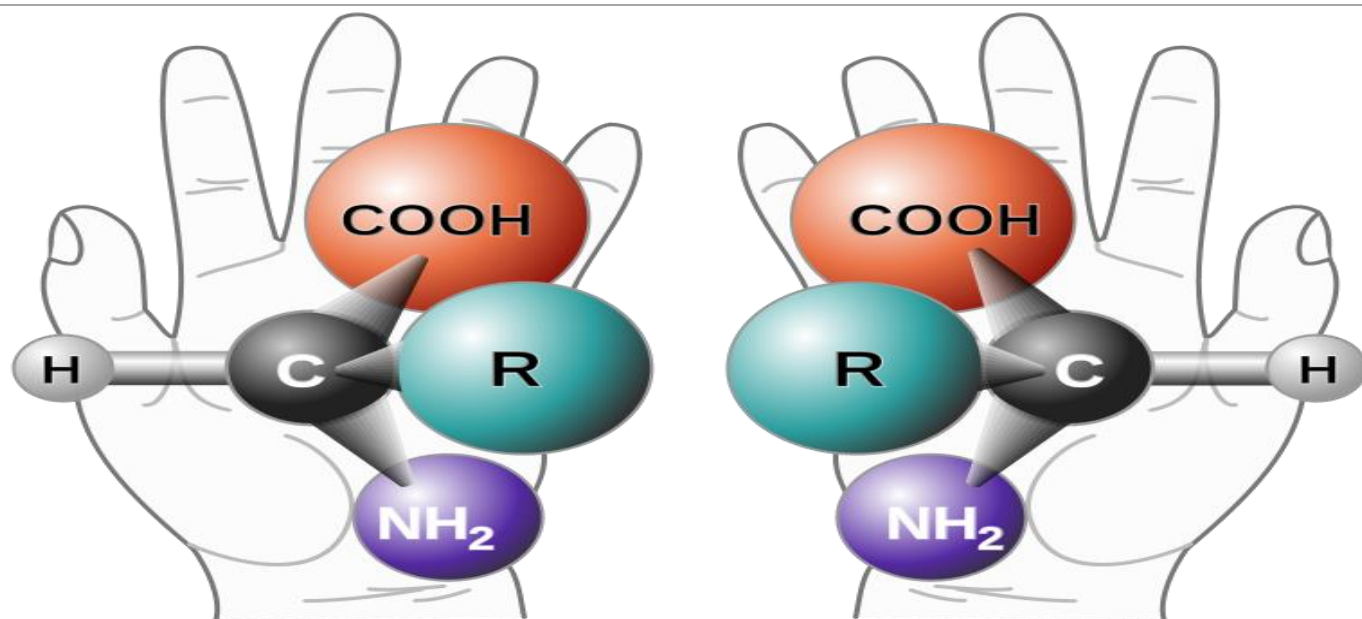


Structure of methane in 3D



Stereochemistry

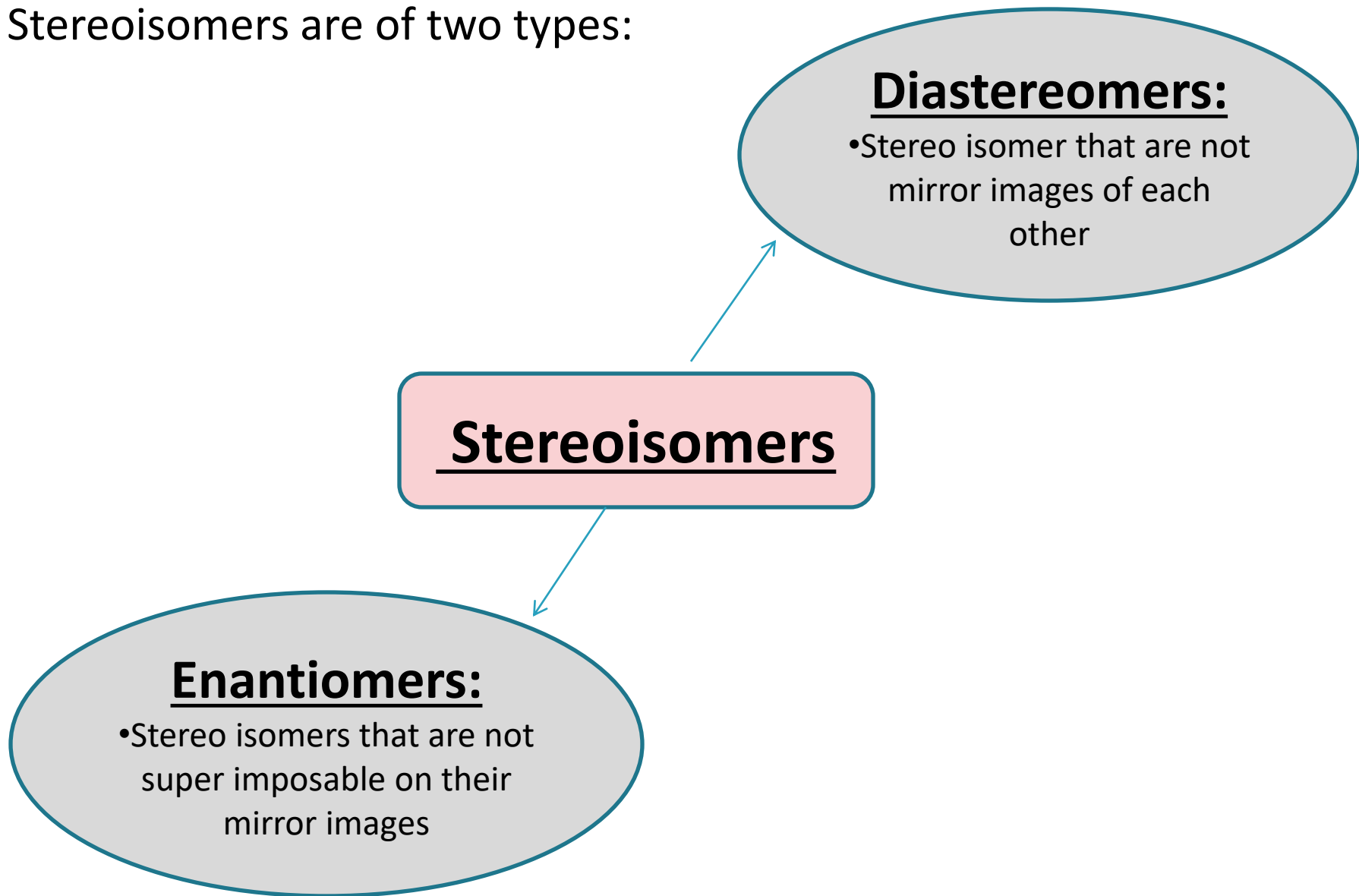
- The branch of science that deals with the structure of compound in 3D is known as **stereochemistry**.
- **Stereoisomers** :- Particular kind of isomers that differ from each other only in the spatial configuration of the atoms are known as Stereoisomers.
- **Chirality** :- Carbon to which four different atoms or functional groups are attached is known as chiral carbon and this phenomenon is known as chirality.



Chirality in
amino acids

Types of Stereoisomers

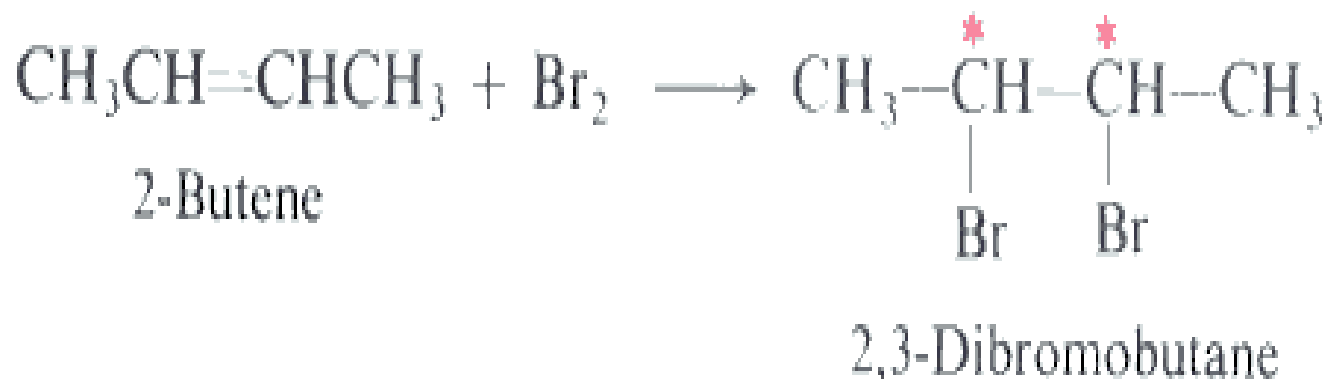
- Stereoisomers are of two types:



Stereo selective reactions

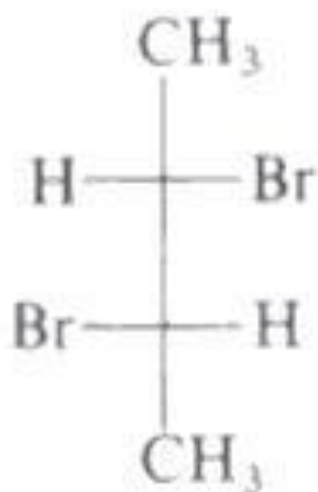
- A reaction that gives one stereo isomer out of several possible diastereomers is known as a stereo selective reaction.
- Reaction of 2-Butene with bromine gives 2,3-Dibromobutane

Stereoselective reactions

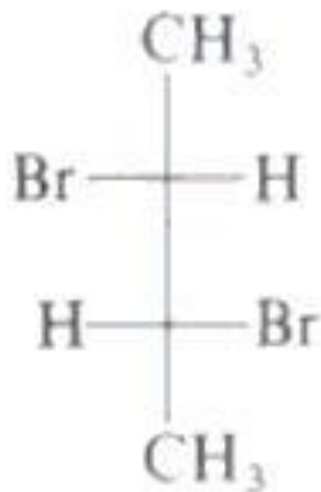


- Product can exist as a pair of enantiomers (I & II) or a meso compound (III).

2,3-Dibromobutane

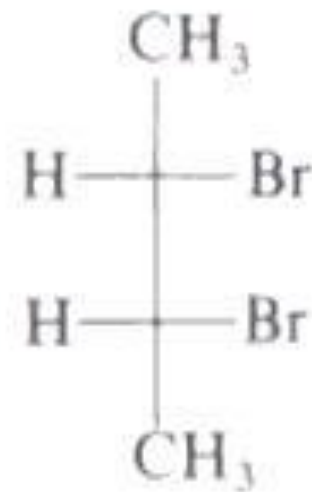


I



II

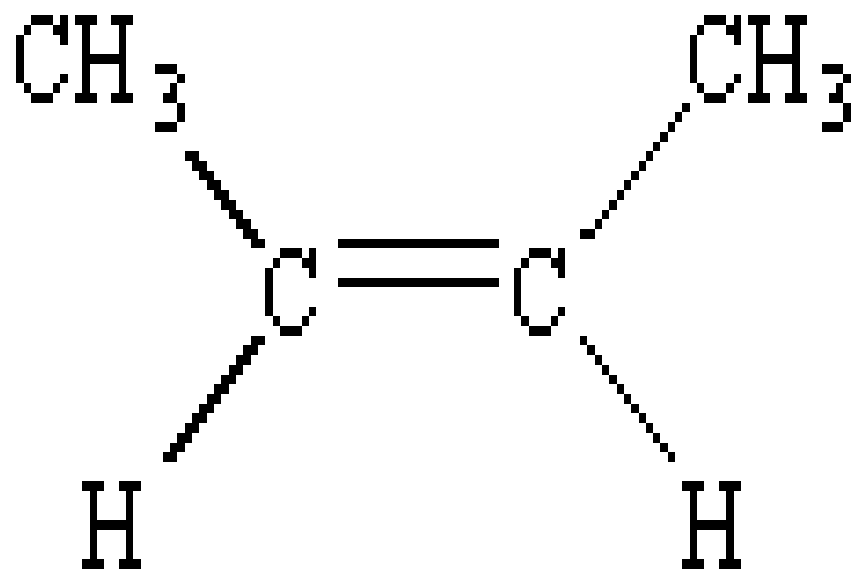
Enantiomers



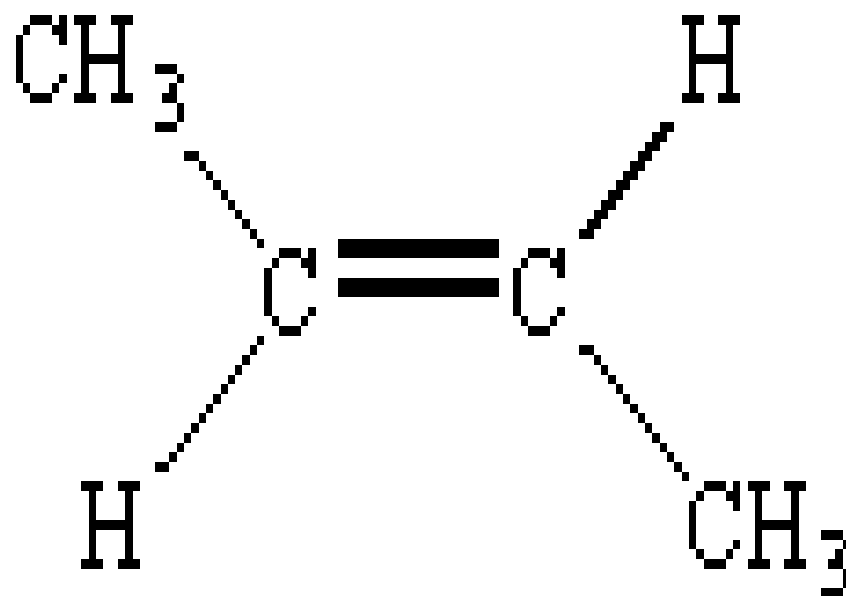
III

Meso

Also the reactants exist as stereoisomers:
A pair of geometric isomers: *cis* & *trans*



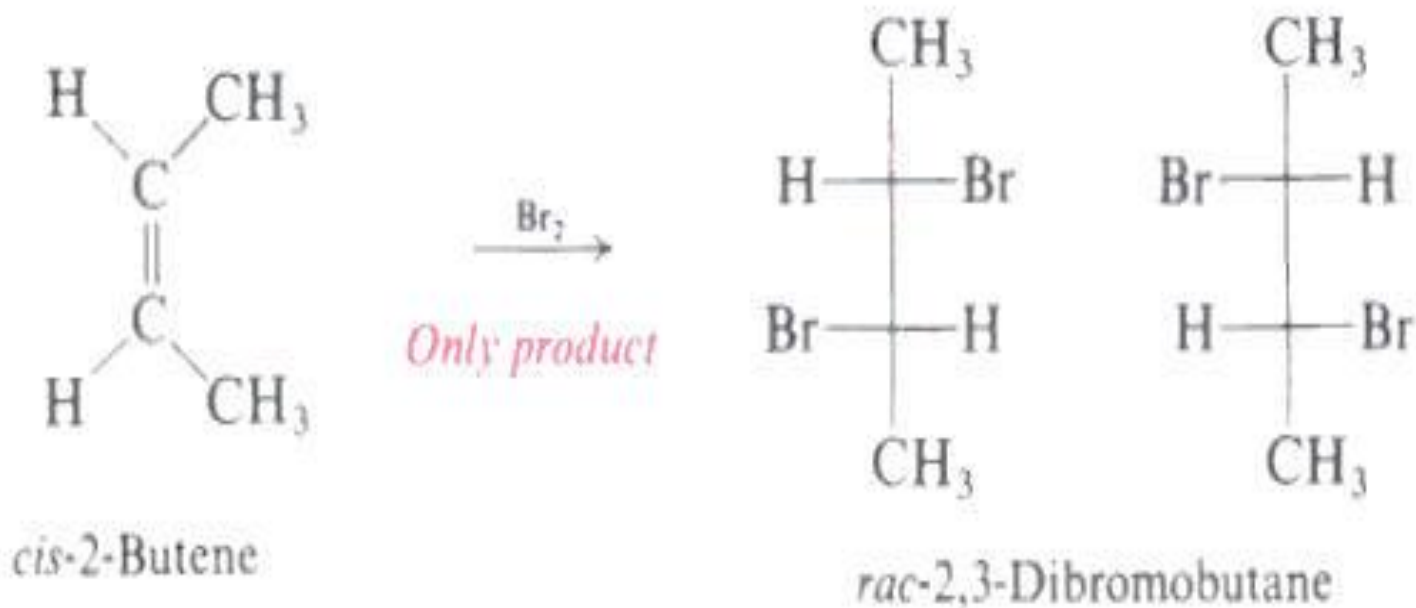
cis-2-Butene



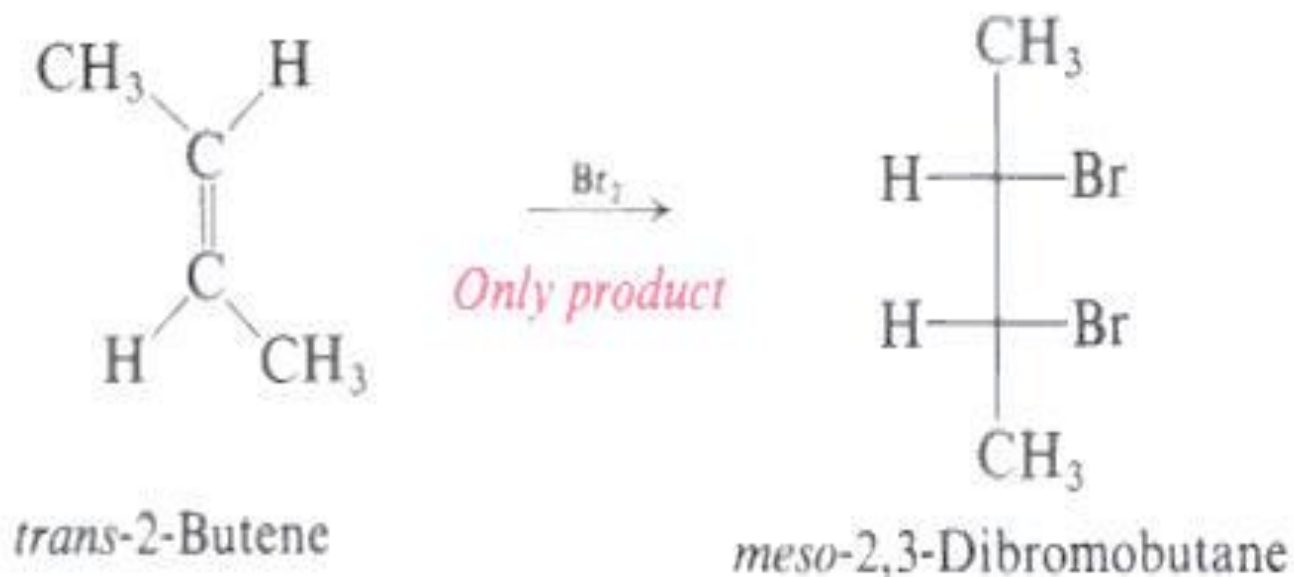
trans-2-Butene

Stereo specific reactions

- A reaction in which stereo chemically different molecules react differently is called a stereo specific reaction
- Example: Reaction with *cis*-2-Butene gives racemic mixture of 2,3-Dibromobutane (A pair of enantiomer).

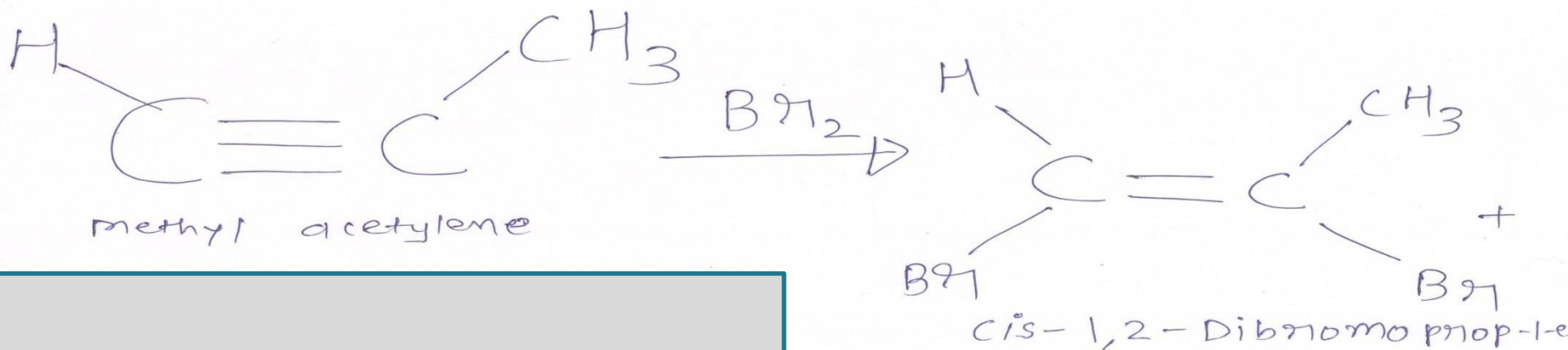


Whereas Reaction with *trans*-2-Butene gives meso 2,3-Dibromobutane (only one product meso compound)



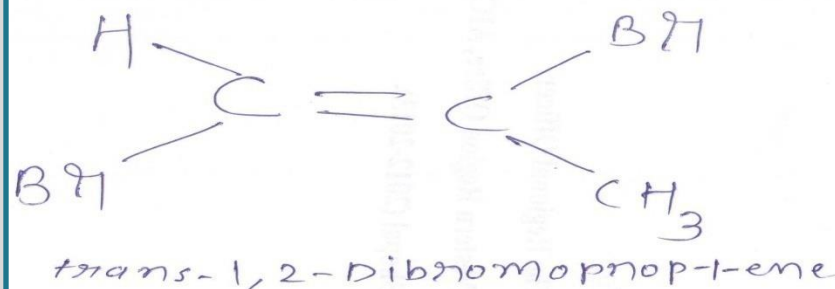
- In both the above reaction, *cis* & *trans*-2-Butene are stereochemically different molecules. Both of them react in different patterns. So this type of reaction is known as a stereospecific reaction.
- Hence the addition of bromine to 2-Butene is both stereoselective as well as stereospecific.

Addition of Bromine to Methyl acetylene



- This reaction gives a pair of geometric isomer (i.e. *cis* & *trans*). So this reaction is stereo selective in nature.

- But Methyl acetylene has no any stereo isomer. So it can't be stereo specific.



Conclusion

- If a reaction is carried out on a compound that has no stereo isomer then it can't be stereo specific but it is stereo selective.
- Further all the stereo specific reactions are stereo selective but it is not necessary that all the stereo selective reactions are stereo specific.

THANK YOU