

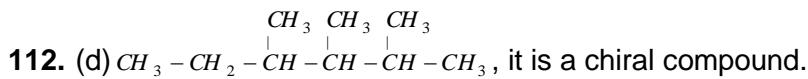
## Structural and stereo isomerism

101. (b) Racemic mixture is combination of *d* and *l* isomers.
102. (c)  $\text{Cl}_2\text{C}=\text{CH}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{CH}_2$ . It can't show geometrical isomerism due to unsymmetrical alkene.
103. (b) Geometrical isomerism.
104. (b)  $\text{CH}_3-\text{CH}_2-\underset{\substack{| \\ \text{CH}_3}}{\text{CH}}-\text{CH}_2-\text{Cl}$
105. (a) Functional isomerism
106. (c) 2-butene
107. (a)  $\text{HCOOC}_2\text{H}_5$  and  $\text{CH}_3\text{COOCH}_3$
108. (a)  $\text{CH}_3\text{OCH}_3$
109. (b) Non superimposable on its mirror image.
110. (c) Spatial arrangement of atoms
111. (a)  $\text{NH}_2-\text{NH}_2$  (Hydrazine)  
Hydrazine has:  
A **single N–N sigma bond**  
Free rotation around the N–N bond  
This gives different conformations:  
  - gauche
  - trans
  - eclipsed
  - staggered $\text{B}_2\text{H}_6$  (Diborane)  
Contains **three-centre two-electron (3c–2e) bonds**



No free rotation

**Cannot show conformations.**



113 (b) If a molecule has:

**2 chiral (asymmetric) carbon atoms**, and

The two chiral centers are **dissimilar** (not identical, not related by symmetry),

And **no internal plane of symmetry** is present

Then the number of optical isomers is given by:

Total =  $2^n$  (where n = number of chiral centers)

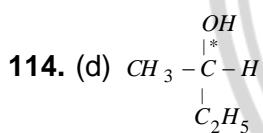
So for **n = 2**:

$2^2 = 4$  optical isomers

These will be:

Two pairs of enantiomers

No meso form (because the chiral centers are dissimilar)



In this structure chiral carbon is present that is why it is optically active.

115. (b) 2-chloro butane will be optically active.

116. (a) 1

117. (a) Conformation

118. (b) Structures are mirror images of each other which are non super impossible so they are enantiomers.

119. (d) 3

Why? — Number of possible structures for intermediate F = 3



When **3-methyl-2-butanol** undergoes **acid-catalyzed dehydration**, it follows an **E1 mechanism**, which goes through a **carbocation intermediate**.

This carbocation can **rearrange**, giving more than one alkene.

Step 1: Formation of the first carbocation

The –OH group is protonated and leaves, forming a **secondary carbocation** at carbon-2.

Step 2: Rearrangement (1,2-hydride shift)

A hydrogen from a neighboring carbon shifts, converting the secondary carbocation into a **more stable tertiary carbocation**.

Step 3: Formation of alkene products (F)

From the two carbocations (before and after shift), elimination can occur in different ways.

This produces **three different alkenes**:

**2-methyl-2-butene** (major product, most substituted)

**3-methyl-1-butene**

**2-methyl-1-butene**

These three are the **three possible structures of compound F**.

Follow-up reaction

When **Br<sub>2</sub> in CCl<sub>4</sub>** is added, each alkene gives **dibromo products**.

Because different alkenes + stereochemistry give **5 total dibrominated products**, this confirms that **three alkenes** were present originally.

120. (d) Both have one chiral carbon atom hence racemic mixture will be obtain

