

Structural and stereo isomerism

101. (b) Racemic mixture is combination of *d* and *l* isomers.
102. (c) $\text{Cl}_2\text{C}=\text{CH}-\text{CH}_2-\text{CH}_2-\text{CH}_2$. It can't show geometrical isomerism due to unsymmetrical alkene.
103. (b) Geometrical isomerism.
104. (b) $\text{CH}_3-\text{CH}_2-\underset{\text{CH}_3}{\overset{*}{\text{CH}}}-\text{CH}_2-\text{Cl}$
105. (a) Functional isomerism
106. (c) 2-butene
107. (a) HCOOC_2H_5 and $\text{CH}_3\text{COOCH}_3$
108. (a) CH_3OCH_3
109. (b) Non superimposable on its mirror image.
110. (c) Spatial arrangement of atoms
111. (a) NH_2-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
 B_2H_6 (Diborane)
 Contains **three-centre two-electron (3c–2e) bonds**



No free rotation

Cannot show conformations.

112. (d) $CH_3 - CH_2 - \overset{\overset{CH_3}{|}}{CH} - \overset{\overset{CH_3}{|}}{CH} - \overset{\overset{CH_3}{|}}{CH} - CH_3$, it is a chiral compound.

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)

114. (d) $CH_3 - \overset{\overset{OH}{|}}{\overset{*}{C}} - H$
 $\quad \quad \quad |$
 $\quad \quad \quad C_2H_5$

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 imposable 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_2 in CCl_4** 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

