Isomerism

Question1

Which of the following compounds does not exhibit optical isomerism?

MHT CET 2025 26th April Morning Shift

Options:

A. 3-Iodohexane

B. 2-Iodopentane

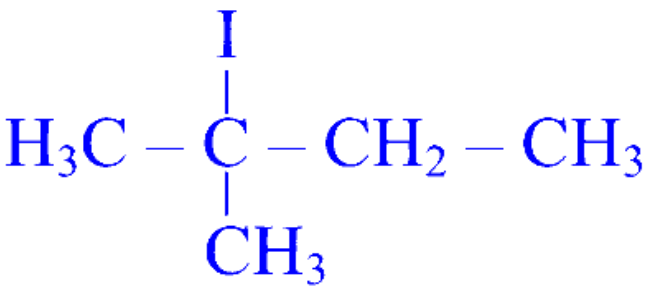
C. 2-Iodo-2-methylbutane

D. 2-Iodo-3-methylbutane

Answer: C

Solution:

A chiral carbon must be attached to four different groups or atoms to show chirality. Compounds having chiral carbon are optically active.



2-Iodo-2-methylbutane
(No chiral carbon atom)

Question2

Which of the following compounds is an optically inactive compound?

MHT CET 2025 25th April Evening Shift

Options:

A. 3-chlorohexane

B. 2-chloro-2-methylbutane

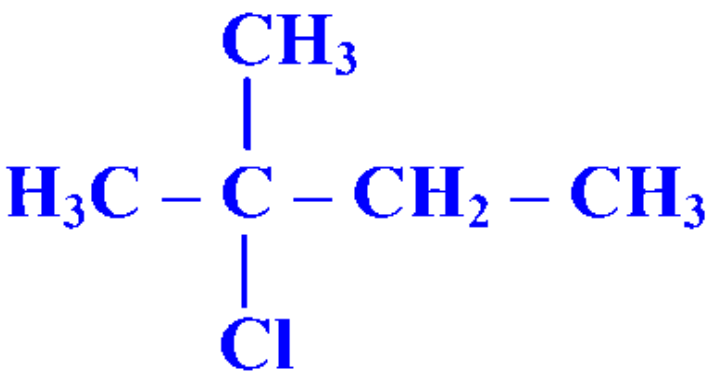
C. 2-chloropentane

D. 2-chloro-3-methylbutane

Answer: B

Solution:

The compound 2-chloro-2-methylbutane is achiral as carbon is bonded two similar group $(-CH_3)$ and hence, it is an optically inactive compound.



Question3

How many chiral carbon atoms are present in 2-chloro-3,4,5-trimethylhexane?

MHT CET 2025 23rd April Evening Shift

Options:

A. 4

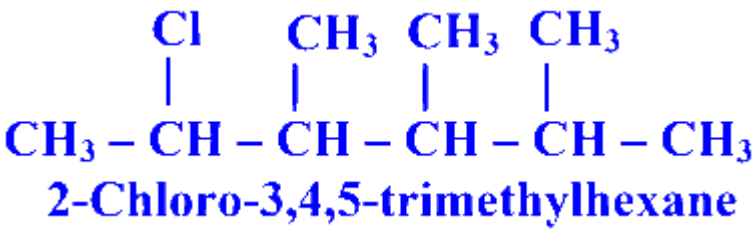
B. 3

C. 2

D. 1

Answer: B

Solution:



∴ The number of chiral carbon atoms are 3.

Question4

Which among the following is a pair of functional isomers?

MHT CET 2025 23rd April Morning Shift

Options:

A. Butan-2-ol and 2-Methylpropanol

B. Butan-1-ol and 1-Methoxypropane

C. 1-Methoxypropane and Ethoxyethane

D. 2-Methoxypropane and 1-Methoxypropane

Answer: B

Solution:

$$CH_3 - CH_2 - CH_2 - CH_2 - OH$$
Butan-1-ol (alcohol)
and
$$CH_3 - CH_2 - CH_2 - O - CH_3$$
1-Methoxypropane (ether)

Both have same molecular formula $(C_4H_{10}O)$ but different functional groups.

Question5

Which of the following alkenes does NOT exhibit cis-trans isomerism?

MHT CET 2025 22nd April Evening Shift

Options:

A. But-1-ene

B. But-2-ene

C. 3,4-Dimethylhex-3-ene

D. Pent-2-ene

Answer: A

Solution:

For any compound to exhibit cis-trans isomerism, it must contain identical atoms or groups of atoms on either side of systems around which free rotation is not possible such as double bond.

Hence, but-1-ene $CH_3 - CH_2 - CH = CH_2$ will not exhibit cis-trans isomerism.

Question6

What is the number of structural isomers possible for alkene with molecular formula C_5H_{10} ?

MHT CET 2025 22nd April Morning Shift

Options:

A. 2

B. 3

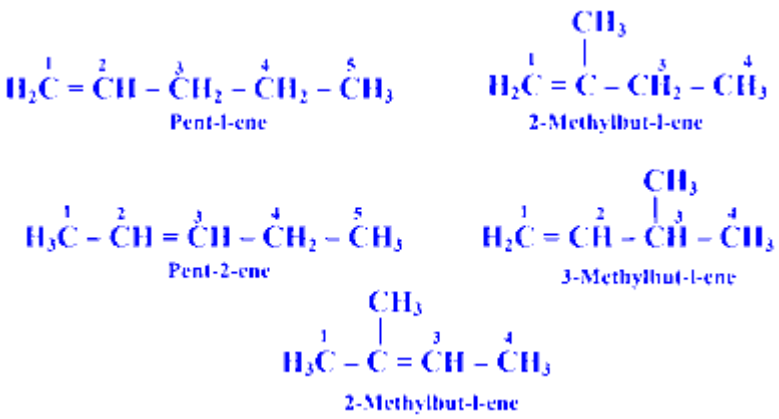
C. 4

D. 5

Answer: D

Solution:

Number of structural isomers for an alkene having molecular formula $C_5H_{10} = 5$



Question7

What is the number of chiral carbon atoms present in 3,4-Dibromohexane?

MHT CET 2025 21st April Morning Shift

Options:

A. 5

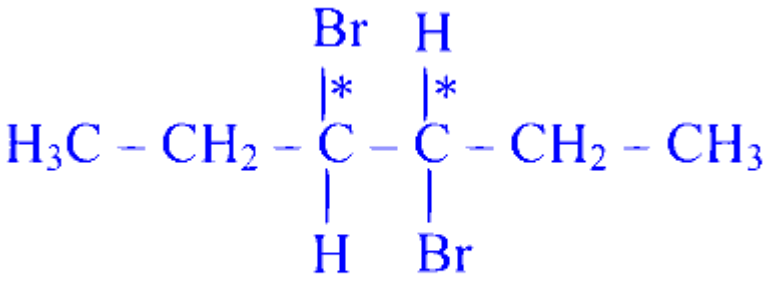
B. 4

C. 3

D. 2

Answer: D

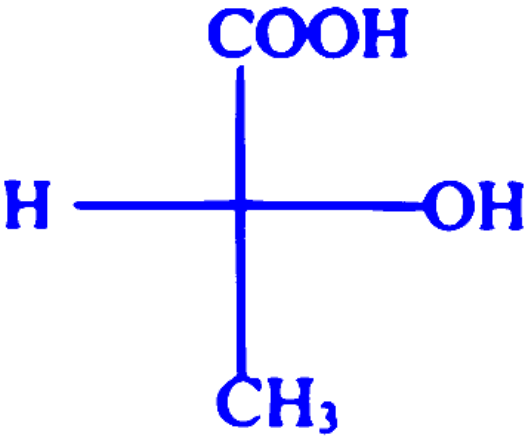
Solution:



3,4-Dibromohexane

Question8

Identify the name of method used for three dimensional representation of molecule as follows.



MHT CET 2025 19th April Evening Shift

Options:

A. Wedge formula

B. Fisher projection formula

C. Newman projection formula

D. Sawhorse formula

Answer: B

Solution:

The diagram shows a **cross-like representation** where:

- Vertical bonds go **behind the plane**
- Horizontal bonds come **out of the plane**

This is the characteristic feature of a **Fischer projection** .

✅ **Correct answer: B. Fischer projection formula**

Why not others?

- **Wedge formula** → uses solid and dashed wedges
- **Newman projection** → looks along a C–C bond
- **Sawhorse formula** → oblique view of C–C bond

✔ **Answer: Fischer projection formula**

Question9

Identify chiral molecule from following:

MHT CET 2024 16th May Evening Shift

Options:

A. 2-Bromopropane

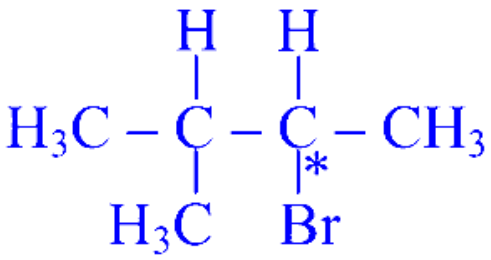
B. 2-Bromo-2-methylbutane

C. 2-Bromo-3-methylbutane

D. 3-Bromopentane

Answer: C

Solution:



2-Bromo-3-methylbutane

Question10

Which of the following is NOT optically active compound?

MHT CET 2024 16th May Morning Shift

Options:

A. 1,2-Diiodobutane

B. 1,3-Diiodobutane

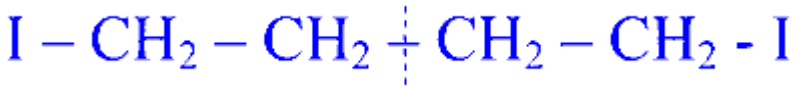
C. 1,4-Diiodobutane

D. 2,3-Diiodobutane

Answer: C

Solution:

1,4-Diidobutane has plane of symmetry. Thus, it does not rotate the plane of plane polarized light and is optically inactive.



Question11

Which of the following alkenes does NOT exhibit cis-trans isomerism?

MHT CET 2024 15th May Evening Shift

Options:

A. But-1-ene

B. But-2-ene

C. 3,4-Dimethylhex-3-ene

D. Pent-2-ene

Answer: A

Solution:

For any compound to exhibit cis-trans isomerism, it must contain identical atoms or groups of atoms on either side of double bond. Hence, but-1-ene $CH_3 - CH_2 - CH = CH_2$ will not exhibit cis-trans isomerism.

Question12

What is the number of chiral carbon atoms present in 2-chloro-3,4-dimethylhexane?

MHT CET 2024 15th May Morning Shift

Options:

A. One

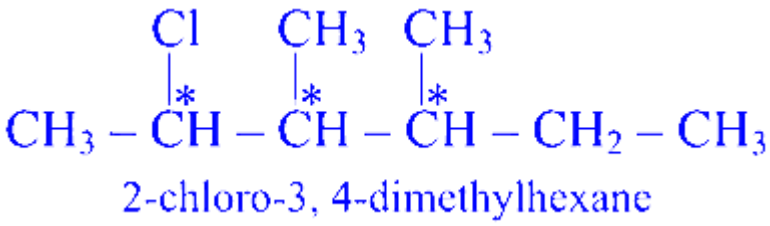
B. Two

C. Three

D. Four

Answer: C

Solution:



The number of chiral carbon atoms is 3.

Question13

Which of the following isomers of C_4H_9Br is a chiral molecule?

MHT CET 2024 15th May Morning Shift

Options:

A. n-Butyl bromide

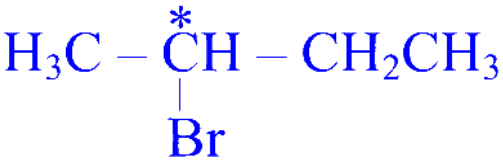
B. sec- Butyl bromide

C. Isobutyl bromide

D. tert-Butyl bromide

Answer: B

Solution:



sec – butyl bromide

Carbon atom in a molecule marked with asterisk (*) denotes the chiral carbon atom. Compounds having chiral carbon are optically active.

Question14

What is the number of chiral carbon atoms in threose?

MHT CET 2024 10th May Evening Shift

Options:

A. One

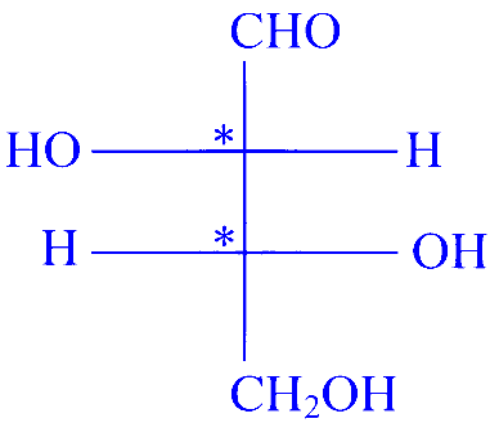
B. Two

C. Three

D. Four

Answer: B

Solution:



Threose

Question15

Which among the following is NOT a true statement regarding enantiomers?

MHT CET 2024 9th May Evening Shift

Options:

A. Enantiomers have identical refractive index.

B. Enantiomers have same chemical properties.

C. Enantiomers are superimposable mirror images of each other.

D. Enantiomers have equal but opposite optical rotation.

Answer: C

Solution:

Option C is NOT a true statement regarding enantiomers.

Enantiomers are non-superimposable mirror images of each other. Each enantiomer in a pair has opposite configurations at all chiral centers, resulting in compounds that cannot be placed on top of one another and give the same structure in three-dimensional space. This non-superimposable nature is what makes them distinct from one another in terms of their optical activity, although they have identical physical properties like melting point and boiling point, except for the direction in which they rotate plane-polarized light.

Question16

Which among the following is NOT a pair of isomers?

MHT CET 2024 4th May Evening Shift

Options:

A. Butan-2-ol and 2-Methylpropanol

B. Butan-1-ol and 1-Methoxypropane

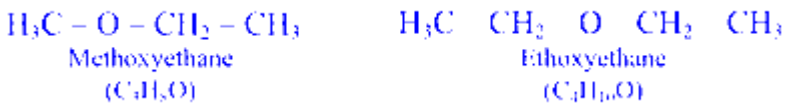
C. 1-Methoxypropane and Ethoxyethane

D. Methoxyethane and Ethoxyethane

Answer: D

Solution:

Isomers have same molecular formula but different arrangement of atoms.



Methoxyethane and Ethoxyethane have different molecular formulae and hence, they are not isomers.

Question17

Which from following pairs of compounds exhibits metamerism?

MHT CET 2024 4th May Morning Shift

Options:

A. But-2-ene and But-1-ene

B. Methoxymethane and Ethanol

C. Ethoxyethane and Methoxypropane

D. Butane and 2-Methylpropane

Answer: C

Solution:

Ethoxyethane ($CH_3 - CH_2 - O - CH_2 - CH_3$) and methoxypropane ($CH_3 - O - CH_2 - CH_2 - CH_3$) have same functional group as ether but have different distribution of carbon atoms attached to etheral oxygen. Thus, both pair of compounds show metamerism.

Question18

Which of the following alkenes does NOT exhibit cis-trans isomerism?

MHT CET 2024 4th May Morning Shift

Options:

A. But-1-ene

B. But-2-ene

C. 3,4-Dimethylhex-3-ene

D. Pent-2-ene

Answer: A

Solution:

For any compound to exhibit cis-trans isomerism, it must contain identical atoms or groups of atoms on either side of double bond. Hence, but-1-ene $CH_3 - CH_2 - CH = CH_2$ will not exhibit cis-trans isomerism.

Question19

Identify the chiral molecule from following.

MHT CET 2024 4th May Morning Shift

Options:

A. 2-Iodopropane

B. 2-Iodo-2-methylbutane

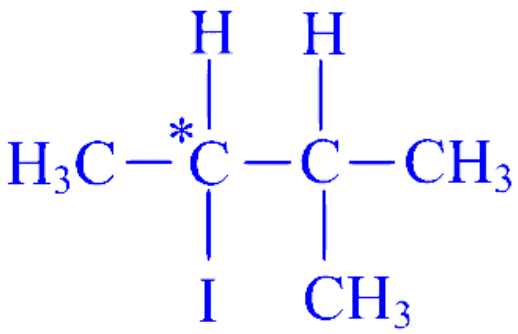
C. 2-Iodo-3-methylbutane

D. 3-Iodopentane

Answer: C

Solution:

A chiral carbon must be attached to four different groups or atoms. Carbon atom in a molecule marked with asterisk (*) denotes the chiral carbon atom.



2-Iodo-3-methylbutane

Question20

How many isomers of $C_4H_{11}N$ are secondary amines?

MHT CET 2024 4th May Morning Shift

Options:

A. One

B. Two

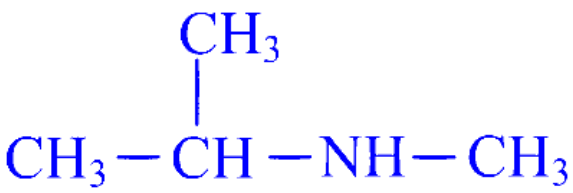
C. Three

D. Four

Answer: C

Solution:

Three isomers of $C_4H_{11}N$ are secondary amines.

Amine	Common name
$C_2H_5 - NH - C_2H5$	Diethylamine
$CH_3 - CH_2 - CH_2 - NH - CH_3$	Methylpropylamine
	Methylisopropylamine

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Question21

Which from following properties is NOT identical for Enantiomers?

MHT CET 2024 3rd May Morning Shift

Options:

A. Melting point

B. Density

C. Refractive index

D. Sign of optical rotation

Answer: D

Solution:

The property that is NOT identical for enantiomers is:

Option D: Sign of optical rotation

Enantiomers have identical physical properties such as melting point, density, and refractive index. However, they differ in the way they rotate plane-polarized light; specifically, they rotate light in equal magnitudes but in opposite directions. This property is known as optical activity, and the direction in which each enantiomer rotates the plane of polarized light (either clockwise or counterclockwise) is called the sign of optical rotation.

Question22

Idertify chiral molecule from following.

MHT CET 2024 2nd May Evening Shift

Options:

A. 2 - Chloropropane

B. 2 - Chloro - 2 - methylbutane

C. 3 - Chloro - 3 - methylbutane

D.

None of These

Answer: D

Solution:

First, recall that for a carbon atom to be a **chiral center**, it must have four **different** substituents. Let us examine each compound:

1) 2-Chloropropane

Structure:

$CH_3 - CHCl - CH_3$

At the middle carbon (C_2), the four substituents would be:

Cl

H

CH_3 (on one side)

CH_3 (on the other side)

Since there are **two identical CH_3 groups**, this carbon does **not** have four different substituents and is therefore **not chiral**.

---

2) 2-Chloro-2-methylbutane

A possible way to see the structure is:

$$CH_3 - \underbrace{C(Cl,\ CH_3)}_{C_2} - CH_2 - CH_3$$

At carbon 2 (C_2), the substituents are:

Cl

a (single) CH_3 substituent (the "2-methyl")

the chain to the left (CH_3)

the chain to the right (CH_2-CH_3)

But observe carefully: the "chain to the left" is just a **single CH_3** (because C1 is simply CH_3). That means on C2 there are **two separate methyl groups** (one is the "2-methyl" substituent, the other is the main-chain carbon 1). Hence C2 has two identical substituents (CH_3 and CH_3), so it is **not chiral**.

---

3) 3-Chloro-3-methylbutane

Analogously, for 3-chloro-3-methylbutane, the third carbon (C_3) is bonded to:

Cl

a "3-methyl" group (CH_3)

the chain to the left (CH_2-CH_3)

the chain to the right (CH_3)

But again, on closer inspection, C3 ends up having **two methyl groups**:

one is the explicit "3-methyl" substituent,

the other is the fourth carbon of the main chain, which is just CH_3.

Because of these two identical CH_3 substituents, C3 is not chiral.

---

4) None of These

None of the given molecules has a carbon with four different substituents. Therefore, none of the listed compounds is chiral. If the question strictly asks "Which is chiral?" then the correct conclusion is that no option (A), (B), (C) is actually chiral.

Conclusion:
All the given compounds (2-chloropropane, 2-chloro-2-methylbutane, and 3-chloro-3-methylbutane) are achiral because none contains a carbon attached to four different groups.
👉 Correct answer: none of these.

Question23

What is the number of moles of carbon atoms present in n mole molecules of an alkane if it exhibits five structural isomers?

MHT CET 2024 2nd May Morning Shift

Options:

A. 4n

B. 3n

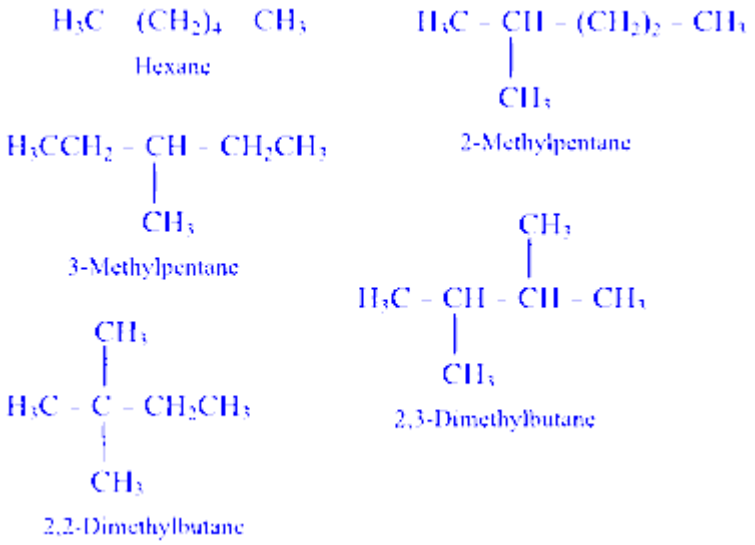
C. 5n

D. 6n

Answer: D

Solution:

An alkane will exhibit five structural isomers when there are 6 moles of carbon atoms present in it. The structural isomers of alkane C_6H_{14} are as follows:



Question24

Which among the following is NOT a true statement for enantiomers?

MHT CET 2023 14th May Morning Shift

Options:

A. Enantiomers have identical refractive index.

B. Enantiomers are superimposable mirror images of each other.

C. Enantiomers have same chemical properties.

D. Enantiomers have equal but opposite optical ration.

Answer: B

Solution:

Enantiomers are non-superimposable mirror images of each other. This means that no matter how you rotate or flip one enantiomer, it will not perfectly align with its mirror image. Each enantiomer has a chiral center, or a carbon atom with four different substituents attached to it, leading to two different spatial arrangements that cannot be superimposed onto each other. Therefore, Option B, which states that "Enantiomers are superimposable mirror images of each other," is NOT a true statement about enantiomers.

As for the other options:

Option A is true: Enantiomers have the same physical properties, such as refractive index, boiling point, and melting point, in an achiral environment.

Option C is mostly true: Enantiomers have the same chemical properties in achiral environments or with achiral reagents, but they can behave differently in chiral environments or with chiral reagents, including biological systems.

Option D is true: Enantiomers have equal but opposite optical rotation; one enantiomer will rotate plane-polarized light to the right (dextrorotatory, or +) and the other to the left (levorotatory, or −) by the same magnitude, but in opposite directions.

Question25

What is the molecular formula of an alkane if it exhibits three structural isomers?

MHT CET 2023 13th May Evening Shift

Options:

A. C_3H_8

B. C_4H_{10}

C. C_5H_{12}

D. C_6H_{14}

Answer: C

Solution:

Alkanes have the following numbers of structural isomers:

C_1H_4 (methane): 1 isomer

C_2H_6 (ethane): 1 isomer

C_3H_8 (propane): 1 isomer

C_4H_{10} (butane): 2 isomers

C_5H_{12} (pentane): 3 isomers

C_6H_{14} (hexane): 5 isomers

Since three structural isomers correspond to pentane, the correct choice is

Option C

C_5H_{12}

Question26

Which from following methods of structural formula representation uses conventionally a point for front carbon and a circle around it for rear carbon?

MHT CET 2023 13th May Morning Shift

Options:

A. Andiron formula

B. Condensed formula

C. Newman projection formula

D. Fisher projection formula

Answer: C

Solution:

The method of structural formula representation that **uses a dot for the front carbon and a circle for the rear carbon** is:

✅ **C. Newman projection formula**

Explanation:

- In a **Newman projection** , the molecule is viewed along a **C–C bond** .
- The **front carbon** is represented by a **dot (•)** .
- The **rear carbon** is represented by a **circle (○)** .
- This method is especially useful for studying **conformations** like staggered and eclipsed forms.

✔ **Correct answer: C**

Question27

What is the number of moles of 'C' atoms present in n mole molecule of alkane if it exhibits three structural isomers?

MHT CET 2023 12th May Evening Shift

Options:

A. 3n

B. 4n

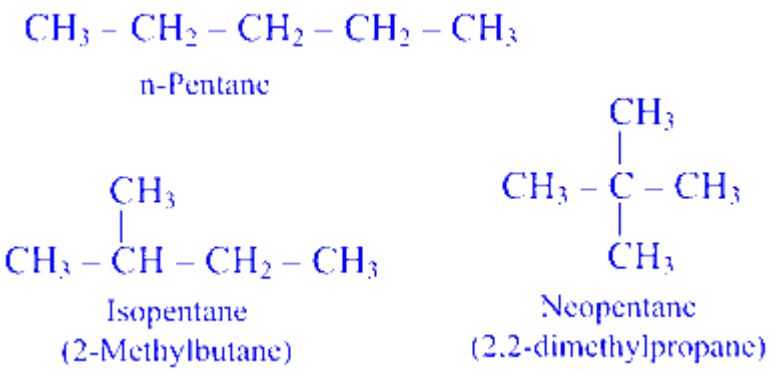
C. 5n

D. 6n

Answer: C

Solution:

Pentane (C_5H_{12}) exists in three isomeric forms:



Question28

Identify the chiral molecule from the following.

MHT CET 2023 12th May Morning Shift

Options:

A. 2-Iodopropane

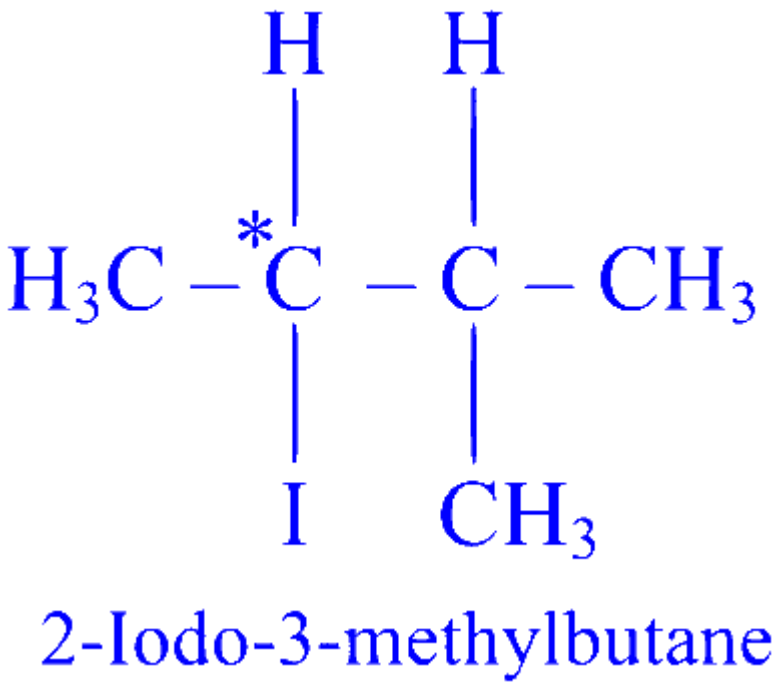
B. 2-Iodo-2-methylbutane

C. 2-lodo-3-methylbutane

D. 3-Iodopentane

Answer: C

Solution:



2-Iodo-3-methylbutane

Question29

How many isomers of $C_4H_{11}N$ are tertiary amines?

MHT CET 2023 12th May Morning Shift

Options:

A. One

B. Two

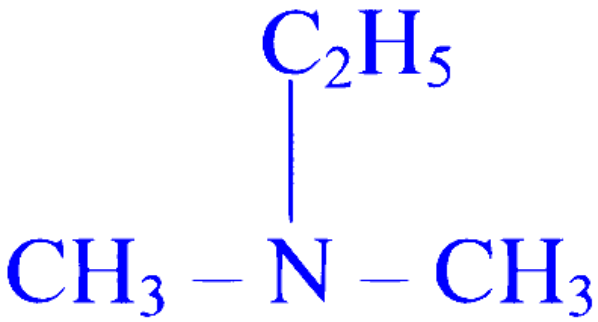
C. Three

D. Four

Answer: A

Solution:

Only one isomer of $C_4H_{11}N$ is a tertiary amine.



Question30

Identify the molecular formula of an alkane that exhibits only two different structural isomers.

MHT CET 2023 10th May Evening Shift

Options:

A. C_2H_6

B. C_3H_8

C. C_4H_{10}

D. C_6H_{12}

Answer: C

Solution:

Number of Carbon atoms	Alkane	Number of isomers
2	Ethane	No structural isomer
3	Propane	No structural isomer
4	Butane	Two
6	Hexane	Five

Question31

Identify the chiral molecule from following.

MHT CET 2023 9th May Morning Shift

Options:

A. 2-Bromopropane

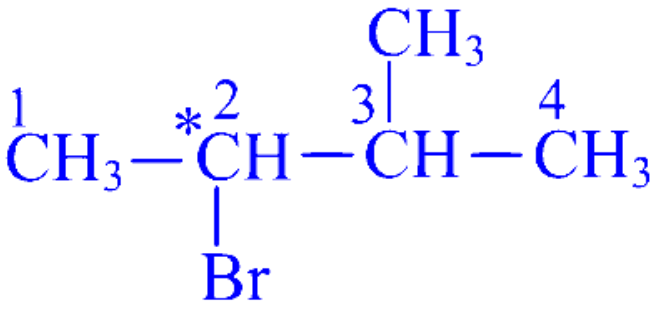
B. 2-Bromo-2-methylbutane

C. 2-Bromo-3-methylbutane

D. 3-Bromopentane

Answer: C

Solution:



2-Bromo-3-methylbutane is a chiral molecule.

Question32

Which from following pairs of compounds is an example of metamerism?

MHT CET 2022 11th August Evening Shift

Options:

A. But-2-ene and But-1-ene

B. m-Butane and 2-Methylpropane

C. Ethoxyethane and methoxypropane

D. Dimethyl ether and ethyl alcohol

Answer: C

Solution:

Metamerism occurs when two isomers have the same molecular formula and the same functional group (usually involving a heteroatom like O, N or S), but differ in the alkyl groups attached to that heteroatom.

Among your options:

• A (but-2-ene vs. but-1-ene) – position isomers of an alkene

• B (n-butane vs. 2-methylpropane) – chain (skeletal) isomers of an alkane

• C (ethoxyethane vs. methoxypropane) – both are ethers ($C_4H_{10}O$) with different alkyl groups around the oxygen

• D (dimethyl ether vs. ethyl alcohol) – functional-group isomers (ether vs. alcohol)

Only option C fits metamerism.

Ethoxyethane: $CH_3CH_2–O–CH_2CH_3$

Methoxypropane: $CH_3–O–CH_2CH_2CH_3$

Question33

Identify the chiral molecule from the following:

MHT CET 2021 23rd September Evening Shift

Options:

A. 2-Bromo-2-methylbutane

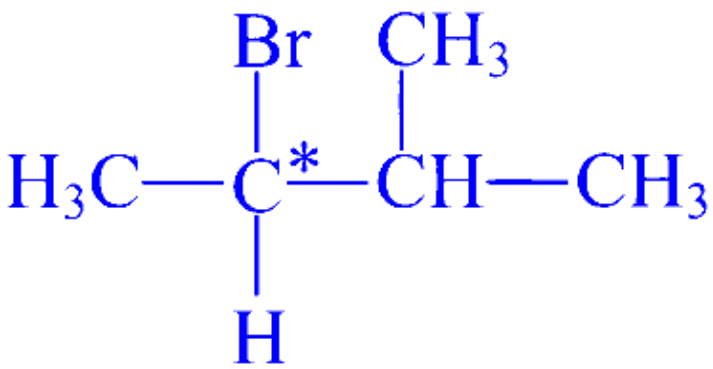
B. 2-Bromo-3-methylbutane

C. 3-Bromopentane

D. 2-Bromopropane

Answer: B

Solution:



2-Bromo-3-methylbutane

Question34

Which of the following alkanes is optically active?

MHT CET 2021 23th September Morning Shift

Options:

A. 2-Methylbutane

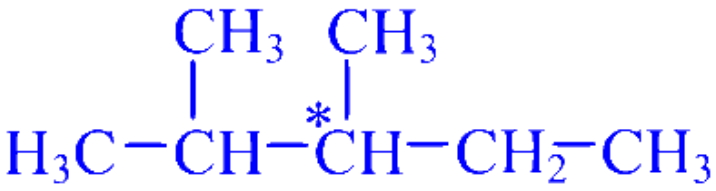
B. 2,3-Dimethylbutane

C. 2,3-Dimethylpentane

D. 2-Methylpropane

Answer: C

Solution:



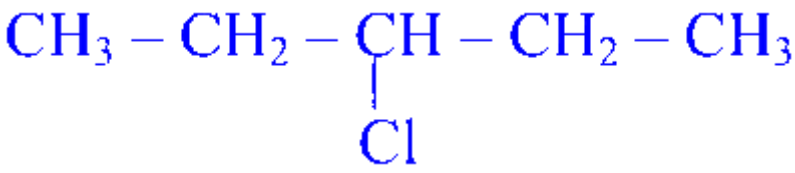
2,3-Dimethylpentane

Question35

Which of the following is likely to undergo racemization during alkaline hydrolysis?

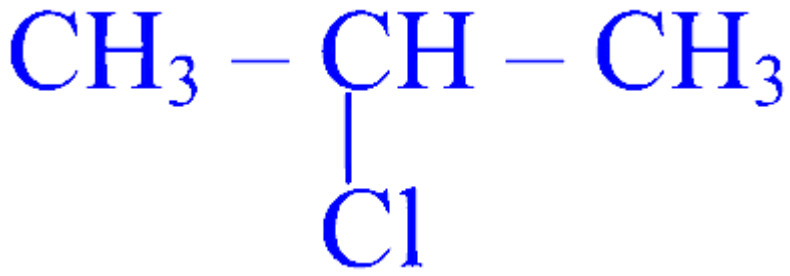
MHT CET 2021 22th September Evening Shift

Options:

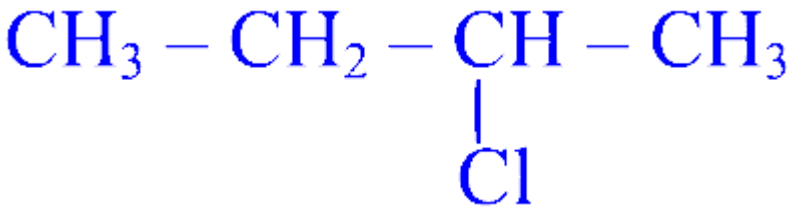
A. 

B. $(CH_3)C - CH_2 - Cl$

C.

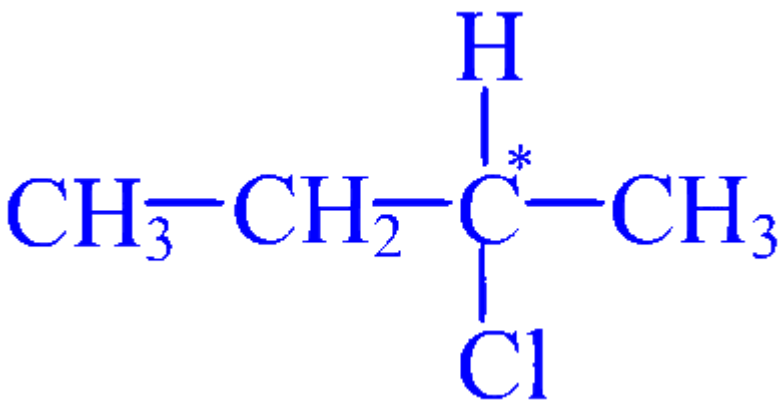


D.



Answer: D

Solution:



Due to chiral carbon atom, it undergoes racemization during alkaline hydrolysis by S_Nl reaction.

Question36

What type of isomers are the ethoxy ethane and methoxy propane?

MHT CET 2021 21th September Evening Shift

Options:

A. Tautomers

B. Metamers

C. Position isomers

D. Functional group isomers

Answer: B

Solution:

Ethoxyethane ($CH_3CH_2OCH_2CH_3$) and methoxypropane ($CH_3OCH_2CH_2CH_3$) are isomers that have the same molecular formula, $C_4H_{10}O$, but different arrangements in terms of how the alkyl groups are attached to the oxygen atom.

These isomers differ in the distribution of carbon atoms about the oxygen atom in the ether linkage. They are examples of **metamers**.

Question37

Which of the following compounds does NOT exhibit optical isomerism?

MHT CET 2021 20th September Evening Shift

Options:

A. 2-Iodo-3-methylbutane

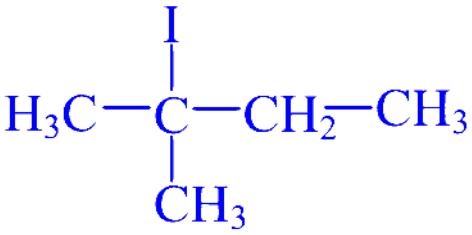
B. 3-Iodohexane

C. 2-Iodopentane

D. 2-Iodo-2-methylbutane

Answer: D

Solution:



2-Iodo-2-methylbutane
(No chiral carbon atom)

Question38

Which of the following compounds is optically inactive?

MHT CET 2021 20th September Evening Shift

Options:

A. 2-Chloro-2-methylbutane

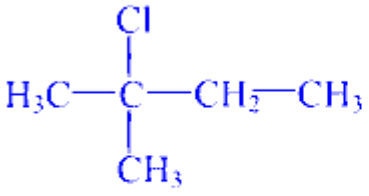
B. 3-Chlorohexane

C. 2-Chloro-3-methylbutane

D. 2-Chloropentane

Answer: A

Solution:



2-Chloro-3-methylbutane (No chiral carbon atom)

Question39

Which of the following pairs of alkenes is an example of position isomers?

MHT CET 2021 20th September Evening Shift

Options:

A. But-1-ene and 2-methylprop-1-ene

B. But-1-ene and 2-methylbut-1-ene

C. But-1-ene and but-2-ene

D. But-2-ene and 2-methylprop-1-ene

Answer: C

Solution:

$CH_3 - \underset{But-2-ene}{CH = CH} - CH_3$ and $CH_2 = \underset{But-1-ene}{CH} - CH_2 - CH_3$

But-1-ene and but-2-ene have same molecular formula (C_4H_8) and the same carbon skeleton but the double bonds are located at different positions.

Question40

Identify the isomerism exhibited by methoxyethane and propan-1-ol.

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Options:

A. Position isomerism

B. Chain isomerism

C. Functional group isomerism

D. Metamerism

Answer: C

Solution:

$\underset{\text{Methoxyethane}}{CH_3 - CH_2 - O - CH_3}$ and $\underset{\text{Propan-1-ol}}{CH_3 - CH_2 - CH_2 - OH}$

Both have same molecular formula (C_3H_8O) but different functional groups.

Question41

How many chiral carbon atoms are present in 2 - Bromo - 3, 4, 5 - trimethylhexane?

MHT CET 2021 20th September Morning Shift

Options:

A. 2

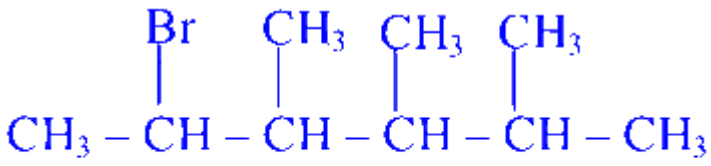
B. 3

C. 4

D. 1

Answer: B

Solution:



2 – Bromo – 3, 4, 5 – trimethylhexane

Question42

Which among the following compound is not optically active?

MHT CET 2020 16th October Evening Shift

Options:

A. 3-chloro-2-methyl pentane

B. 3-chloropentane

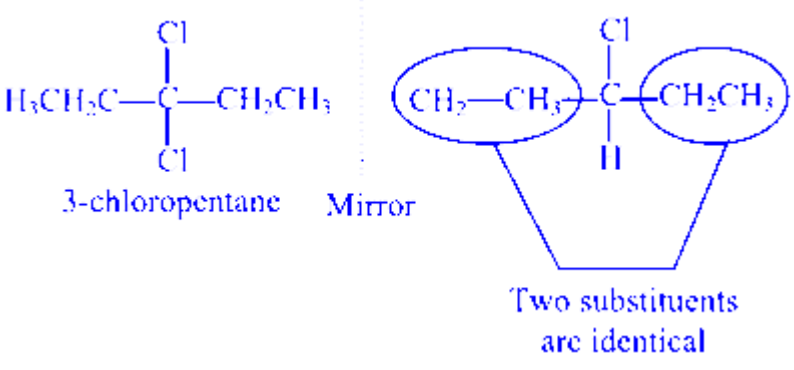
C. 2-chloropentane

D. 2-chloro-3-methyl pentane

Answer: B

Solution:

3-chloropentane compound is not optically active.



Because, in this compound no stereogenic centre is present and they are superimposable on each other. So, in the molecule absence of stereogentic centife shows that this molecule is not optically active.

Question43

How many primary amines are possible for molecular formula C_3H_9N ?

MHT CET 2019 3rd May Morning Shift

Options:

A. 4

B. 1

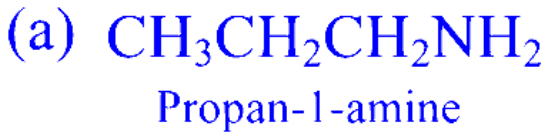
C. 2

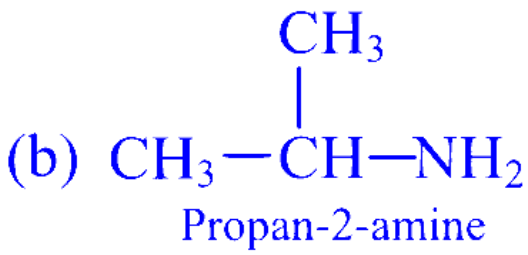
D. 3

Answer: C

Solution:

Amine with molecular formula C_3H_9N have two primary structures. These are as follows:





Other isomers are not primary amines.

Question44

How many isomers are possible for an alkane having molecular formula C_5H_{12} ?

MHT CET 2019 2nd May Evening Shift

Options:

A. 5

B. 3

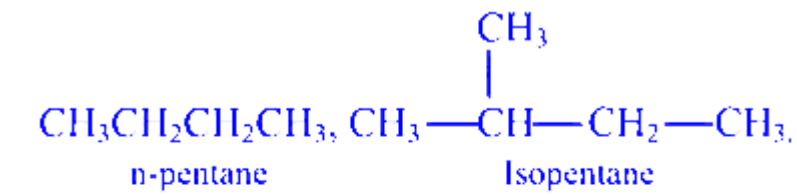
C. 4

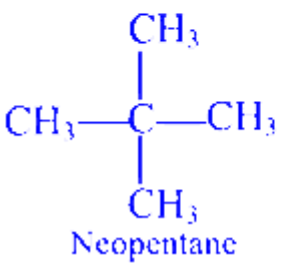
D. 2

Answer: B

Solution:

There can be 3 possible isomers for an alkane having formula C_5H_{12}. These are as follows:





Question45

How many metameric ethers are represented by the molecular formula $C_4H_{10}O$?

MHT CET 2019 2nd May Evening Shift

Options:

A. 4

B. 3

C. 2

D. 5

Answer: B

Solution:

There are 4-metameric ether that are represented by the molecular formula C_4H_{10}, which are as follows: