Isomerism

Question1

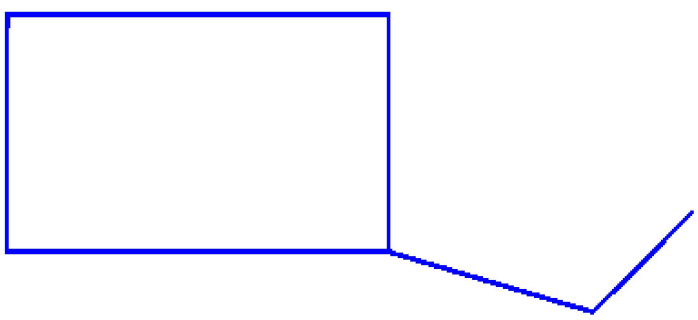
Among the following, identify the compound that is not an isomer of hexane

KCET 2025

Options:

A. $CH_3 - CH_2 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_2 - CH_3$

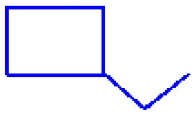
B. $CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$

C. 

D. $CH_3 - \underset{\displaystyle CH_3}{\underset{|}{CH}} - CH_2 - CH_2 - CH_3$

Answer: C

Solution:



MF : C_6H_2

MF : C_6H_{14}

∴ above compounds are not isomers

Question2

Propanone and propanal are

KCET 2024

Options:

A. position isomers

B. functional isomers

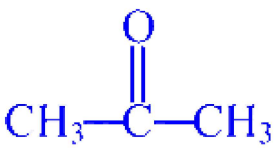
C. chain isomers

D. geometrical isomers

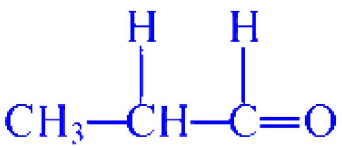
Answer: B

Solution:

Propanone and propanal have the same molecular formula but different functional group i.e. ketone and aldehyde respective. Hence, these two are the functional isomers of each other.



Propanone



Propanal

Question3

A pair of compounds having the same boiling points are

KCET 2023

Options:

A. cis but-2-ene and trans but-2-ene

B. n-hexane and neo-hexane

C. benzene and naphthalene

D. (+) butan-2-ol and (−) butan-2-ol

Answer: D

Solution:

The correct answer to the question: "A pair of compounds having the same boiling points are," is Option D: (+) butan-2-ol and (−) butan-2-ol.

Let's explain why the other options are incorrect:

Option A: cis but-2-ene and trans but-2-ene have different spatial arrangements around the double bond. This difference in geometry leads to different physical properties, especially boiling points. Typically, the trans isomers are less polar and have a lower boiling point compared to the cis isomers.

Option B: n-hexane and neo-hexane (more correctly called 2,2-dimethylbutane) are structural isomers, which means they have different structures and thus different intermolecular forces and boiling points. n-hexane is a straight-chain alkane, whereas neo-hexane is a highly branched alkane. The increased branching in neo-hexane decreases the surface area for intermolecular interactions, leading to a lower boiling point than n-hexane.

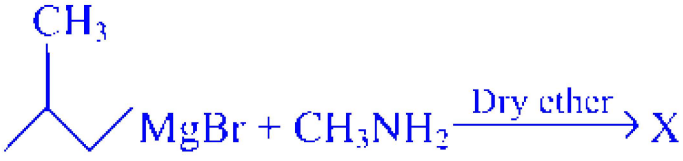
Option C: Benzene and naphthalene are aromatic hydrocarbons, but they are not isomeric. Benzene has a single aromatic ring, while naphthalene has two fused aromatic rings. This difference results in naphthalene having a significantly higher boiling point than benzene due to the larger surface area and greater London dispersion forces in naphthalene.

Option D: (+) butan-2-ol and (−) butan-2-ol are enantiomers, which are stereoisomers that are non-superposable mirror images of each other. Enantiomers have identical physical properties (e.g., boiling point, melting point) in a non-chiral environment because they share the same molecular formula and connectivities. The (+) and (-) refer to the different optical activities of the molecules; that is, they rotate plane-polarized light in different directions, but this does not affect the boiling point of the compound.

Therefore, the only pair of compounds listed with the exact same boiling point would be the R and S enantiomers of butan-2-ol (also known as (+) and (-) butan-2-ol), as noted in Option D.

Question4

In the reaction,



The number of possible isomers for the organic compound X is

KCET 2020

Options:

A. 4

B. 5

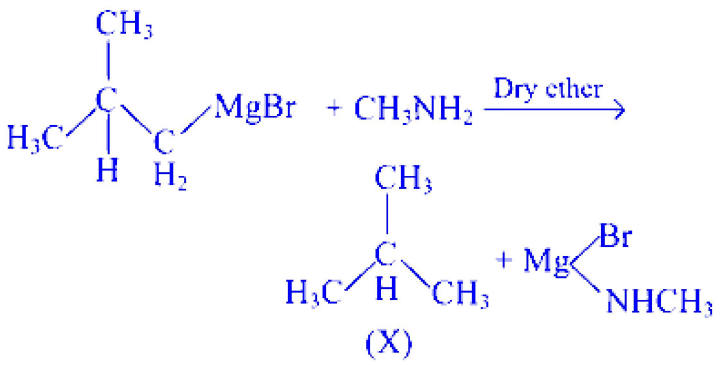
C. 3

D. 2

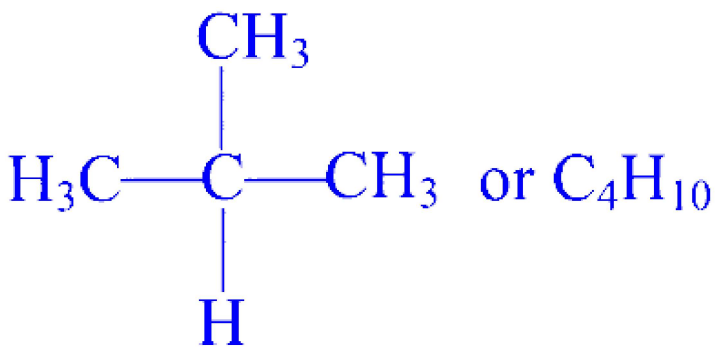
Answer: D

Solution:

In the given reaction,



So, for X,



we can have another isomer as

$H_3C - CH_2 - CH_2 - CH_3$.

So, total two isomers are possible.

Question5

Which of the following is not a pair of functional isomers?

KCET 2020

Options:

A. $C_2H_5OC_2H_5$ and $C_3H_7OCH_3$

B. CH_3CH_2OH and CH_3OCH_3

C. $CH_3CH_2NO_2$ and H_2NCH_2COOH

D. CH_3COOH and $HCOOCH_3$

Answer: A

Solution:

Functional isomers contain two different functional groups like aldehydes CH_3CH_2CHO and ketones CH_3COCH_3

But, in case of $C_2H_5OC_2H_5$ and $C_3H_7OCH_3$ both functional groups are same i.e. ether.

Question6

Identify the following compound which exhibits geometrical isomerism

KCET 2018

Options:

A. but-2-ene

B. but-1-ene

C. butane

D. isobutane

Answer: A

Solution:

The compound that exhibits geometrical isomerism is:

but-2-ene

Here's why:

Double Bond Requirement: Geometrical (or cis-trans) isomerism occurs in compounds with a carbon–carbon double bond (C=C). This double bond prevents free rotation, allowing for different spatial arrangements of the groups attached to each carbon.

But-2-ene Structure: The formula for but-2-ene is $CH_3CH = CHCH_3$. In this molecule, each carbon of the double bond has two different substituents (a hydrogen atom and a methyl group), which makes cis-trans isomerism possible.

Cis-But-2-ene: The two methyl groups are on the same side of the double bond.

Trans-But-2-ene: The two methyl groups are on opposite sides of the double bond.

Other Options:

But-1-ene: Although it is an alkene, the double bond is terminal (at the end of the chain), meaning one of the carbons of the double bond has two identical substituents (hydrogens), so no cis-trans isomerism can occur.

Butane and Isobutane: These are alkanes with single bonds, which allow free rotation and do not exhibit geometrical isomerism.

Thus, the correct answer is Option A: but-2-ene.

Question7

The two forms of D-glucopyranose are called

KCET 2018

Options:

A. diastereomers

B. anomers

C. epimers

D. enantiomers

Answer: B

Solution:

Two forms of D-glucopyranose such as a-D-(+) glucopyranose, β-D-(+) Glucopyranose have different configuration at anomeric C-1 carbon atom hence, are called anomers.

Question8

$[Fe(NO_2)_3Cl_3]$ and $[Fe(O-NO)_3Cl_3]$ shows

KCET 2018

Options:

A. linkage isomerism

B. geometrical isomerism

C. optical isomerism

D. hydrate isomerism

Answer: A

Solution:

Let's analyze the two complexes:

$[Fe(NO_2)_3Cl_3]$

In this complex, the NO_2 ligand is coordinated in the "nitro" mode, meaning that the **nitrogen** atom attaches to the iron center.

$[Fe(O-NO)_3Cl_3]$

Here, the ligand is bound via the **oxygen** atom, forming the "nitrito" isomer.

Key points:

Both complexes have the same formula but differ only in the way the NO_2 ligand attaches to the central metal.

This type of isomerism, where the ligand can bind through different atoms (nitrogen or oxygen), is called **linkage isomerism**.

Therefore, the correct option is:

Option A: linkage isomerism.

Question9

Identify the correct statement in the following.

KCET 2017

Options:

A. *n*-butane and isobutane are functional isomers

B. Propan-1-ol and propan-2ol are position isomers

C. Dimethyl ether and ethanol are chain isomers

D. Ethanoic acid and methyl methanoate are position isomers

Answer: B

Solution: