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— **TUITION** —

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CHEMISTRY

ORGANIC CHEMISTRY II

Level & Board	AQA (A-LEVEL)
TOPIC:	OPTICAL ISOMERISM
PAPER TYPE:	SOLUTION - 2
TOTAL QUESTIONS	10
TOTAL MARKS	/37

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Optical Isomerism - 2

1. H , CH_3 , OH and CN groups attached to the central chiral carbon atom i.e. 4 substituents.

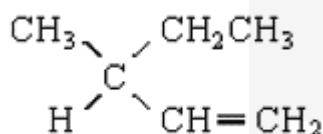
(3)

2. D

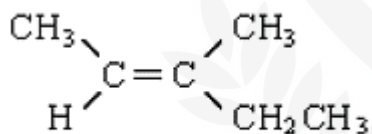
(1)

- 3.

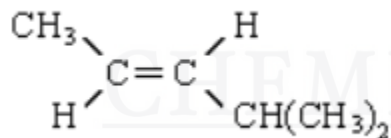
Structure of P



Structure of Q



Structure of R

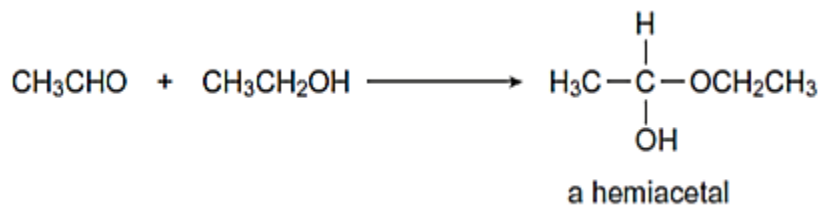


(3)

- I am Sorry !!!! 4. D

(1)

5.
(a)

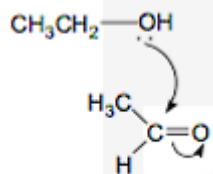


i. **Name of the mechanism of reaction:**

Nucleophilic addition

(1)

ii. **First step of mechanism:**



(2)

(b)

i.

Racemic mixture:

An equal mixture of enantiomers or optical isomers is called a racemic mixture.

(1)

ii.

Two chiral molecules with the same structural formula would be non-superimposable mirror images of each other.

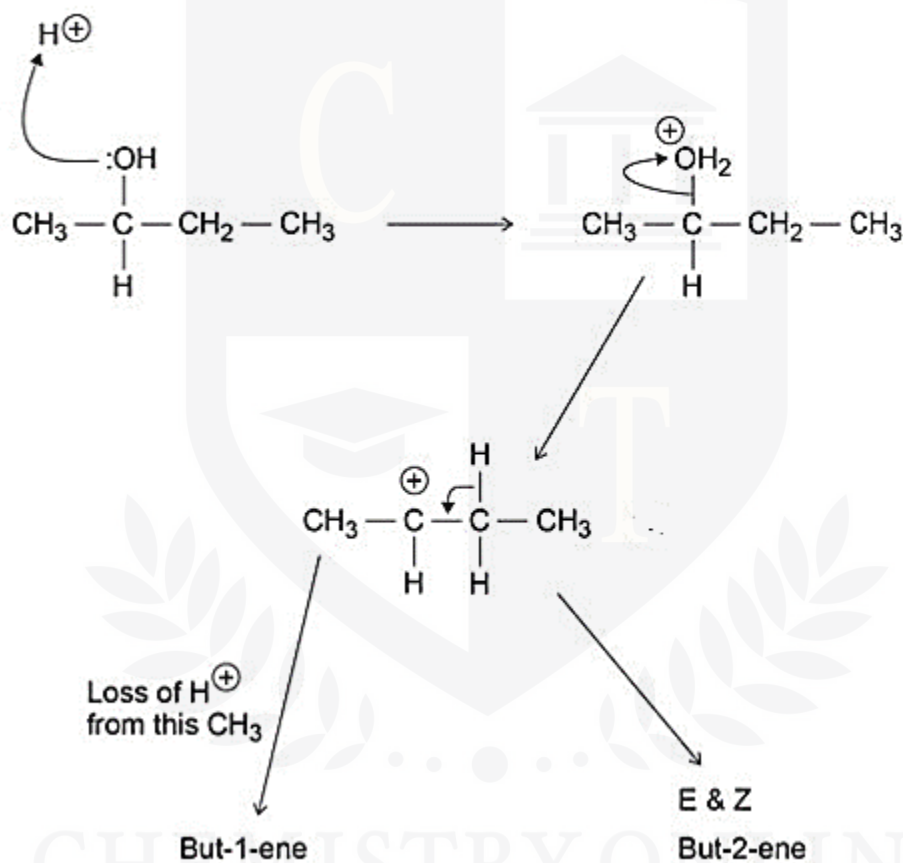
(1)

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6. D

(1)

7.

*Name of the mechanism:**Elimination**Mechanism:*

(6)

8.

(a)

There are three isomers are represented by the formula C₅H₁₂.

(1)

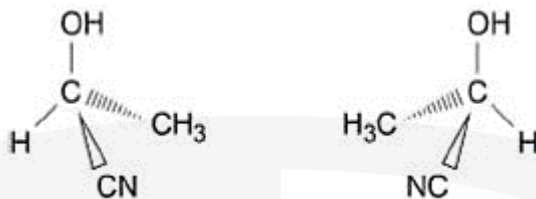
(b)

Chain isomerism is shown by the isomers of C₅H₁₂.

(1)

(c)

Following are the two enantiomers of 2-hydroxypropanenitrile i.e. mirror image of each other:



(2)

(d)

Separate samples of enantiomers, though having the same chemical formula, can be distinguished using a technique called **polarimetry**.

By using Plane-polarized.

- Plane-polarized light interacts with enantiomers and causes rotation.
- Each enantiomer (R and S) rotates the plane of polarization in **opposite directions**.

So, by measuring the direction of rotation (clockwise or counter-clockwise), we can identify the type of enantiomer present in sample.

(2)

9.

(a)

IUPAC name of $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}(\text{OH})\text{CN}$ is :

2-hydroxyhexanenitrile

(1)

(b)

Two stereoisomers of $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}(\text{OH})\text{CN}$ can be distinguished By using Plane-polarized.

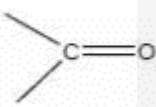
Plane-polarized light interacts with enantiomers and causes rotation. Each enantiomer (R and S) rotates the plane of polarization in **opposite directions**.

So, by measuring the direction of rotation (clockwise or counter-clockwise), we can identify the enantiomer of $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}(\text{OH})\text{CN}$ present in sample.

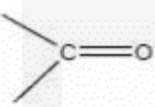
(2)

(c)

Planar Carbonyl Group:

The  bond in pentanal is part of a planar carbonyl group.

This planarity is because the carbon atom involved uses sp^2 hybridization, forcing its bond angles to be 120 degrees, leading to a flat arrangement

around the  group.

Nucleophilic Attack:

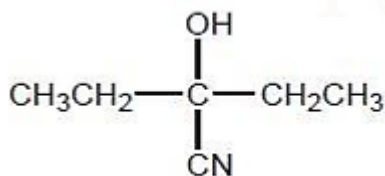
A nucleophile attacks the electrophilic carbon atom of the carbonyl group. However, due to the planarity of the $\text{C}=\text{O}$ group, the attack can occur from either side of the plane with **equal probability**.

So, product produces with equal probability or it produces equal amounts of the two isomers/enantiomers.

(3)

(d)

Structure of the compound formed:



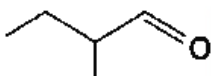
It does not show stereoisomerism because it does not contain a chiral centre and contains two identical/ethyl groups i.e. symmetrical (product).

(2)

10.

(a)

Following is the skeletal formula of a branched chain aldehyde with molecular formula $C_5H_{10}O$ that is optically active.



(1)

(b)

Two stereoisomers of $C_5H_{10}O$ can be distinguished by using plane-polarized light.

Plane-polarized light interacts with enantiomers and causes rotation.

Each enantiomer (*R* and *S*) rotates the plane of polarization in opposite directions.

So, by measuring the direction of rotation (clockwise or counter-clockwise), we can identify the enantiomer of $C_5H_{10}O$ present in sample.

(2)

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