CHEMISTRY ONLINE
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CHEMISTRY

ORGANIC CHEMISTRY

Level & Board	AQA (A-LEVEL)
TOPIC:	INTRODUCTION TO ORGANIC CHEMISTRY
PAPER TYPE:	SOLUTION - 1
TOTAL QUESTIONS	10
TOTAL MARKS	33

Introduction to Organic Chemistry - 1

1.

(a)

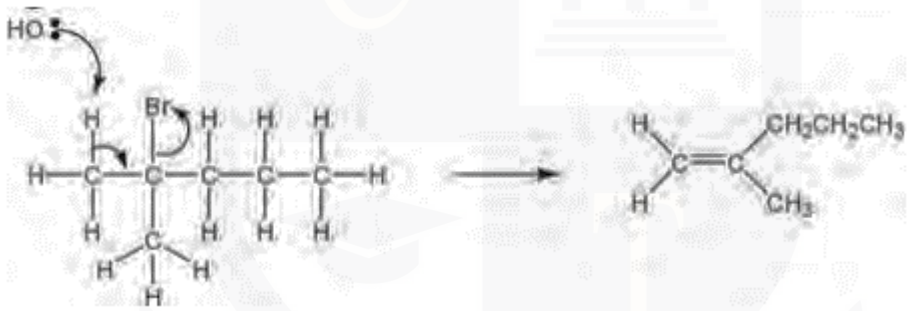
The term "structural isomers" refers to compounds that have the same molecular formula, indicating the same number and types of atoms, but they have different structural, displayed, or skeletal formulas.

(1)

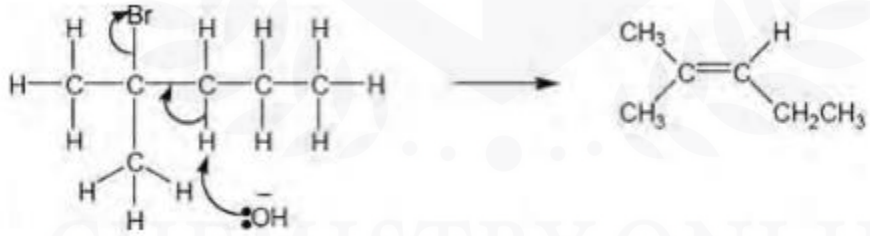
(b)

Name: Elimination (basic)

Mechanism:



OR



(5)

2. A

(1)

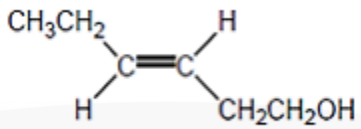
3. D

(1)

4.

(a)

E isomer of J



(1)

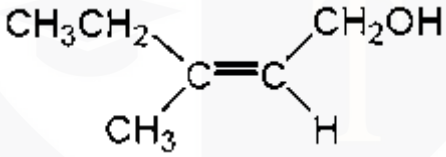
(b)

Skeletal formula of the organic product formed when J is dehydrated using concentrated sulfuric acid is as

(1)

(c)

By applying the Cahn-Ingold-Prelog (CIP) priority rules to the given compound



Assign priorities to groups:

- Comparing the atoms directly attached to **C=C bond** the right-hand carbon.
- Priority is based on atomic number.
- CH_2OH takes priority over H because in CH_2OH , C has a higher atomic number than H.

Assign priorities to groups:

- Comparing the atoms one bond away from **C=C bond** the left-hand carbon.
- The ethyl group gets priority over the methyl group because the ethyl group has a carbon atom bonded to the left-hand carbon, while the methyl group has only hydrogen atoms.

Determine the configuration around the double bond:

- As the higher priority groups (ethyl and CH_2OH) are on the same side of the double bond, the configuration is Z.

IUPAC Name:

- So full IUPAC name is 3-methylpent-2-en-1-ol with a Z configuration.

(6)

(d)

Moles of maleic acid = 10.0 / 116.0 = 8.62×10^{-2}

Mass of organic product expected = $(8.62 \times 10^{-2}) \times 98.0 = 8.45$ g

Moles of organic product formed = 6.53 / 98.0 = 6.66×10^{-2}

% yield = $100 \times (6.66 \times 10^{-2}) / (8.62 \times 10^{-2})$

= 77.3%

As it is less then 80% So the statement of that the student was not correct.

(2)

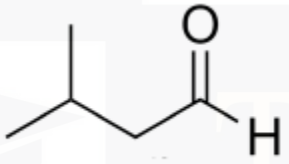
5. C

(1)

6.

(a)

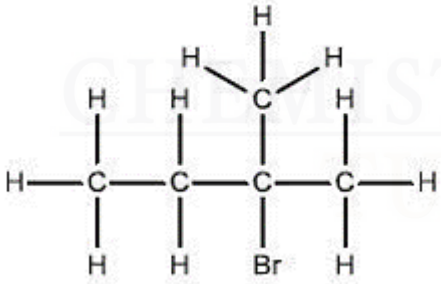
The skeletal formula of 3-methylbutanal.



(1)

(b)

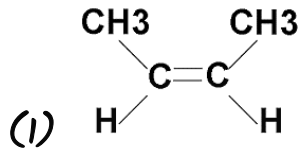
Following is the formula of $C_5H_{11}Br$ that is the major product of the reaction of 2-methylbut-2-ene with hydrogen bromide.



(1)

(c)

Cracking of hydrocarbons produces molecules that could be attacked by electrophiles



(1)

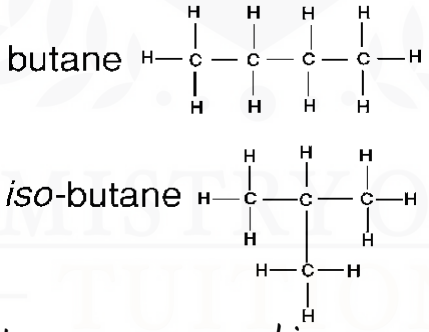
7. B

(1)

8.

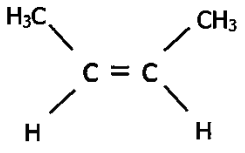
Difference between structural & stereoisomers

Structural Isomers:
These are molecules that have the same molecular formula but have different structures. For example, butane and isobutane. They both have the chemical formula C_4H_{10} but have their unique structures.
Different C Chain: For example, methylpropene (CH_3-CH=CH_2) and But-1-ene (CH_3-CH_2-CH=CH_2) or But-2-ene (CH_3-CH=CH-CH_3). They have different carbon chains.
Different Position of Functional Group: Consider But-1-ene (CH_2=CH-CH_2-CH_3) and But-2-ene (CH_3-CH=CH-CH_2). The position of the double bond is different.
Different Functional Group: for example like Cyclobutane (C_4H_8) and But-1-ene (CH_2=CH-CH_2-CH_3) Here, different types of functional groups are present.

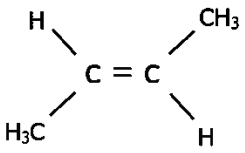


Stereoisomers (Geometric isomers): These molecules have the same structural formula but differ in how their atoms are arranged in space. An example is cis- and trans-2-butene (C_4H_8) where the atoms are arranged differently around a double bond.
Lack of Rotation around C=C: Geometric isomers arise because a double bond restricts rotation.
Structures of E- and Z-but-2-ene: E-but-2-ene has groups on opposite sides of the double bond, while Z-but-2-ene has groups on the same side.

Correct Identity of E and Z Isomers: *To separate apart, use the Cahn-Ingold-Prelog (CIP) rules, prioritizing substituents based on atomic numbers.*



Cis-2-butene
(z)-2-butene



Trans-2-butene
(E)-2-butene

(6)

9. D

(1)

10.

(a)

Crude oil OR petroleum is a substance from which paraffin is obtained.

Fractional distillation / fractionation is the process used to obtain paraffin from Crude oil.

(2)

(b)

An equation for the incomplete combustion of dodecane is as:

$C_{12}H_{26} + 12.5O_2 \rightarrow 12CO + 13H_2O$

(1)

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