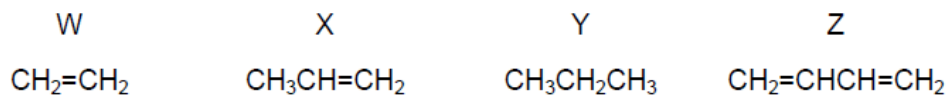


1. **June/2022/Paper_11/No.30**

Oct-1-ene, $\text{CH}_3(\text{CH}_2)_5\text{CH}=\text{CH}_2$, can be thermally cracked.

Which of the compounds W, X, Y and Z can be obtained by thermally cracking oct-1-ene?



- A W, X, Y and Z
- B W, X and Y only
- C W, X and Z only
- D W and X only

2. **June/2022/Paper_12/No.5**

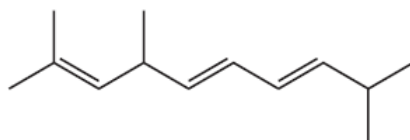
Ethane and ethene are both hydrocarbon molecules.

What is a feature of **both** molecules?

- A a planar structure
- B bond angles of 109°
- C σ covalent bonds
- D π covalent bonds

3. **June/2022/Paper_12/No.26**

A skeletal formula is shown.



What is the total number of stereoisomers including the one shown?

- A 4
- B 6
- C 8
- D 16

4. June/2022/Paper_12/No.27

The molecular formula CH_3 can represent an anion, a cation or a free radical. Species with the molecular formula CH_3 can act as an electrophile, a free radical or a nucleophile depending on the number of outer shell electrons on the central carbon atom.

How many outer shell electrons on the central carbon atom must be present for CH_3 to act in these different ways?

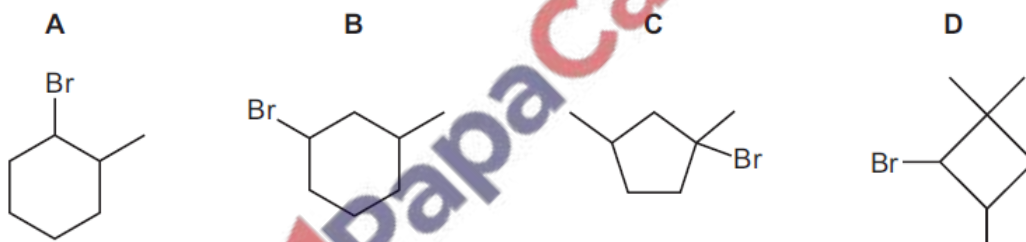
	CH_3 as an electrophile	CH_3 as a free radical	CH_3 as a nucleophile
A	6	7	8
B	6	8	7
C	7	6	8
D	8	7	6

5. June/2022/Paper_12/No.28

Compound Z, $\text{C}_7\text{H}_{13}\text{Br}$, has two chiral centres. A sample of Z contains all four possible optical isomers.

This sample of Z reacts with hot ethanolic NaOH to produce a mixture of **only** three isomers. Two of these isomers are optical isomers of each other.

What could be the formula of Z?



6. June/2022/Paper_12/No.29

The free-radical substitution reaction between methane and chlorine involves initiation, propagation and termination stages.

Which row is correct?

	involved in initiation stage	radical produced in a propagation stage
A	homolytic fission	$\text{H}\cdot$
B	homolytic fission	$\text{CH}_3\cdot$
C	heterolytic fission	$\text{H}\cdot$
D	heterolytic fission	$\text{CH}_3\cdot$

7. June/2022/Paper_13/No.29

Structural isomerism and stereoisomerism should be considered when answering this question.

Y is a gaseous hydrocarbon which decolourises aqueous bromine.

10.0 g of Y occupies a volume of 3.43 dm³ under room conditions.

How many isomeric structures are possible for Y?

- A 4 B 5 C 6 D 7

8. June/2022/Paper_21/No.3(a, b)

Liquids that contain molecules of T smell like lemons.

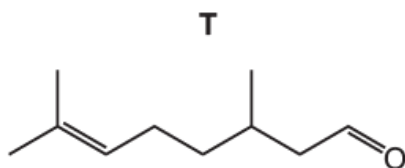


Fig. 3.1

(a) Molecules of T exist as a pair of stereoisomers.

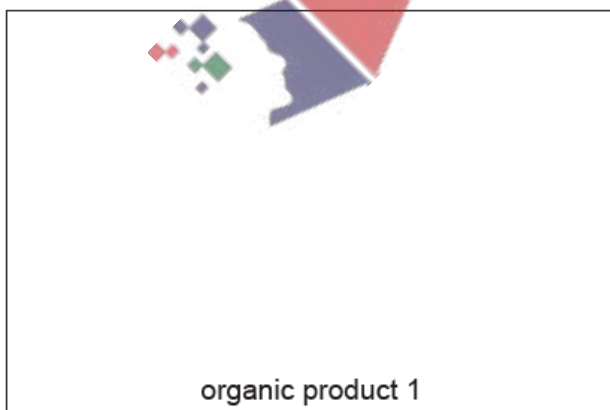
Name the type of stereoisomerism shown by molecules of T. Explain your answer.

.....

..... [2]

(b) Two organic products are produced when a sample of T is heated under reflux with excess acidified concentrated KMnO₄.

Draw the structure of the two organic products, from this reaction, in the boxes.



[2]

(b) **V** contains two types of functional group: a carboxylic acid and an alkene.

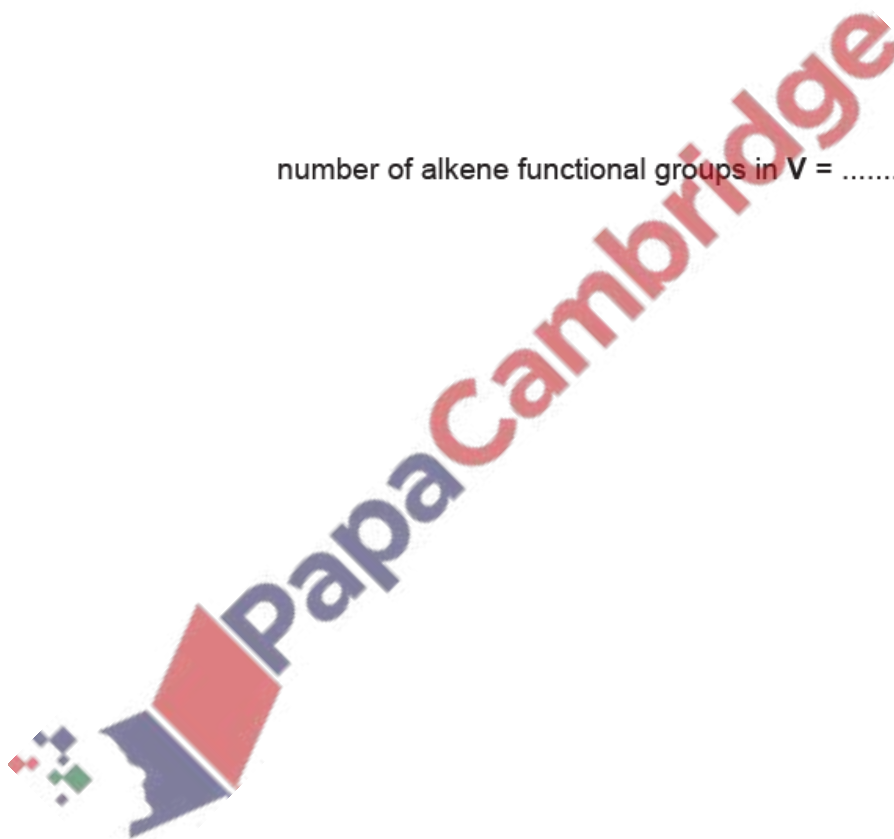
- (i) Describe a chemical test and observation which confirms the presence of a carboxyl functional group.

.....
..... [2]

- (ii) A 3.196 g sample of Br_2 reacts completely with 2.800 g of **V**.

Calculate how many alkene functional groups are present in one molecule of **V**. Show your working.

number of alkene functional groups in **V** = [1]



10. June/2022/Paper_22/No.4(a)

(a) Bromine reacts with butane in the presence of ultraviolet light to form bromobutane.

Two structural isomers with the molecular formula C_4H_9Br are produced during this reaction.

(i) Draw the two structural isomers and state the systematic name of each isomer.

structural isomer 1

name

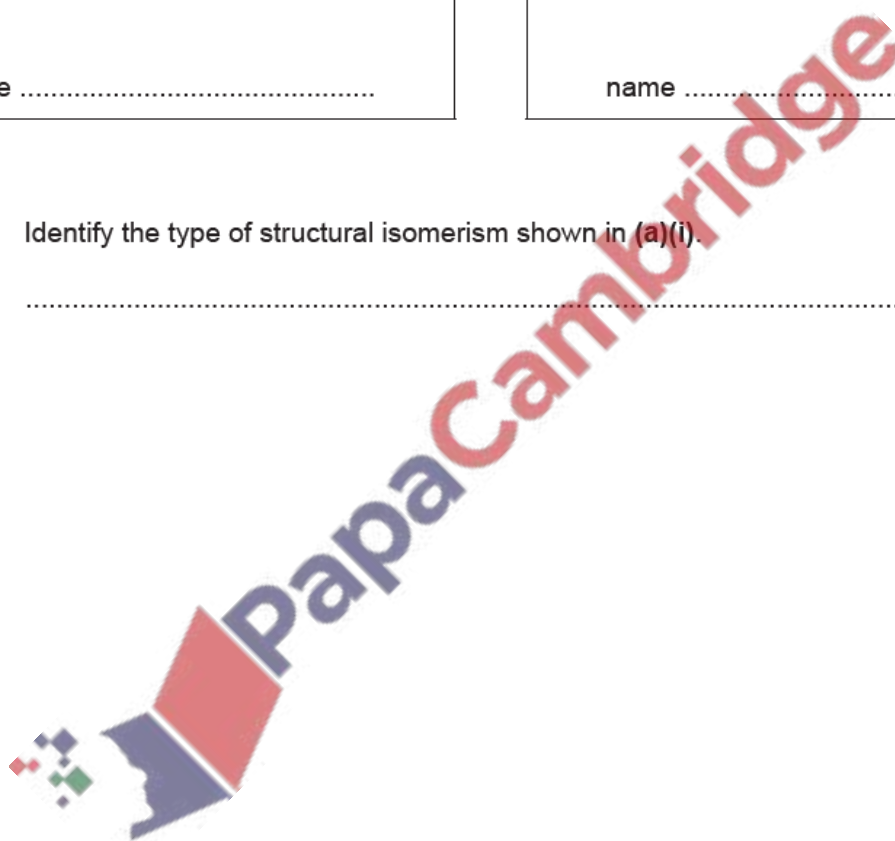
structural isomer 2

name

[2]

(ii) Identify the type of structural isomerism shown in (a)(i).

..... [1]



11. June/2022/Paper_22/No.6(a, b)

Z is a molecule which contains the elements carbon, hydrogen and oxygen only.

Z contains only alkene and carboxyl functional groups.

- (a) Complete Table 6.1 by describing the observations that occur when two different reagents are added to separate samples of **Z**(aq).

Table 6.1

reagent added to Z (aq)	observation
$\text{Br}_2(\text{aq})$	
$\text{Na}_2\text{CO}_3(\text{s})$	

[2]

- (b) Table 6.2 shows the percentage by mass of each element present in **Z**.

Table 6.2

element	percentage by mass/%
carbon	41.38
hydrogen	3.45
oxygen	55.17

Using the data in Table 6.2, demonstrate that the empirical formula of **Z** is CHO.
Show your working.

[1]