11.1 Introduction to Organic Chemistry

Set A **Answer key**

A From the lesson

10 MARKS

1

88 (one more CH_2, +14). [1]

Both have the same functional group, –OH, which decides the reactions. [1]

2

CH_3: sp^3, CH and CH_2: sp^2 [1]

6 C–H + 2 C–C = **8 σ**, **1 π** [1]

3

An electron pair donor, with a lone pair of electrons. [1]

4

sp^2, 120°. [1]

5

The bonding electrons are shared equally, one to each atom, forming two free radicals. [1]

6

Nucleophilic substitution. [1]

7

It has one chiral centre and one C=C bond that shows cis–trans isomerism. [1]

Number of stereoisomers = 2^2 = **4** [1]

B Practice

20 MARKS

8

C 4-methylhex-2-ene [1]

2-methylhex-2-ene does not exhibit stereoisomerism.

3-methylhex-2-ene and 5-methylhex-2-ene have only cis and trans isomers: number of stereoisomers = 2^1.

4-methylhex-2-ene has 2^2 = 4 stereoisomers.

9

(a) 3-chloropent-1-ene [1]

(b) 5,6-dihydroxyheptan-3-one [1]

(c) 4-ethyl-3,6-dimethyloctane [1]

(d) 2-ethyl-1,1-dimethylcyclobutane [1]

10 **(a)** addition *or* reduction *or* catalytic hydrogenation [1]

(b) nucleophilic addition [1]

(c) elimination [1]

(d) free radical substitution [1]

(e) elimination *or* dehydration [1]

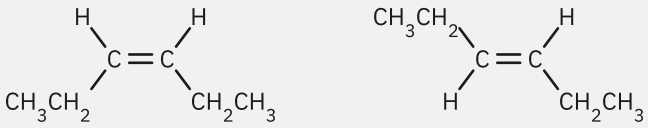
(f) hydrolysis [1]

11 Cis-trans isomerism occurs when there are 2 different substituents attached to each of the two carbon atoms of a C=C bond, due to its restricted rotation. [1]

Enantiomerism occurs when a molecule is chiral with no plane of symmetry, hence giving rise to a pair of isomers that are non-superposable mirror images. These compounds can rotate the plane of polarised light. [1]

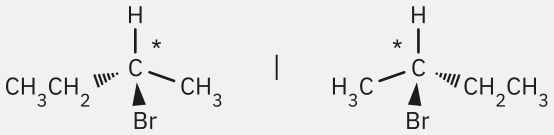
12 **(a)** hex-3-ene: geometric (cis-trans) isomerism [1]

[1]



(b) 2-bromobutane: optical isomerism [1]

[1]



NOTE Show a tetrahedral shape about the chiral carbon, draw the dash and wedge bonds clearly, and draw the mirror plane between the mirror images.

13 Molecules A, B and C are stereoisomers. Each molecule has 2 chiral carbon atoms. [1]

As molecules A and B have no plane of symmetry, they are chiral and exist as a pair of enantiomers, which are non-superimposable mirror images. Each enantiomer is optically active and rotates plane polarised light by an equal magnitude but in opposite directions. [1]

Molecule C, which has a plane of symmetry, is achiral (a meso compound). It is superimposable on its mirror image and is optically inactive. [1]