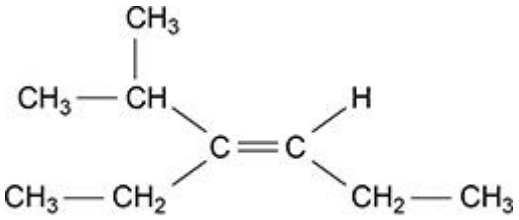
Q1.

(a) Compound **J** is one of a pair of stereoisomers.



Compound **J**

Explain:

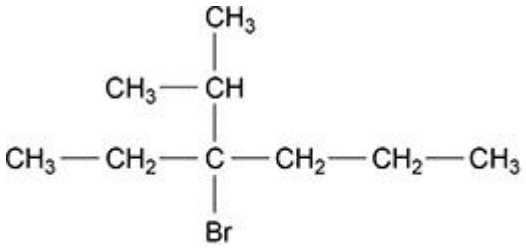
- what stereoisomers are
- how *E*-*Z* stereoisomerism occurs
- how the Cahn-Ingold-Prelog rules can be used to decide whether compound **J** is an *E* or *Z* isomer.

_____

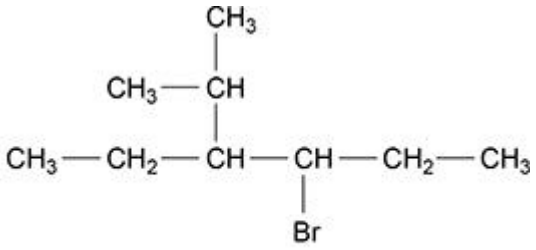
_____

(6)

(b) Compound **J** reacts with hydrogen bromide to form compounds **K** and **L**.



Compound **K**



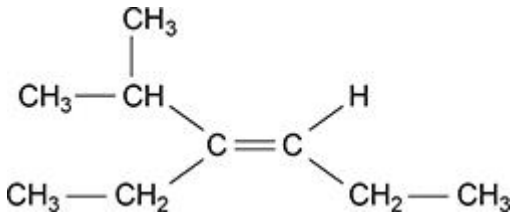
Compound **L**

K is the major product.

Name and outline the mechanism for the formation of **K**.

Name of mechanism _____

Outline of mechanism



(5)

(c) Explain why compound **K** is the major product in the reaction in part (b).

_____

_____

_____

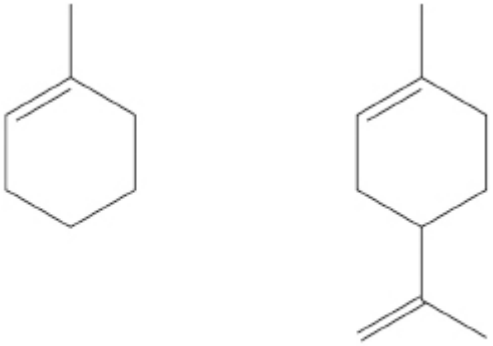
_____

(3)

(Total 14 marks)

Q2.

1-Methylcyclohexene and limonene are cyclic alkenes with a citrus smell.
1-Methylcyclohexene is manufactured and used in the chemical industry.
Limonene is found naturally in orange peel.



1-methylcyclohexene **limonene**

(a) 1-Methylcyclohexene reacts with HBr to form two structural isomers.
The major product is 1-bromo-1-methylcyclohexane.

Name and outline the mechanism for the formation of this major product.

Name of mechanism _____

Outline of mechanism

(5)

(b) Draw the skeletal formula of the minor product formed in the reaction in part (a).

Explain why the products are formed in different amounts.

Skeletal formula

Explanation _____

_____

_____

_____

_____

_____

_____

(4)

(c) Draw the structure of the major product when an excess of HBr reacts with limonene.

(1)

(Total 10 marks)

Q3.

This question is about 2-methylbut-1-ene.

(a) Name the mechanism for the reaction of 2-methylbut-1-ene with concentrated sulfuric acid.

Outline the mechanism for this reaction to form the major product.

Name of mechanism _____

Outline of mechanism to form major product

(5)

(b) Draw the structure of the minor product formed in the reaction in part (a)

Explain why this is the minor product.

Structure of minor product

Explanation _____

_____

_____

_____

(3)

(c) Draw the skeletal formula of a functional group isomer of 2-methylbut-1-ene.

(1)

(d) 2-methylbut-1-ene can form a polymer.

State the type of polymerisation.

Draw the repeating unit for the polymer formed.

Type of polymerisation _____

Repeating unit

(2)

(Total 11 marks)