



# Paddington Academy

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**OCR AS CHEMISTRY**

**UNIT 2 MODULE 1**

**ASSESSMENT POINT 2**

**85 MINUTES**

**76 MARKS**

Answer all the questions.

- 1 Fuels are an important part of our everyday life. Crude oil is a source of hydrocarbons such as  $C_{14}H_{30}$ .

$C_{14}H_{30}$  is cracked into octane which can be used as a fuel. To improve its efficiency as a fuel, octane is processed into branched chain alkanes and cycloalkanes.

- (a) What is meant by a *hydrocarbon*?

.....  
 ..... [1]

- (b) Write an equation for the cracking of  $C_{14}H_{30}$  to form octane.

..... [1]

- (c) Octane can be reformed into 1,2-dimethylcyclohexane,  $CH_3C_6H_{10}CH_3$ , and another product.

- (i) Draw the structure of 1,2-dimethylcyclohexane.

[1]

- (ii) Identify the other product formed.

..... [1]

- (d) Isomerisation of octane can produce 2,2,3-trimethylpentane.

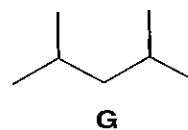
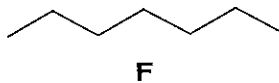
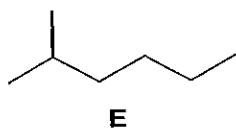
- (i) Draw the structure of 2,2,3-trimethylpentane.

[1]

- (ii) Write an equation for the complete combustion of 2,2,3-trimethylpentane.

..... [2]

- 3 Each of the compounds, **E**, **F** and **G**, has the formula  $C_7H_{16}$ .



- (a) (i) Which of **E**, **F** or **G** has the highest boiling point? ..... [1]

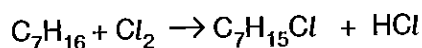
- (ii) State the type of intermolecular forces present in all three compounds.

..... [1]

- (iii) Identify another isomer of  $C_7H_{16}$  that is likely to have a boiling point lower than the boiling points of **E**, **F** or **G**.

[1]

- (b) **E**, **F** and **G** all react with chlorine as shown below.



The reaction is initiated by the formation of chlorine free-radicals.

- (i) What is meant by the term *free-radical*?

..... [1]

- (ii) Write an equation to show the formation of chlorine free-radicals.

..... [1]

- (iii) State the type of bond breaking involved in the formation of chlorine free-radicals.

..... [1]

- (iv) Write equations to show the **two** propagation steps that lead to the formation of  $C_7H_{15}Cl$ .

..... [2]

- (v) Explain, with the aid of an equation, how  $C_{14}H_{30}$  could be formed in this reaction.

..... [1]

(c) Compounds **E** and **G** can react with chlorine to form a mono-chloro compound,  $C_7H_{15}Cl$ .

Deduce the number of possible structural isomers, each with formula  $C_7H_{15}Cl$ , that could be made by the reaction of chlorine with

(i) compound **E**, ..... [1]

(ii) compound **G**. ..... [1]

[Total: 11]

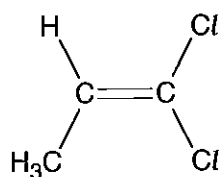


- 2 The chlorinated alkene,  $C_3H_4Cl_2$ , has five structural isomers that are alkenes and two other structural isomers that are not alkenes.

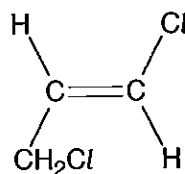
(a) (i) What is meant by the term *structural isomer*?

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

(ii) Two of the structural isomers of  $C_3H_4Cl_2$  are drawn below.



isomer 1



isomer 2

Draw the other three **structural** isomers, 3–5, of  $C_3H_4Cl_2$  that are alkenes.

isomer 3	isomer 4	isomer 5

[3]

(iii) Name isomer 1..... [1]

(iv) Draw one structural isomer of  $C_3H_4Cl_2$  that is **not** an alkene.

[1]

(b) Another type of isomerism is *cis-trans* isomerism.

Why can some alkenes have *cis* and *trans* isomers?

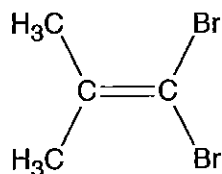
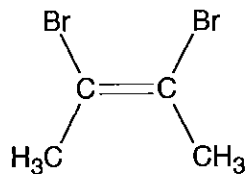
.....

.....

..... [2]

[Total: 9]

- 2 Compounds **A** and **B** are both dibromoalkenes with the molecular formula,  $C_4H_6Br_2$ . Compounds **A** and **B** are isomers.

**A****B**

- (a) (i) Name compound **A**.

..... [1]

- (ii) Calculate the percentage, by mass, of Br in compound **A**.

answer = ..... % [2]

- (iii) Draw another structural isomer of  $C_4H_6Br_2$ .

[1]

- (b) The reaction between isomer **B** and  $Br_2$  can be used to show the presence of the  $C=C$  double bond.

- (i) State what you would see when isomer **B** reacts with  $Br_2$ .

..... [1]

- (ii) State the type of reaction mechanism for this reaction.

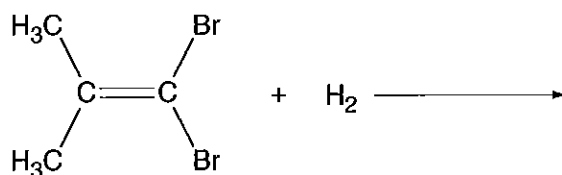
..... [1]

- (iii) What is the molecular formula and the empirical formula of the organic product?

molecular formula = ..... empirical formula = ..... [2]

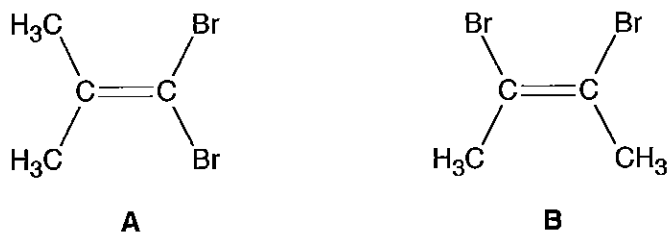


- (c) For the reaction between isomer **A** and  $H_2$ , identify the organic product and state the conditions used.



conditions..... [2]

- (d) Isomers **A** and **B**, shown below, both react with HBr.



- (i) Explain why **A** can produce two different structural isomers but **B** only one.

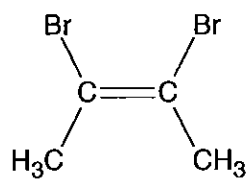
.....  
 .....  
 ..... [1]

- (ii) Identify the two structural isomers formed when **A** reacts with HBr.

--	--

[2]

(e) Isomer **B**, shown below, can be converted into 2,3-dibromobutan-2-ol.



**B**

(i) Draw the skeletal formula of 2,3-dibromobutan-2-ol.

[1]

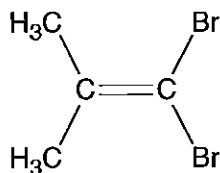
(ii) Suggest the reagent and conditions that could be used for the conversion.

reagent .....

conditions .....

..... [2]

(f) Isomer **A**, shown below, can form an addition polymer.



**A**

Draw a section of the polymer including two repeat units.

[2]

[Total: 18]



(b) Propene is a by-product of the refining of oil fractions.

Propene undergoes addition polymerisation to form poly(propene).

(i) Write an equation for the formation of poly(propene).

..... [1]

(ii) Draw a section of the polymer formed from propene. Show two repeat units.

[1]

(c) Propene can also be converted into alcohols.

State the reagents and conditions for this conversion and identify the organic products.

(i) reagents and conditions,

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

(ii) organic products.

[2]

[Total: 20]

**END OF QUESTION PAPER**