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Centre number

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Candidate number

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Surname

StemUp Model Solution

Forename(s)

Candidate signature

I declare this is my own work.

A-level CHEMISTRY

Paper 2 Organic and Physical Chemistry

Monday 16 June 2025

Morning

Time allowed: 2 hours

Materials

For this paper you must have:

- the Periodic Table/Data Booklet, provided as an insert (enclosed)
- a ruler with millimetre measurements
- a scientific calculator, which you are expected to use where appropriate.

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do **not** write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- All working must be shown.
- Do **all** rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 105.

For Examiner's Use	
Question	Mark
1	
2	
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TOTAL	

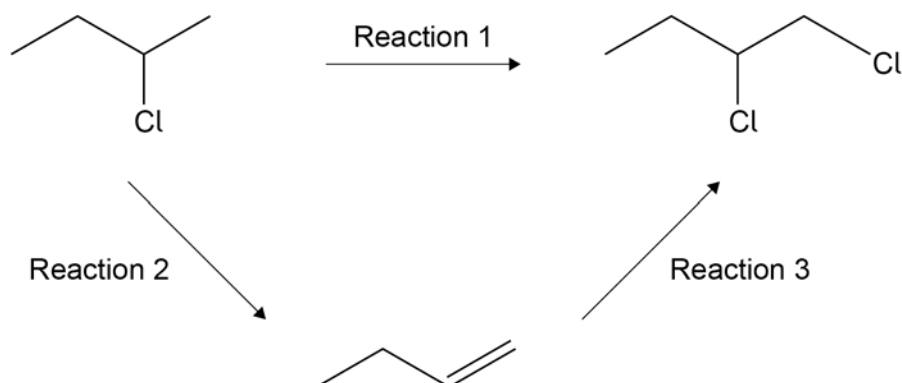


J U N 2 5 7 4 0 5 2 0 1

Answer **all** questions in the spaces provided.

0 1

This question is about different ways to make 1,2-dichlorobutane.



0 1 . 1

Give the name of the mechanism for reaction 1.

State **one** essential condition needed for reaction 1.

[2 marks]

Name of mechanism (Free) radical substitution

Essential condition UV light (ultraviolet radiation)

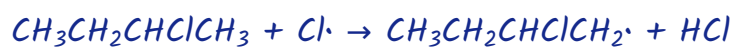
0 1 . 2

Give equations to show **three** essential steps in the mechanism for reaction 1.

[3 marks]

Initiation: $\text{Cl}_2 \rightarrow 2\text{Cl}\cdot$

Propagation:



0 1 . 3

Suggest **two** reasons why using reaction 1 is likely to give a low yield of 1,2-dichlorobutane.

[2 marks]

Reason 1 Further substitution can happen, giving polychlorinated products such as trichlorobutanes.

Reason 2 Substitution can happen at other positions, giving other isomers (e.g. 2,2- or 1,3-dichlorobutane).

0 1 . 4

Give a suitable reagent and conditions needed for reaction 2.

[2 marks]

Reagent KOH (or NaOH)

Conditions Hot, ethanolic solvent, heat under reflux

0 1 . 5

Identify the reagent and name the mechanism for reaction 3.

[2 marks]

Reagent Chlorine, Cl₂

Name of mechanism Electrophilic addition

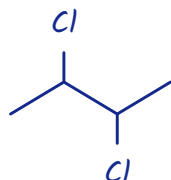
0 1 . 6

Use of the reagent for reaction 2 followed by the reagent for reaction 3 gives another organic product.

Give the structure of the other organic product.

[1 mark]

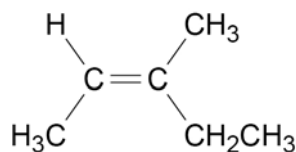
CH₃CHClCHClCH₃ (2,3-dichlorobutane)



0 2

This question is about isomerism.

Compound **L** has this structure.



0 2

1

Use IUPAC rules to name **L**.

Explain why **L** exists as stereoisomers.

[3 marks]

Name Z-3-methylpent-2-ene (the Z isomer)

Explanation There is restricted rotation about the C=C double bond (it cannot rotate),

and each carbon atom in the C=C has two different groups attached.

0 2

2

Compound **M** has the same carbon chain as **L** but the double bond is in a different position.

M also exists as stereoisomers.

Draw the structural formula of **M**.

Explain why **M** exists as stereoisomers.

[2 marks]

Structural formula



Explanation M has a chiral centre (C3 has four different groups attached), so it forms two non-superimposable mirror images.

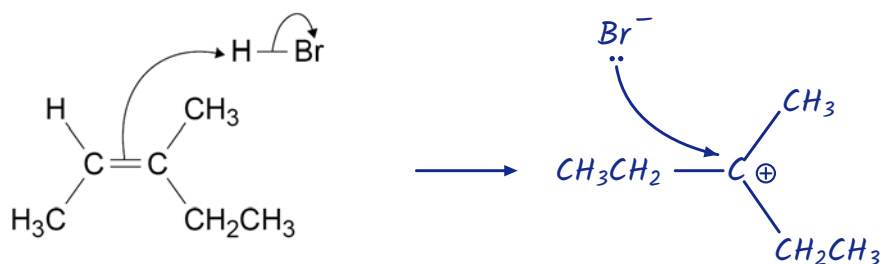


0 2 3

Figure 1 shows part of the mechanism when **L** reacts with hydrogen bromide.

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Figure 1



Complete **Figure 1** to show the next step in the mechanism that gives the major product.

[2 marks]

7

Turn over for the next question

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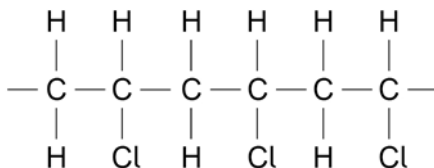


0 3

This question is about polymers.

0 3 . 1

A section of the polymer PVC is shown.



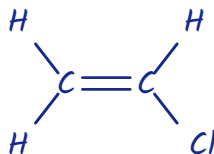
Name the monomer used to make PVC.

Draw the structure of the monomer used to make PVC.

[2 marks]

Monomer name Chloroethene

Structure



0 3 . 2

State why PVC is **not** biodegradable.

[1 mark]

The C-C bonds in the polymer chain are non-polar (and strong), so they are not attacked by nucleophiles and cannot be hydrolysed.

0 3 . 3

Diisobutyl phthalate (DIBP) is a plasticiser added to PVC to modify its properties.

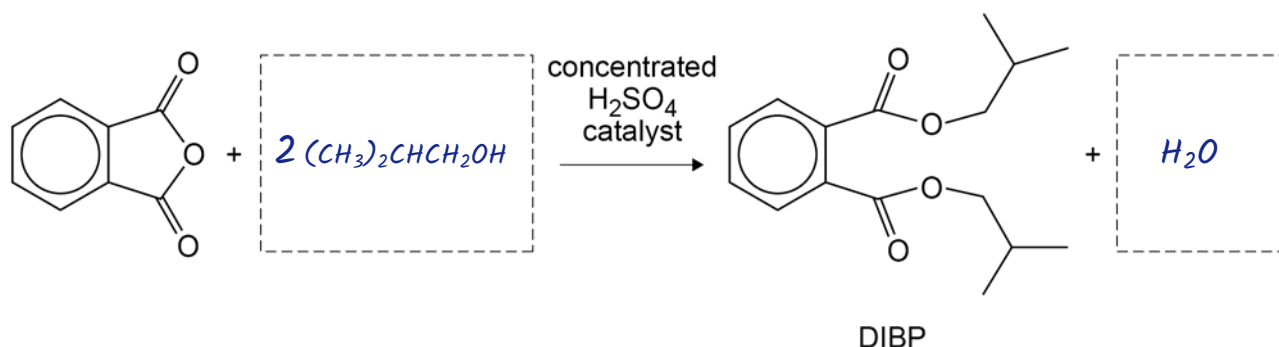
State how the properties of PVC are modified by the addition of DIBP.

[1 mark]

It makes the PVC softer and more flexible (it lowers the glass transition temperature).



0 3 . 4 An incomplete equation for the reaction used to make DIBP is shown.



Complete the equation.

Give the name of the mechanism for this reaction.

Deduce the empirical formula of DIBP.

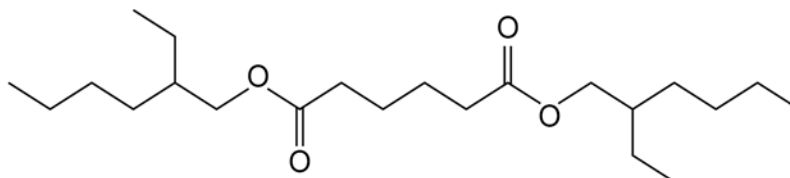
[4 marks]

Name of mechanism (Nucleophilic) addition-elimination

Empirical formula of DIBP $C_8H_{11}O_2$

0 3 . 5 A different plasticiser, DEHA, is added to PVC used for food packaging.

The structure of DEHA is



Identify the organic compound that would react with hexanedioic acid to form DEHA.

[1 mark]

2-ethylhexan-1-ol, $CH_3CH_2CH_2CH_2CH(CH_2CH_3)CH_2OH$

Question 3 continues on the next page

Turn over ►



0 3 . 6

DEHA can be absorbed into food from PVC packaging.

In an investigation, 1 kg samples of three different foods are stored in PVC packaging for 30 days.

Table 1 shows the water content, fat content and mass of DEHA in each type of food after 30 days.

Table 1

Food	Water content (%)	Fat content (%)	Mass of DEHA in food after 30 days / mg
Milk	87	3	2.83
Cheese	45	26	10.88
Butter	16	80	24.56

Use your knowledge of intermolecular forces to explain these results.

[3 marks]

The more fat a food contains (and the less water), the greater the mass of DEHA absorbed.

DEHA is non-polar (hydrophobic): it has long alkyl (hydrocarbon) chains and no O-H groups, so it cannot form hydrogen bonds with water.

Fats also contain long hydrocarbon chains, so (relatively strong, many) van der Waals' / London forces form between DEHA and the fat molecules, so DEHA dissolves in fat.

So butter absorbs most DEHA and milk (mostly water) the least.

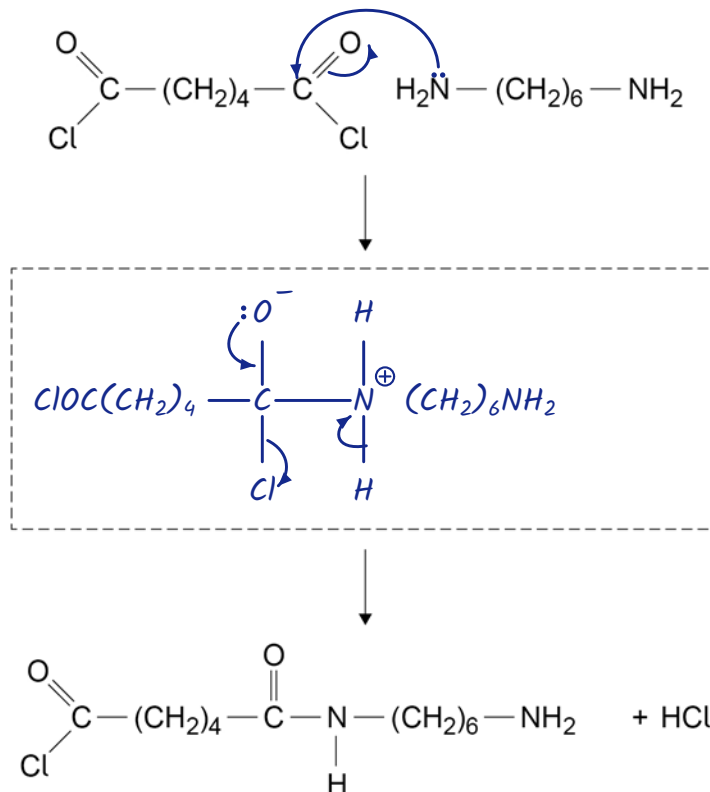


0 3 7

The polymer nylon 6,6 can be made from hexanedioyl dichloride and hexane-1,6-diamine.

Figure 2 shows an incomplete mechanism for the first steps in this reaction.

Figure 2



Draw the missing intermediate in the box in **Figure 2**.

Complete **Figure 2** by adding the curly arrows and any relevant lone pairs of electrons involved in these steps in the mechanism.

[4 marks]

Question 3 continues on the next page

Turn over ►

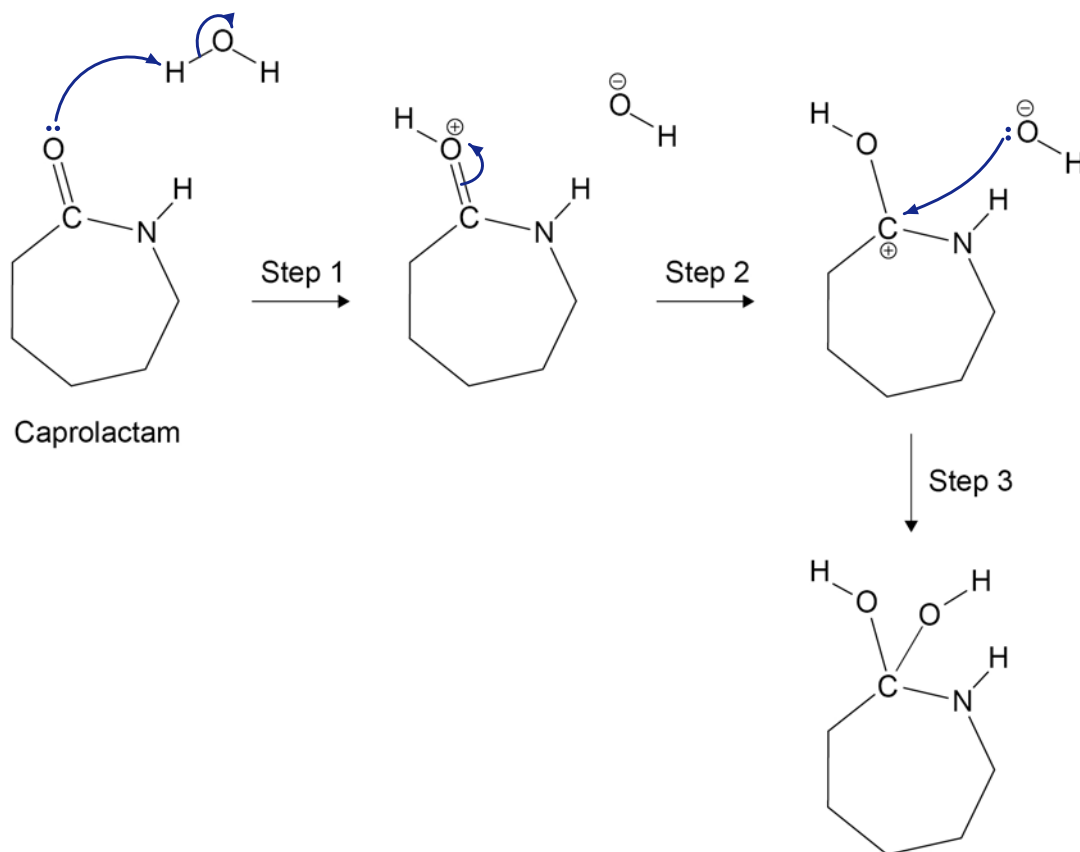


0 3 8

The polymer nylon 6 can be made by heating caprolactam with water.

Figure 3 shows the species involved in the first three steps of the mechanism for this reaction.

Figure 3



Complete **Figure 3** by adding the curly arrows and any relevant lone pairs of electrons involved in these steps in the mechanism.

[4 marks]

20



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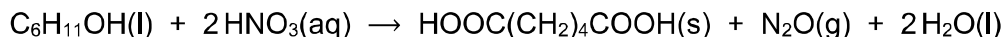


0 4

Hexanedioic acid is an important compound used in organic synthesis.

Hexanedioic acid can be prepared from cyclohexanol.

The equation for the reaction is



Method

Step 1 Add 5 cm³ of concentrated nitric acid to a boiling tube.

Step 2 Place the boiling tube in a beaker of water at 85 °C

Step 3 Add 2 cm³ of cyclohexanol dropwise to the boiling tube.

Step 4 Leave the reaction mixture for 10 minutes.

Step 5 Cool the boiling tube in a beaker of cold water for a further 10 minutes.

Step 6 Filter the contents of the boiling tube and collect the impure solid.

Step 7 Recrystallise the impure solid using methanol.

Step 8 Wash the purified crystalline product with some ice-cold distilled water, and dry.

Step 9 Measure the melting point of the hexanedioic acid.

0 4 . 1

Suggest why the apparatus should be set up in a fume cupboard.

[1 mark]

N₂O gas is produced; it is toxic (its hazard is unknown, so it should be treated as toxic) and can cause respiratory problems. Concentrated nitric acid is also corrosive and gives harmful fumes.

0 4 . 2

Deduce the role of the concentrated nitric acid in the reaction.

[1 mark]

Oxidising agent



0 4 . 3

Outline how **Steps 7** and **8** should be done to obtain the purified crystalline product.**[5 marks]**

Dissolve the impure solid in the minimum volume of hot methanol, to make a saturated solution.

Filter the hot solution quickly (hot gravity filtration, not Büchner) to remove insoluble impurities.

Leave the filtrate to cool (then in an ice bath) so that crystals of hexanedioic acid form; soluble impurities stay in solution.

Filter off the crystals under reduced pressure (Büchner funnel).

Wash with a little ice-cold distilled water, then dry the crystals between filter papers or in a warm place.

0 4 . 4

In **Step 8**, the distilled water must be ice-cold.

Suggest why using water at room temperature lowers the recorded yield of product.

[1 mark]

Hexanedioic acid is slightly soluble in water, so water at room temperature dissolves some of the product and washes it away. Ice-cold water dissolves less product.

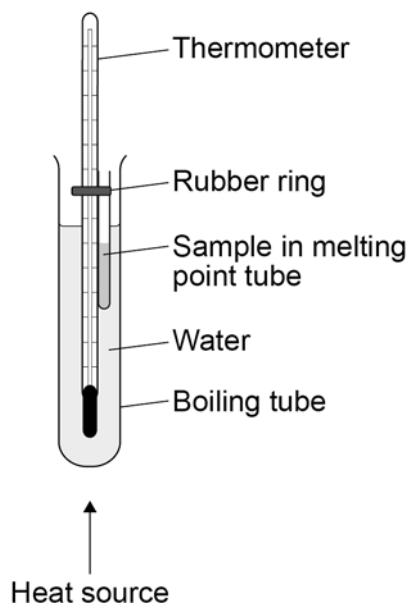
Question 4 continues on the next page**Turn over ►**

0 4 . 5

Figure 4 shows how a student set up the apparatus for measuring the melting point of hexanedioic acid in **Step 9** (data book value $152\text{ }^{\circ}\text{C}$).

The apparatus is supported by clamps but these are not shown.

Figure 4



Identify **two** mistakes the student made in setting up this apparatus.

State the problem caused by each mistake.

[4 marks]

Mistake 1 Water is used to heat the sample (in the boiling tube).

Problem caused Water boils at $100\text{ }^{\circ}\text{C}$, so the temperature will not get high enough ($152\text{ }^{\circ}\text{C}$) to melt the sample.

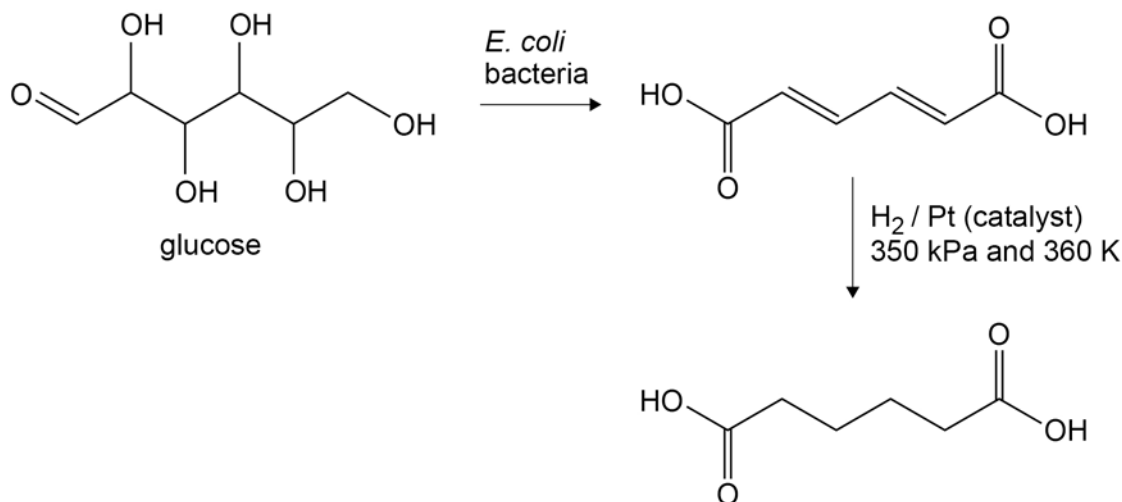
Mistake 2 The sample is much higher than the bulb at the bottom of the thermometer.

Problem caused The temperature of the sample will be lower than (different from) the reading on the thermometer.



Figure 5 shows an alternative process to make hexanedioic acid.

Figure 5



0 4 . 6

Scientists disagree about whether this alternative process is more sustainable or less sustainable than the process starting from cyclohexanol.

Use the information given in **Figure 5** to provide a justification for each point of view.

[2 marks]

Justification for alternative process being more sustainable Glucose is a renewable feedstock (from plants), and the *E. coli* bacteria are renewable. The Pt catalyst can be reused.

Justification for alternative process being less sustainable It is a two-stage process that uses hydrogen gas (non-renewable, from fossil fuels), high pressure (350 kPa) and a platinum catalyst mined from the earth.

14

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0 5

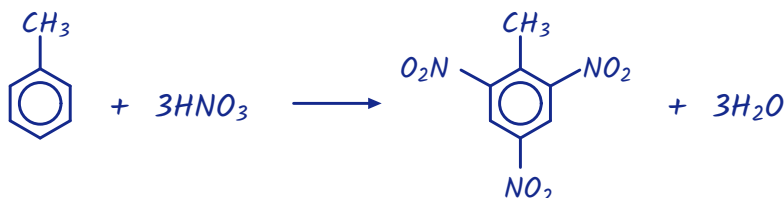
This question is about making the explosive 2-methyl-1,3,5-trinitrobenzene, commonly known as TNT.

TNT can be made by reacting methylbenzene with concentrated nitric acid in the presence of concentrated sulfuric acid.

0 5 . 1

Give the overall equation for the reaction between methylbenzene and nitric acid.

[2 marks]



0 5 . 2

The yield of TNT in this reaction is 42.5%.

Calculate the mass, in g, of TNT ($M_r = 227.0$) obtained from 1050 cm^3 of methylbenzene.

Methylbenzene has density = 0.867 g cm^{-3} and $M_r = 92.0$

[4 marks]

$$\text{Mass of methylbenzene} = 1050 \times 0.867 = 910.35 \text{ g}$$

$$n(\text{C}_6\text{H}_5\text{CH}_3) = 910.35 \div 92.0 = 9.895 \text{ mol}$$

1 : 1 ratio, so with 42.5% yield:

$$n(\text{TNT}) = 9.895 \times 0.425 = 4.205 \text{ mol}$$

$$\text{Mass of TNT} = 4.205 \times 227.0 = 954.6 \text{ g} = 955 \text{ g (3 s.f.)}$$

Mass of TNT 955 g



0 5 3

In the mechanism for this reaction, concentrated nitric acid reacts with concentrated sulfuric acid to produce the nitronium ion O_2N^+

Give an equation for the reaction to produce the nitronium ion.

State the role of the nitronium ion in the reaction with methylbenzene.

Outline the mechanism for the reaction of the nitronium ion with methylbenzene to give 2-methyl-1-nitrobenzene.

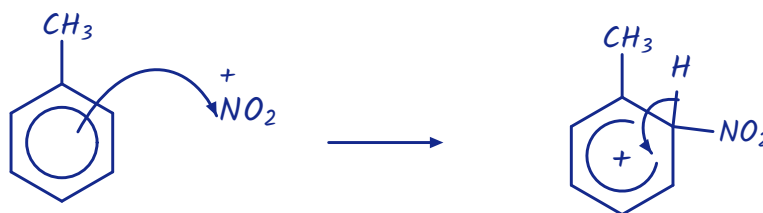
[5 marks]

Equation



Role of nitronium ion Electrophile

Mechanism



11

Turn over for the next question

Turn over ►



0 6

GHK is a natural tripeptide found in human blood plasma.

The amino acid sequence of GHK is Lys-His-Gly

Each amino acid is represented by a three-letter abbreviation.

Lys = lysine

His = histidine

Gly = glycine

Glycine has the structure $\text{H}_2\text{NCH}_2\text{COOH}$

0 6 . 1

D_2O is used as the solvent when obtaining a ^1H NMR spectrum for lysine.

Give **one** reason why D_2O is used rather than CCl_4 and **one** reason why D_2O is used rather than water.

[2 marks]

D_2O rather than CCl_4 D_2O is polar, so lysine (polar / ionic) dissolves in it but not in non-polar CCl_4 .

D_2O rather than water D_2O has no ^1H atoms, so the solvent gives no peak in the ^1H NMR spectrum.

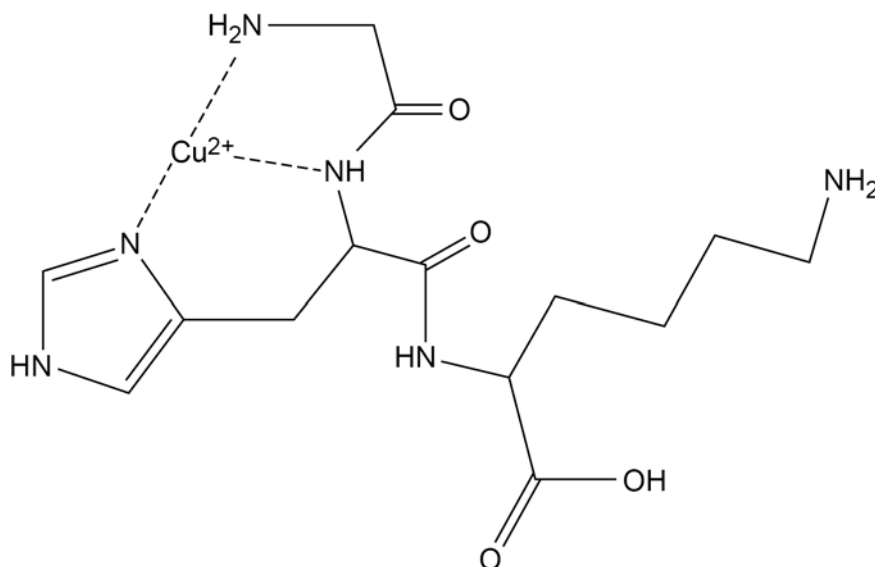


GHK is commonly used in cosmetics as part of anti-ageing treatments.

GHK binds to copper(II) ions in the body to form GHK–Cu

Figure 6 shows the structure of GHK–Cu

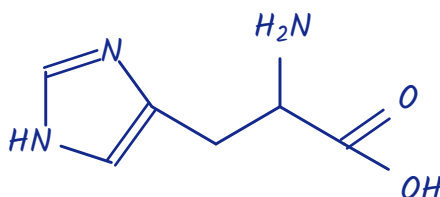
Figure 6



0 6 . 2

Use **Figure 6** to determine the structure of the amino acid histidine, His

[1 mark]



Question 6 continues on the next page

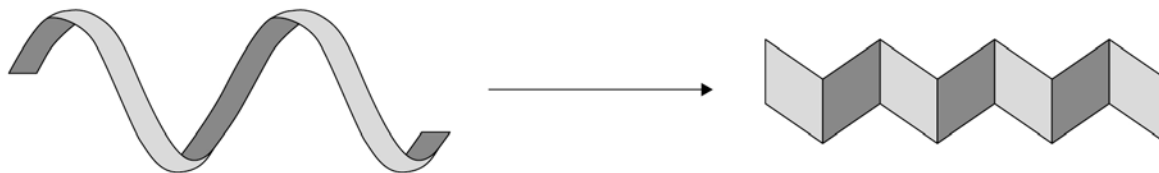
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Lysine molecules can polymerise to give poly(lysine).

0 6 . 3

Increasing the temperature of an alkaline solution of poly(lysine) changes the type of secondary structure in poly(lysine), as shown.



Name the type of secondary structure before and after heating.

[2 marks]

Type of secondary structure before heating α -helix

Type of secondary structure after heating β -pleated sheet

5



0 7

This question is about spectroscopy.

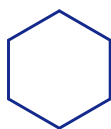
0 7 . 1

Compound **P** is a hydrocarbon with only one peak (a singlet) in its ^1H NMR spectrum.**P** has a precise M_r of 84.09396Carbon has a precise A_r of 12.00000Hydrogen has a precise A_r of 1.00783Use this information to deduce the molecular formula of **P**. Show your working.Suggest **two** possible structures for **P**.Explain how **P** can be identified using its infrared spectrum above 1500 cm^{-1} Use **Table A** in the Data Booklet to help you to answer this question.**[5 marks]**

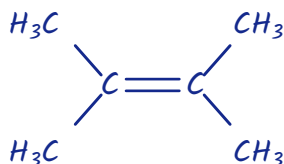
$$84.09396 = (6 \times 12.00000) + (12 \times 1.00783) = 72.00000 + 12.09396$$

Molecular formula C_6H_{12}

Structure 1



Structure 2



Explanation Look for a peak at $1620\text{--}1680\text{ cm}^{-1}$, due to $\text{C}=\text{C}$. If this peak is present, **P** is the alkene (2,3-dimethylbut-2-ene); cyclohexane has no $\text{C}=\text{C}$ so does not have this peak (it only shows C-H at $2850\text{--}3300\text{ cm}^{-1}$).

Question 7 continues on the next page

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0 7 . 2 Compound **Q** has the molecular formula $C_5H_8O_2$

Figure 7 shows the ^{13}C NMR spectrum of compound **Q**.

Figure 8 shows the ^1H NMR spectrum of compound **Q**.

Figure 7

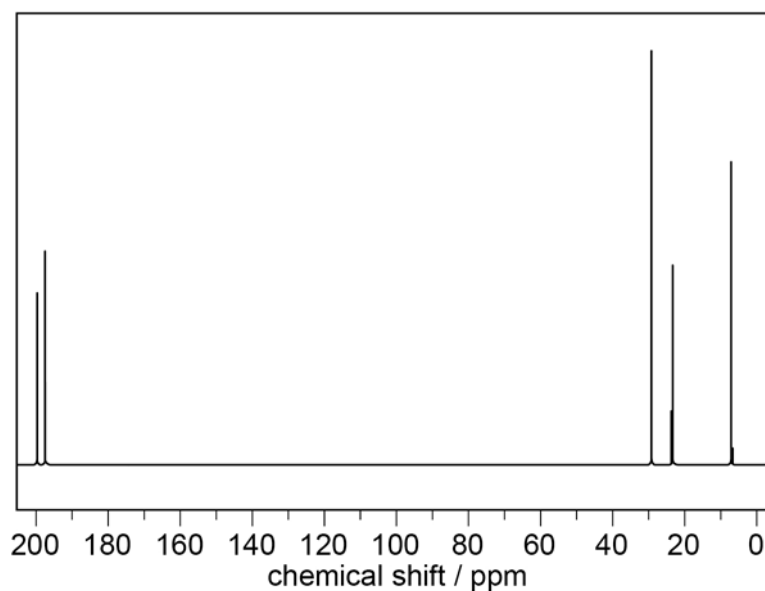
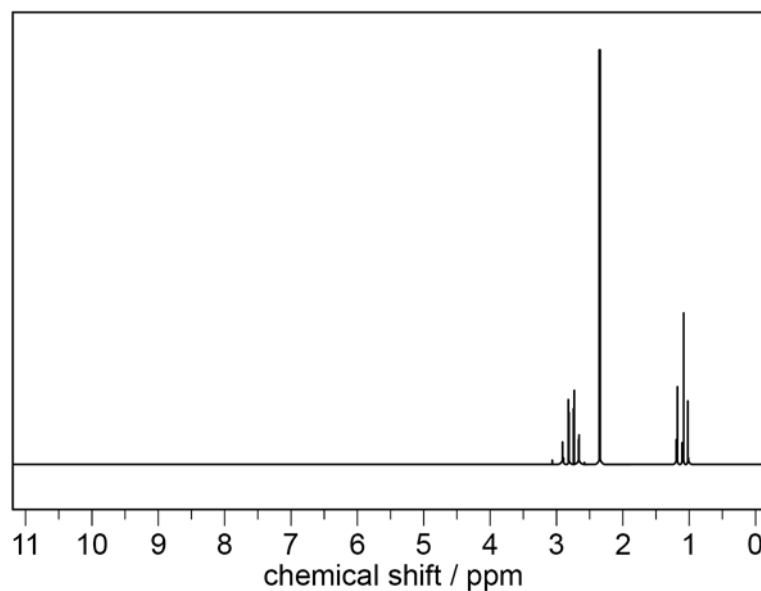


Figure 8



Explain what you can deduce about the structure of compound **Q**.

In your answer you should refer to

- the peaks in the ^{13}C NMR spectrum
- the chemical shift values for the peaks in the ^1H NMR spectrum
- the splitting pattern for the peaks in the ^1H NMR spectrum.

Give the structure of compound **Q**.

[7 marks]

^{13}C NMR: there are 5 peaks, so there are 5 different carbon environments (one for each carbon in $\text{C}_5\text{H}_8\text{O}_2$).

Two peaks at about 200 ppm (in the range 190–220 ppm), so there are two different $\text{C}=\text{O}$ carbons in aldehyde / ketone groups. There is no peak at 160–185 ppm, so **Q** is not an ester or carboxylic acid.

Three peaks between 5 and 50 ppm (about 7, 23 and 29 ppm), so these are $\text{C}-\text{C}$ carbons (alkyl carbons, including $\text{R}-\text{CO}-\text{C}$ carbons).

^1H NMR chemical shifts: there are 3 peaks, so 3 different proton environments.

The peak at about 1.1 ppm (range 0.7–1.2) is due to $\text{R}-\text{CH}_3$.

The peak at about 2.3 ppm (range 2.1–2.6) is due to the H in $\text{R}-\text{CO}-\text{CH}_3$.

The peak at about 2.8 ppm (range 2.6–2.8) is due to the H in $\text{R}-\text{CO}-\text{CH}_2-$.

There is no peak at 9–10 ppm, so there is no aldehyde H (CHO); both $\text{C}=\text{O}$ are ketone groups.

^1H splitting ($n + 1$ rule): the peak at 1.1 ppm is a triplet, so this CH_3 is next to a CH_2 (2 adjacent H).

The peak at 2.3 ppm is a singlet, so this CH_3 has no H on the adjacent carbon (it is next to a $\text{C}=\text{O}$).

The peak at 2.8 ppm is a quartet, so this CH_2 is next to a CH_3 (3

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adjacent H). So there is a $\text{CH}_3\text{CH}_2\text{CO}-$ group.

The two $\text{C}=\text{O}$ groups must be next to each other, joining the $\text{CH}_3\text{CH}_2\text{CO}-$ and the $-\text{COCH}_3$ groups.

So Q is pentane-2,3-dione: $\text{CH}_3\text{CH}_2\text{COCOCH}_3$



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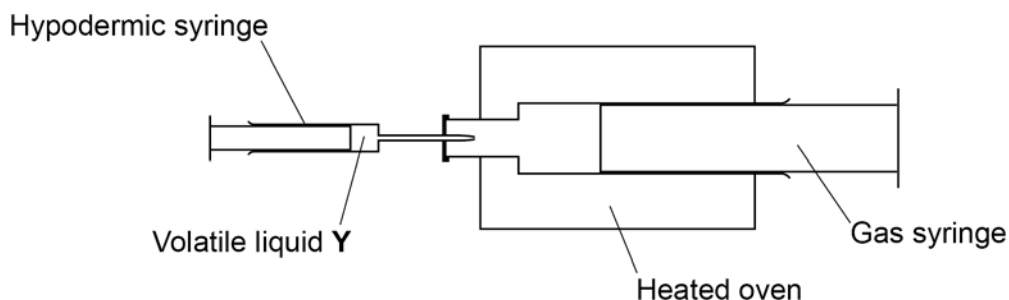
2 5

0 8

This question is about gas volumes.

Figure 9 shows some of the apparatus needed to determine an experimental value for the M_r of an unknown volatile liquid **Y**.

Figure 9



A student uses this method to determine an experimental value for the M_r of **Y**.

1. Record the volume of air in a gas syringe.
2. Collect a sample of **Y** in a hypodermic syringe.
3. Record the mass of the hypodermic syringe and **Y**.
4. Push the needle of the hypodermic syringe through the rubber cap on the gas syringe.
5. Inject a small amount of **Y** into the gas syringe.
6. Remove the hypodermic syringe from the gas syringe.
7. Record the mass of the hypodermic syringe and the remaining **Y**.
8. Record the volume of gas in the gas syringe.
9. Record the temperature in the oven and the atmospheric pressure.

Results

Initial volume of air in the gas syringe	5 cm ³
Mass of hypodermic syringe and Y before injection	3.873 g
Mass of hypodermic syringe and Y after injection	3.471 g
Final volume of gas in the gas syringe	110 cm ³
Temperature	155 °C
Pressure	101 kPa



0 8 . 1

Use the results to determine an experimental value for the M_r of Y.The gas constant, $R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$

Show your working.

[5 marks]

$$\text{Volume of Y} = 110 - 5 = 105 \text{ cm}^3 = 105 \times 10^{-6} \text{ m}^3$$

$$T = 155 + 273 = 428 \text{ K} \quad p = 101 \text{ kPa} = 101 \times 10^3 \text{ Pa}$$

$$\text{Mass of Y} = 3.873 - 3.471 = 0.402 \text{ g}$$

$$pV = nRT \text{ so } n = pV \div RT$$

$$n = (101 \times 10^3 \times 105 \times 10^{-6}) \div (8.31 \times 428)$$

$$n = 10.605 \div 3556.68 = 2.982 \times 10^{-3} \text{ mol}$$

$$M_r = \text{mass} \div n = 0.402 \div 2.982 \times 10^{-3}$$

$$M_r = 134.8 = 135$$

 M_r 135

Question 8 continues on the next page

Turn over ►



0 8 . 2

The percentage uncertainty in the volume of Y in the gas syringe is 0.95%

The percentage uncertainty in the temperature is 0.12%

The uncertainty in each balance reading is ± 0.0005 g

Assume that the uncertainty in the value for pressure is negligible.

Calculate the percentage uncertainty in the use of the balance in this experiment.

Use your answer and the percentage uncertainties for volume and temperature to calculate a range of values for the M_r of Y.

(If you were unable to calculate an experimental value for the M_r of Y in Question 08.1, assume it is 141. This is not the correct answer.)

[3 marks]

$$\text{Two balance readings, so uncertainty} = 2 \times 0.0005 = 0.001 \text{ g}$$

$$\% \text{ uncertainty} = (0.001 \div 0.402) \times 100 = 0.249\%$$

Percentage uncertainty for balance 0.249%

$$\text{Total \% uncertainty} = 0.95 + 0.12 + 0.249 = 1.32\%$$

$$\text{Uncertainty in } M_r = 135 \times 1.32 \div 100 = \pm 1.8$$

$$M_r \text{ range} = 135 - 1.8 \text{ to } 135 + 1.8$$

M_r range 133.2 to 136.8



0 8 . 3

A teacher suggests placing a seal over the needle of the hypodermic syringe after collecting the sample of liquid Y, and then replacing the seal after injecting the liquid Y into the gas syringe.

Give a reason why the teacher's suggestion will improve the experiment.

[1 mark]

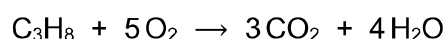
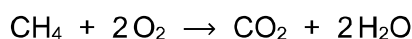
The seal prevents evaporation (loss) of the volatile liquid Y from the needle, so the mass of Y injected (found by difference) is recorded more accurately.

0 8 . 4

A mixture of methane and propane has a volume of 40 cm³

This mixture needs exactly 170 cm³ of oxygen for complete combustion.

The equations for these reactions are



Calculate the volume

- of methane in the original mixture
- of propane in the original mixture.

All volumes are measured at the same temperature and pressure.

[4 marks]

Let volume of CH₄ = a cm³, so volume of C₃H₈ = (40 - a) cm³

Volume of O₂ needed = 2a + 5(40 - a) = 170

200 - 3a = 170 so 3a = 30, a = 10 cm³

Volume of C₃H₈ = 40 - 10 = 30 cm³

Volume of methane 10 cm³

Volume of propane 30 cm³

13

Turn over ►



0	9
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This question is about rates of reaction.

The rate of hydrolysis of a bromoalkane (RBr) is investigated using this method.

- A boiling tube has a cross drawn onto it.
- An aqueous solution of silver nitrate is added to an ethanolic solution of RBr in the boiling tube in a warm water bath.
- The time is recorded for the cross on the boiling tube to become invisible.

The method is repeated at different temperatures.

0	9	.	1
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State why the cross on the boiling tube becomes invisible.

[1 mark]

Insoluble silver bromide (AgBr) forms as a precipitate, so the mixture goes cloudy and hides the cross.

0	9	.	2
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The volume and concentration of each substance used at each temperature is kept constant.

Identify **one** other variable that should be kept constant to ensure that the investigation is fair.

[1 mark]

View the cross from the same distance and angle each time, with the same person judging when it disappears.



0 9 . 3

The reaction between the bromoalkane RBr and an aqueous solution of KOH is investigated.

The rate constant k for this reaction is determined at a series of temperatures T .

The Arrhenius equation can be written in this form.

$$\ln k = -\frac{E_a}{RT} + \ln A$$

Table 2 shows an incomplete set of results for this investigation.

Table 2

$T / ^\circ\text{C}$	$\frac{1}{T} / \text{K}^{-1}$	$k / \text{mol}^{-1} \text{dm}^3 \text{s}^{-1}$	$\ln k$
39.5	3.20×10^{-3}	0.432	-0.84
44.5	3.15×10^{-3}	0.741	-0.30
52.2	3.08×10^{-3}	1.65	0.50
60.3	3.00×10^{-3}	3.74	1.32
71.8	2.90×10^{-3}	10.8	2.38

Complete **Table 2**.

[1 mark]

Question 9 continues on the next page

Turn over ►



0 9 . 4

The results in **Table 2** can be used to plot a graph to determine the activation energy E_a for this reaction.

Complete the x-axis in **Figure 10** by adding an appropriate scale.

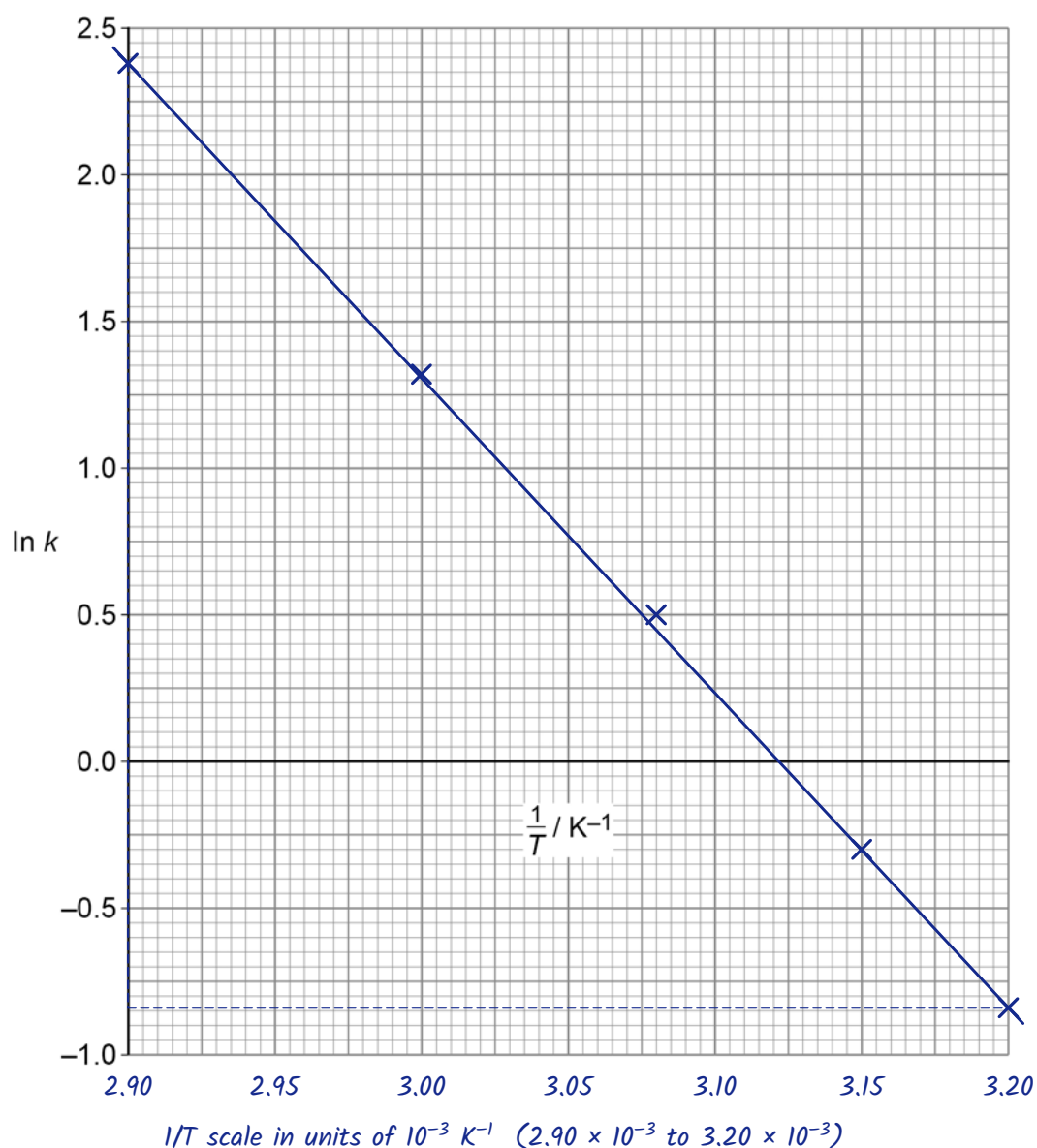
Plot the graph on the grid in **Figure 10**.

Use your graph to determine a value, in kJ mol^{-1} , for the activation energy E_a

The gas constant, $R = 8.31 \text{ J K}^{-1} \text{ mol}^{-1}$

[5 marks]

Figure 10



Gradient from points on line $(2.90 \times 10^{-3}, 2.38)$ and $(3.20 \times 10^{-3}, -0.84)$:

$$\text{gradient} = (-0.84 - 2.38) \div (3.20 \times 10^{-3} - 2.90 \times 10^{-3})$$

$$\text{gradient} = -3.22 \div 3.00 \times 10^{-4} = -10\,733\text{ K}$$

$$\text{gradient} = -E_a/R \text{ so } E_a = -\text{gradient} \times R$$

$$E_a = 10\,733 \times 8.31 = 89\,193\text{ J mol}^{-1}$$

$$E_a = 89\,193 \div 1000 = 89.2\text{ kJ mol}^{-1}$$

$$E_a \underline{\hspace{2cm} 89.2 \hspace{2cm}} \text{ kJ mol}^{-1}$$

Question 9 continues on the next page

Turn over ►



0 9 . 5

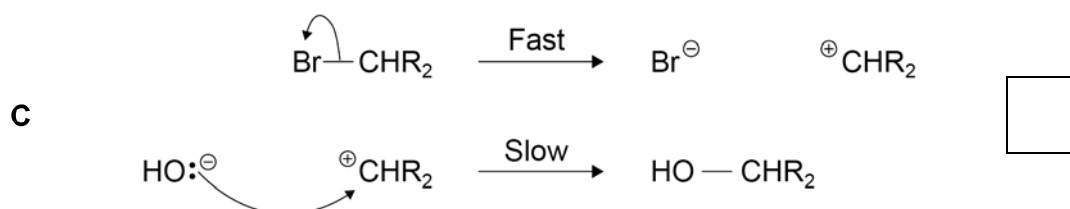
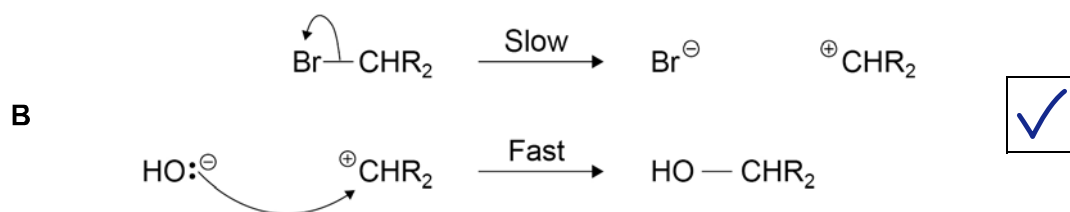
The rate equation for the reaction between a different bromoalkane (R_2CHBr) and an aqueous solution of KOH is

$$\text{rate} = k [R_2CHBr]$$

Which of these is a correct mechanism for the reaction between R_2CHBr and KOH?

[1 mark]

Tick (✓) **one** box.



0 9 . 6

Explain, in terms of bond polarity, why R_2CHBr and KOH react together.

[2 marks]

Br is more electronegative than C, so the C-Br bond is polar: the C is $\delta+$ and the Br is $\delta-$.

The lone pair of electrons on the OH^- (nucleophile) is attracted to / attacks the $\delta+$ carbon (the C^+ after the C-Br bond breaks).

11

END OF QUESTIONS



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