

FOR OFFICIAL USE

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C

KU PS

Total  
Marks

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**0500/402**

NATIONAL  
QUALIFICATIONS  
2009

MONDAY, 11 MAY  
10.50 AM – 12.20 PM

CHEMISTRY  
STANDARD GRADE  
Credit Level

Fill in these boxes and read what is printed below.

Full name of centre

Town

Forename(s)

Surname

Date of birth

Day Month Year

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Scottish candidate number

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Number of seat

- 1 All questions should be attempted.
- 2 Necessary data will be found in the Data Booklet provided for Chemistry at Standard Grade and Intermediate 2.
- 3 The questions may be answered in any order but all answers are to be written in this answer book, and must be written clearly and legibly in ink.
- 4 Rough work, if any should be necessary, as well as the fair copy, is to be written in this book.  
Rough work should be scored through when the fair copy has been written.
- 5 Additional space for answers and rough work will be found at the end of the book.
- 6 The size of the space provided for an answer should not be taken as an indication of how much to write. It is not necessary to use all the space.
- 7 Before leaving the examination room you must give this book to the invigilator. If you do not, you may lose all the marks for this paper.



## PART 1

In Questions 1 to 8 of this part of the paper, an answer is given by circling the appropriate letter (or letters) in the answer grid provided.

In some questions, two letters are required for full marks.

If more than the correct number of answers is given, marks will be deducted.

A total of 20 marks is available in this part of the paper.

### SAMPLE QUESTION

A	CH <sub>4</sub>	B	H <sub>2</sub>	C	CO <sub>2</sub>
D	CO	E	C <sub>2</sub> H <sub>5</sub> OH	F	C

(a) Identify the hydrocarbon.

Ⓐ	B	C
D	E	F

The one correct answer to part (a) is A. This should be circled.

(b) Identify the **two** elements.

A	Ⓑ	C
D	E	Ⓕ

As indicated in this question, there are **two** correct answers to part (b). These are B and F. Both answers are circled.

If, after you have recorded your answer, you decide that you have made an error and wish to make a change, you should cancel the original answer and circle the answer you now consider to be correct. Thus, in part (a), if you want to change an answer A to an answer D, your answer sheet would look like this:

<del>Ⓐ</del>	B	C
Ⓓ	E	F

If you want to change back to an answer which has already been scored out, you should enter a tick (✓) in the box of the answer of your choice, thus:

✓ <del>Ⓐ</del>	B	C
<del>Ⓓ</del>	E	F

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1. Many solutions are used for chemical tests.

A	B	C
Benedict's reagent	lime water	bromine solution
D	E	F
pH indicator	iodine solution	ferroxyl indicator

(a) Identify the solution which could be used to test for maltose.

A	B	C
D	E	F

1

(b) Identify the solution which is used to test for  $\text{Fe}^{2+}(\text{aq})$ .

A	B	C
D	E	F

1

(2)

[Turn over

Marks

KU PS

2. Many chemical compounds contain ions.

A strontium chloride	B lithium oxide	C calcium oxide
D barium fluoride	E sodium fluoride	F potassium chloride

(a) Identify the compound which produces a green flame colour.

You may wish to use the data booklet to help you.

A	B	C
D	E	F

1

(b) Identify the compound in which **both** ions have the same electron arrangement as argon.

A	B	C
D	E	F

1

(2)

Marks

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3. The table contains information about some substances.

Substance	Melting point/°C	Boiling point/°C	Conducts as	
			a solid	a liquid
A	639	3228	yes	yes
B	2967	3273	no	no
C	159	211	no	no
D	1402	2497	no	yes
E	27	677	yes	yes

(a) Identify the substance which exists as a covalent network.

A
B
C
D
E

1

(b) Identify the substance which could be calcium fluoride.

A
B
C
D
E

1

(2)

[Turn over

Marks

KU PS

4. The grid shows the names of some ionic compounds.

A		B		C	
	aluminium bromide		sodium chloride		potassium hydroxide
D		E		F	
	sodium sulphate		potassium bromide		calcium chloride

- (a) Identify the base.

A	B	C
D	E	F

1

- (b) Identify the **two** compounds whose solutions would form a precipitate when mixed.

You may wish to use the data booklet to help you.

A	B	C
D	E	F

1

- (c) Identify the compound with a formula of the type **XY<sub>2</sub>**, where **X** is a metal.

A	B	C
D	E	F

1

(3)

Marks

KU PS

5. The names of some hydrocarbons are shown in the grid.

A	ethane	B	pentene	C	cyclohexane
D	pentane	E	cyclopentane	F	propene

- (a) Identify the **two** isomers.

A	B	C
D	E	F

1

- (b) Identify the hydrocarbon with the highest boiling point.

You may wish to use the data booklet to help you.

A	B	C
D	E	F

1

- (c) Identify the **two** hydrocarbons which can take part in an addition reaction with hydrogen.

A	B	C
D	E	F

1

(3)

[Turn over

Marks

KU PS

6. Reactions can be represented using chemical equations.

A	$\text{Fe}^{2+}(\text{aq}) + 2\text{e}^{-} \rightarrow \text{Fe}(\text{s})$
B	$\text{Fe}^{2+}(\text{aq}) \rightarrow \text{Fe}^{3+}(\text{aq}) + \text{e}^{-}$
C	$2\text{H}_2(\text{g}) + \text{O}_2(\text{g}) \rightarrow 2\text{H}_2\text{O}(\text{g})$
D	$2\text{H}_2\text{O}(\ell) + \text{O}_2(\text{g}) + 4\text{e}^{-} \rightarrow 4\text{OH}^{-}(\text{aq})$
E	$\text{SO}_2(\text{g}) + \text{H}_2\text{O}(\ell) \rightarrow 2\text{H}^{+}(\text{aq}) + \text{SO}_3^{2-}(\text{aq})$

(a) Identify the equation which shows the formation of acid rain.

A
B
C
D
E

1

(b) Identify the equation which represents a combustion reaction.

A
B
C
D
E

1

(c) Identify the **two** equations which are involved in the corrosion of iron.

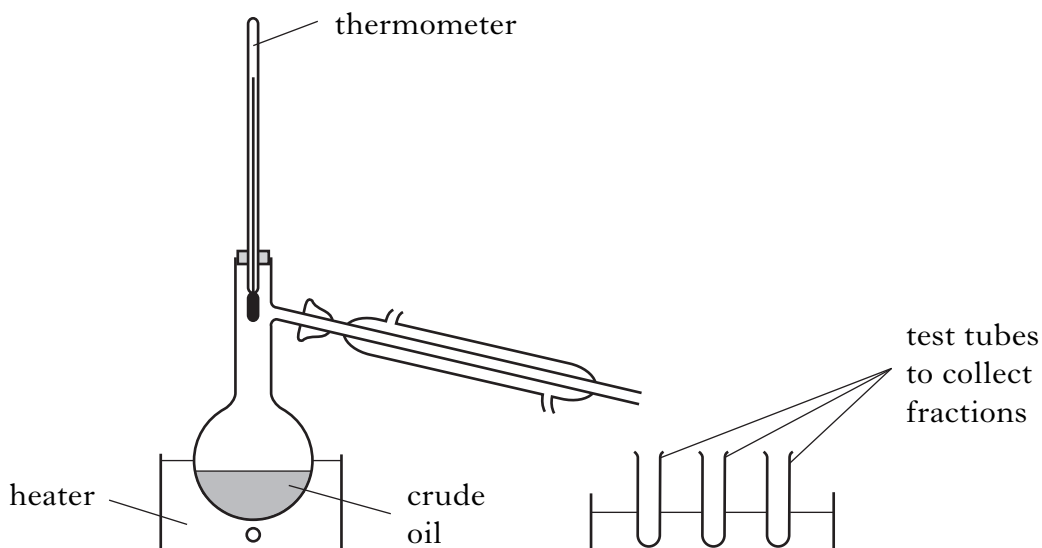
A
B
C
D
E

2

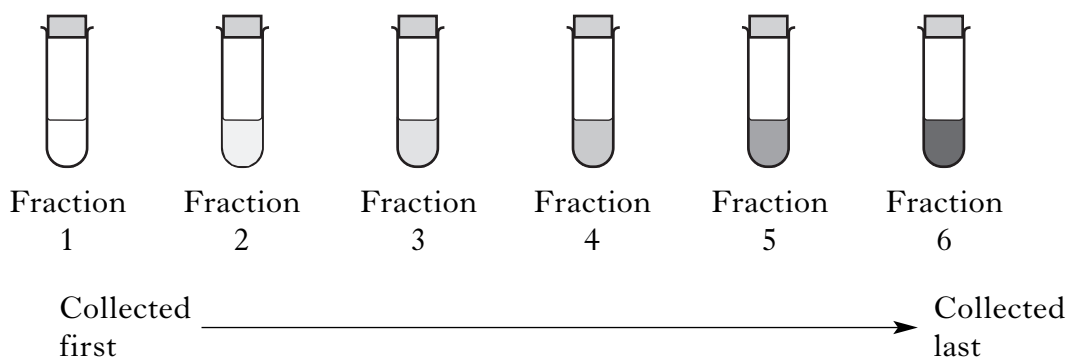
(4)



8. The fractional distillation of crude oil was demonstrated to a class.



Six fractions were numbered in the order they were collected.



Identify the **two** correct statements.

A	Fraction 6 evaporates most easily.
B	Fraction 5 is less viscous than fraction 4.
C	Fraction 2 is more flammable than fraction 3.
D	Fraction 1 has a lower boiling range than fraction 2.
E	The molecules in fraction 3 are larger than those in fraction 4.

A
B
C
D
E

(2)

**[Turn over for Part 2 on *Page twelve***

*Marks*

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**PART 2****A total of 40 marks is available in this part of the paper.**

9. There are three different types of neon atom.

Type of atom	Number of protons	Number of neutrons
${}_{10}^{20}\text{Ne}$		
${}_{10}^{21}\text{Ne}$		
${}_{10}^{22}\text{Ne}$		

- (a) Complete the table to show the number of protons and neutrons in each type of neon atom.

**1**

- (b) What term is used to describe these different types of neon atom?

\_\_\_\_\_

**1**

- (c) A natural sample of neon has an average atomic mass of 20.2.

What is the mass number of the most common type of atom in the sample of neon?

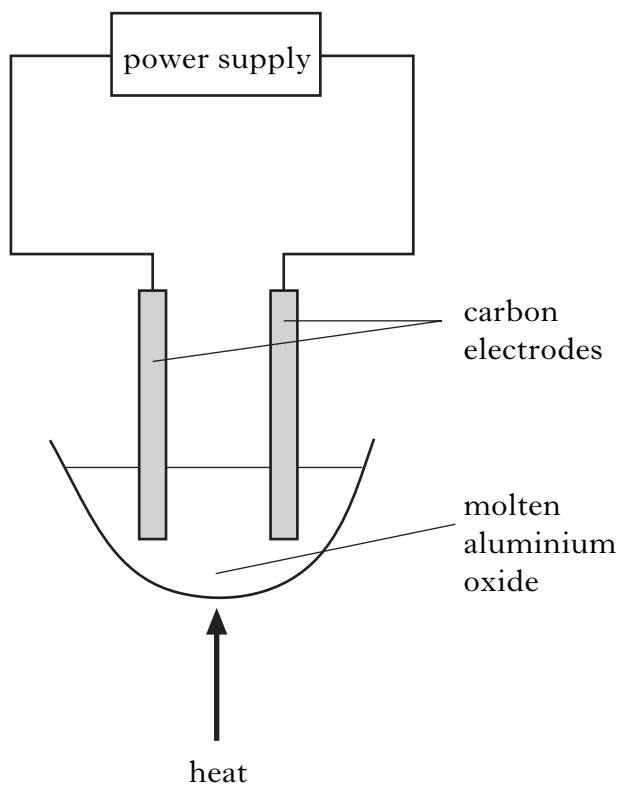
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**1****(3)**

Marks

KU PS

10. Aluminium metal can be produced by passing electricity through molten aluminium oxide.



- (a) Name this process.

\_\_\_\_\_

1

- (b) Write the ionic formula for aluminium oxide.

\_\_\_\_\_

1

- (c) Why do ionic compounds, like aluminium oxide, conduct electricity when molten?

\_\_\_\_\_

\_\_\_\_\_

1

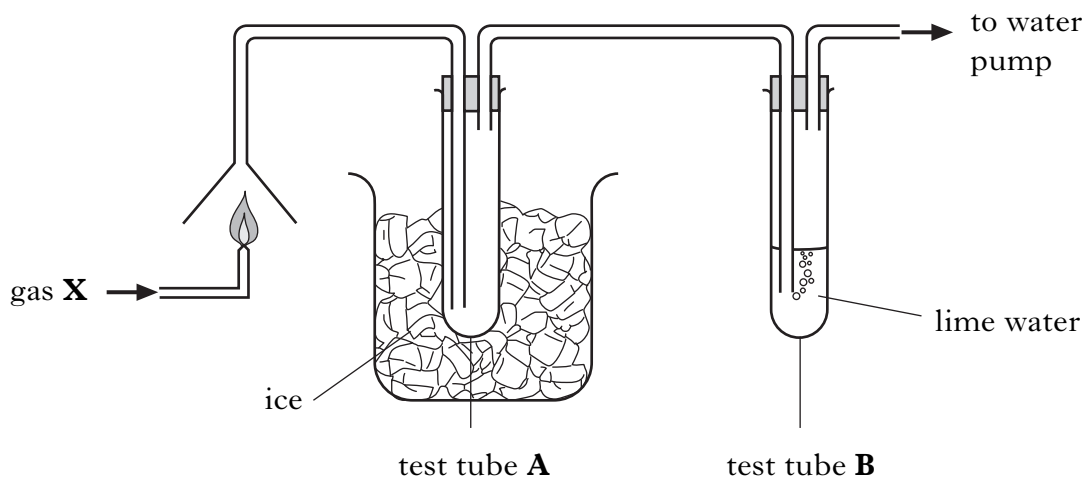
(3)

[Turn over

Marks

KU PS

11. A student burned gas **X** and the products were passed through the apparatus shown.



- (a) The results are shown in the table.

Observation in test tube A	Observation in test tube B
colourless liquid forms	lime water turns milky

Using the information in the table, name two **elements** which **must** be present in gas **X**.

\_\_\_\_\_

1

- (b) The experiment was repeated using hydrogen gas.

Complete the table showing the results which would have been obtained.

Observation in test tube A	Observation in test tube B

1

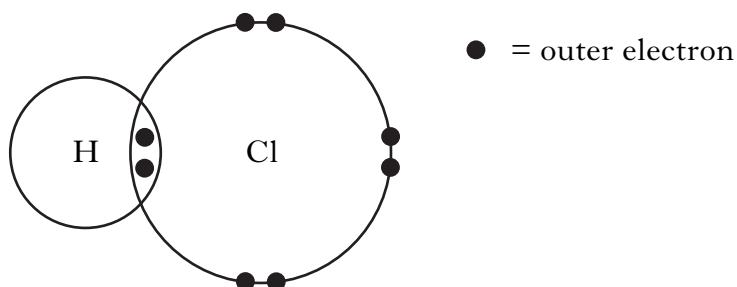
(2)

Marks

KU PS

12. Hydrogen can form bonds with other elements.

The diagram shows the arrangement of outer electrons in a molecule of hydrogen chloride.



(a) What type of bonding is present in a hydrogen chloride molecule?

\_\_\_\_\_

1

(b) Draw a similar diagram, showing **all** outer electrons, to represent a molecule of phosphine,  $\text{PH}_3$ .

1

(2)

[Turn over

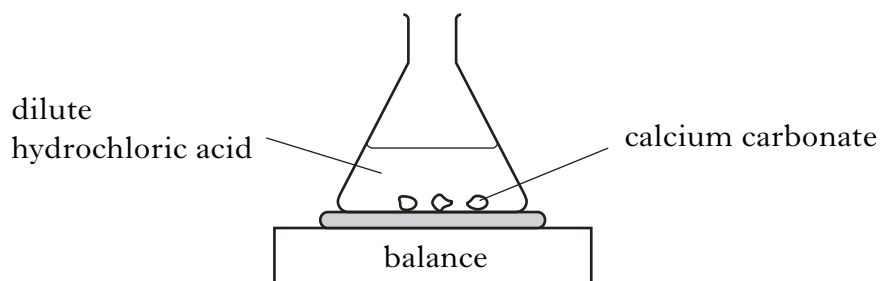
Marks

KU PS

13. The apparatus below was used to investigate the reaction between lumps of calcium carbonate and dilute hydrochloric acid.

Excess acid was used to make sure all the calcium carbonate reacted.

A balance was used to measure the mass lost during the reaction.



- (a) Name the type of chemical reaction taking place when calcium carbonate reacts with dilute hydrochloric acid.

\_\_\_\_\_

1

- (b) The results are shown in the table.

<b>Time/minutes</b>	0	0.5	1.0	2.0	3.0	4.0	5.0
<b>Mass lost/g</b>	0	0.36	0.52	0.70	0.80	0.86	0.86

- (i) Why is mass lost during the reaction?

\_\_\_\_\_

\_\_\_\_\_

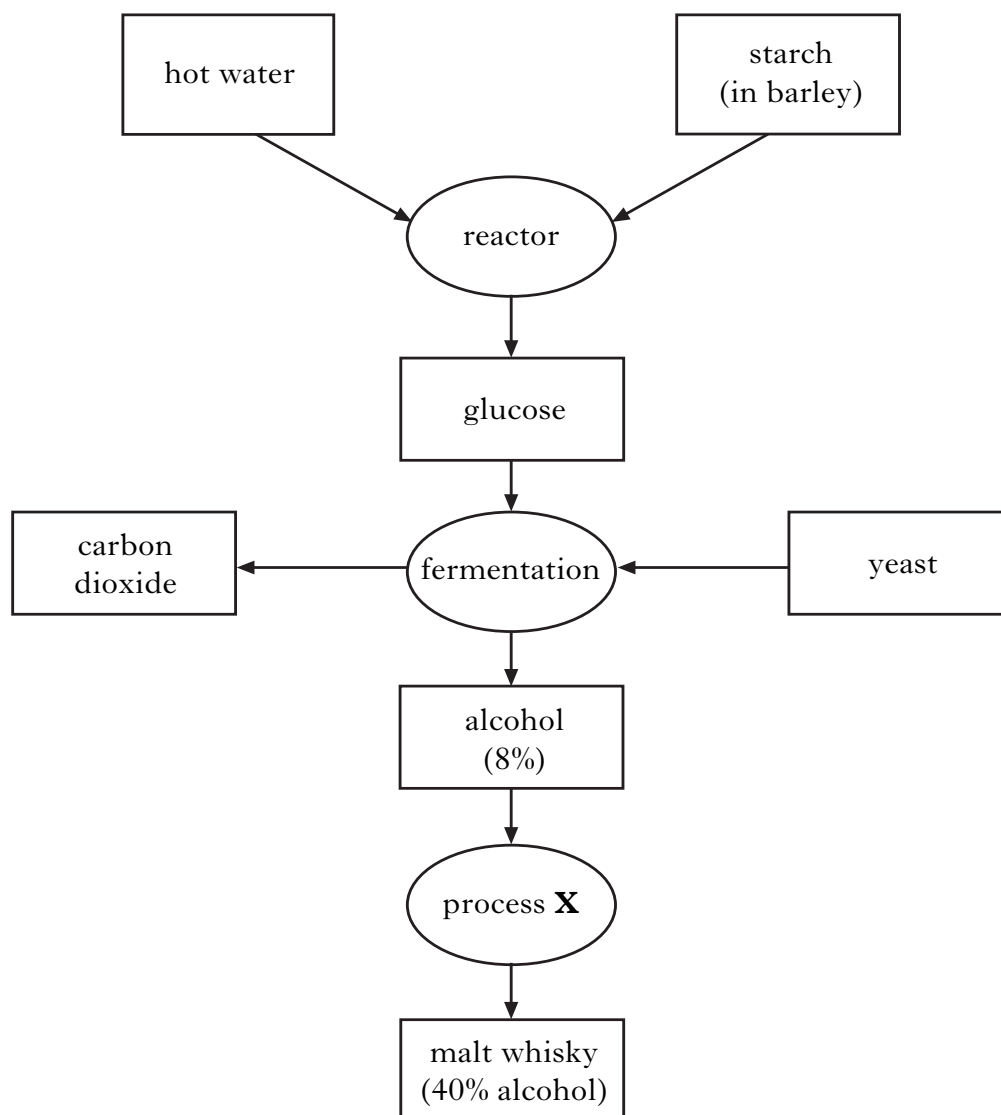
1







16. The diagram shows the main stages in the making of malt whisky.



(a) Name the type of chemical reaction which takes place in the reactor.

\_\_\_\_\_

1

Marks

KU PS

**16. (continued)**

(b) The equation for the reaction taking place during fermentation is:



Balance this equation.

**1**

(c) What name is given to process **X**?

\_\_\_\_\_

**1**

(d) Ethanol,  $\text{C}_2\text{H}_5\text{OH}$ , is the alcohol found in whisky.

A bottle of whisky contains 230 g of ethanol.

Calculate the number of moles of ethanol present in the whisky.

**Show your working clearly.**

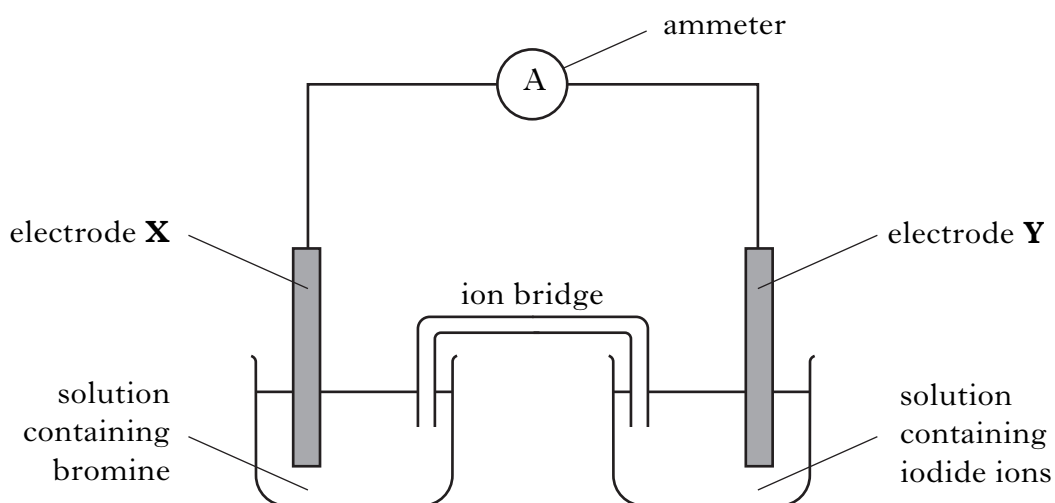
\_\_\_\_\_ mol

**2****(5)****[Turn over**

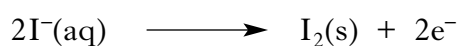
Marks

KU PS

17. A student set up the cell shown.



The reaction taking place at electrode **Y** is:



(a) Name the type of chemical reaction taking place at electrode **Y**.

\_\_\_\_\_

1

(b) **On the diagram**, clearly mark the path and direction of the electron flow.

1

(c) Describe a test, including the result, which would show that iodine had formed at electrode **Y**.

\_\_\_\_\_  
\_\_\_\_\_

1

(d) Write the ion-electron equation for the chemical reaction taking place at electrode **X**.

1

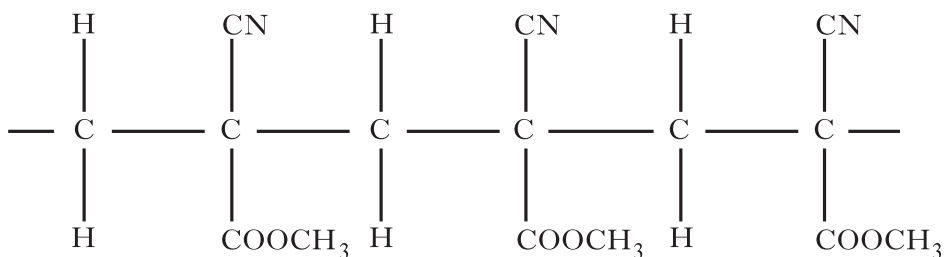
(4)

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KU PS

18. When superglue sets, a polymer is formed.

Part of the polymer structure is shown.



(a) Draw the structure of the repeating unit in the superglue polymer.

1

(b) The polymer shown above contains methyl groups ( $\text{CH}_3$ ).

Another type of superglue, used to close cuts, has the methyl groups replaced by either butyl groups ( $\text{C}_4\text{H}_9$ ) or octyl groups.

Complete the table to show the number of carbon and hydrogen atoms in an octyl group.

Group	Number of atoms	
	Carbon	Hydrogen
methyl	1	3
butyl	4	9
octyl		

1

(c) Name a toxic gas given off when superglue burns.

\_\_\_\_\_

1

(3)

[Turn over

Marks

KU PS

19. (a) The table gives information about some members of the alkane family.

Name	Molecular formula	Boiling point/°C
nonane	C <sub>9</sub> H <sub>20</sub>	151
decane	C <sub>10</sub> H <sub>22</sub>	174
undecane	C <sub>11</sub> H <sub>24</sub>	196
dodecane	C <sub>12</sub> H <sub>26</sub>	

Predict the boiling point of dodecane.

\_\_\_\_\_ °C

1

- (b) What term is used to describe any family of compounds, like the alkanes, which have the same general formula and similar chemical properties?

\_\_\_\_\_

1

- (c) The equation for the burning of nonane is:



Calculate the mass of water produced when 6.4 grams of nonane is burned.

**Show your working clearly.**

\_\_\_\_\_ g

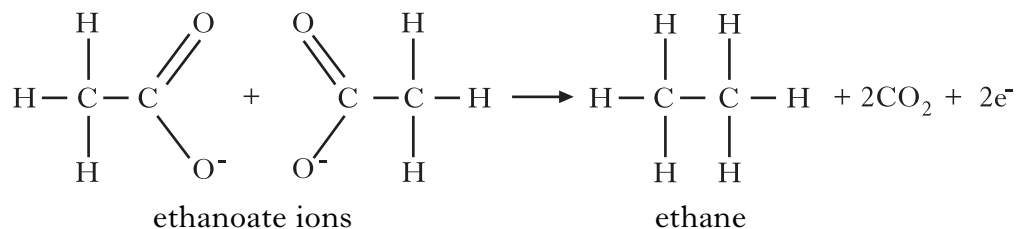
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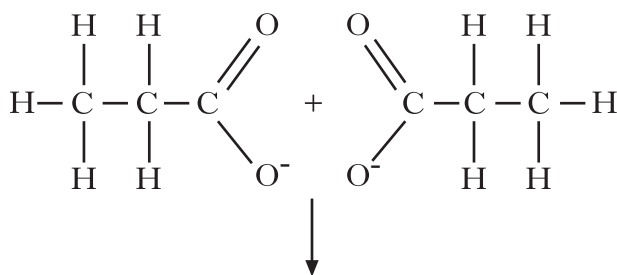
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## 19. (continued)

(d) Alkanes can be prepared by the Kolb  synthesis.



Draw a structural formula for the alkane produced when propanoate ions are used instead of ethanoate ions.

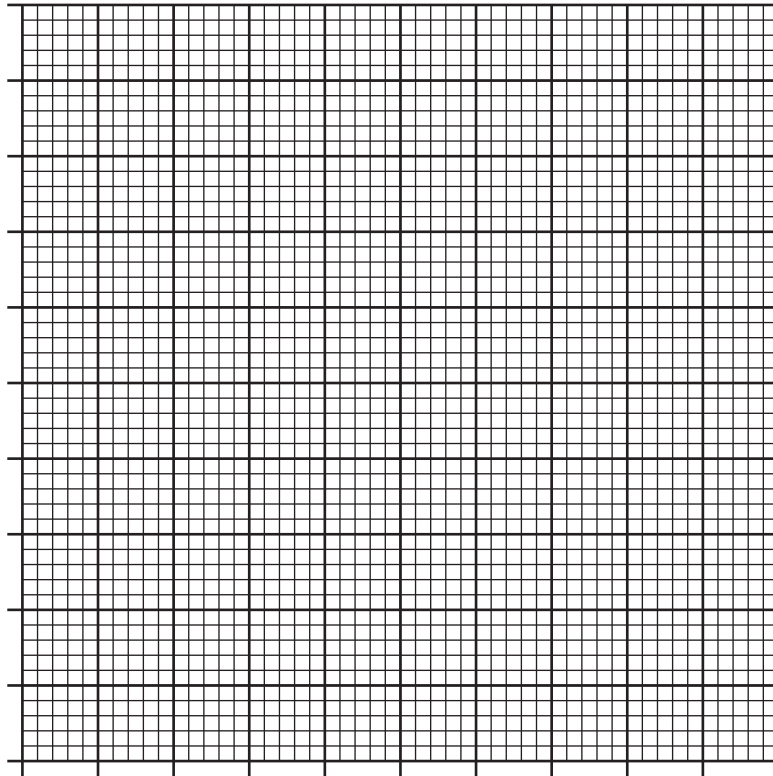
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(5)

[END OF QUESTION PAPER]

**ADDITIONAL SPACE FOR ANSWERS**

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ADDITIONAL GRAPH PAPER FOR QUESTION 13(b)(ii)



**ADDITIONAL SPACE FOR ANSWERS**

KU	PS

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