

FOR OFFICIAL USE

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KU PS

Total
Marks

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0500/401

NATIONAL
QUALIFICATIONS
2011

THURSDAY, 26 MAY
9.00 AM – 10.30 AM

CHEMISTRY
STANDARD GRADE
General Level

Fill in these boxes and read what is printed below.

Full name of centre

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Town

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Forename(s)

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Surname

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Date of birth

Day Month Year

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Scottish candidate number

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Number of seat

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- 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 ₄	B	H ₂	C	CO ₂
D	CO	E	C ₂ H ₅ OH	F	C

- (a) Identify the hydrocarbon.

(A)	B	C
D	E	F

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

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

A	(B)	C
D	E	(F)

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:

(A)	B	C
(D)	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:

✓(A)	B	C
✓(D)	E	F

Marks	KU	PS

1. The grid contains the symbols of some elements.

A	B	C
Mg	N	Ag
D	E	F
S	F	Si

- (a) Identify the symbol for silver.

You may wish to use page 8 of the data booklet to help you.

A	B	C
D	E	F

1

- (b) Identify the symbol for the element which has similar chemical properties to oxygen.

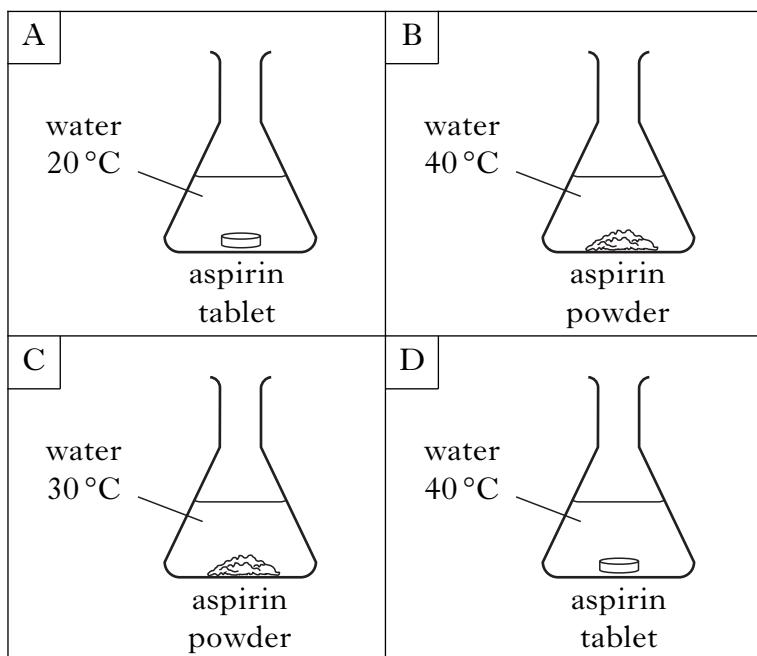
You may wish to use page 8 of the data booklet to help you.

A	B	C
D	E	F

1
(2)

[Turn over

2. A student set up four experiments to investigate the solubility of aspirin.



- (a) Identify the experiment in which the aspirin would take the longest time to dissolve.

A	B
C	D

1

- (b) Identify the **two** experiments which should be compared to show the effect of particle size on the speed of dissolving.

A	B
C	D

1
(2)

Marks	KU	PS
1		
1		
1		
1		
(4)		

3. The grid shows the names of some metals.

A	B	C
sodium	calcium	potassium
D	E	F
zinc	tin	gold

- (a) Identify the metal used to galvanise iron.

A	B	C
D	E	F

1

- (b) Identify the metal that does **not** react with dilute acid.

A	B	C
D	E	F

1

- (c) Identify the metal which has a relative atomic mass of 118.5.

You may wish to use page 4 of the data booklet to help you.

A	B	C
D	E	F

1

- (d) Identify the metal found uncombined in the Earth's crust.

A	B	C
D	E	F

1

(4)

[Turn over

Marks	KU	PS

4. The grid contains the names of some chemical processes.

A	B	C
electrolysis	polymerisation	Ostwald
D	E	F
Haber	distillation	cracking

- (a) Identify the process used to produce smaller, more useful hydrocarbons.

A	B	C
D	E	F

1

- (b) Identify the process which uses electricity to break up a compound into its elements.

A	B	C
D	E	F

1

- (c) Identify the process used to make plastics from alkenes.

A	B	C
D	E	F

1
(3)

Marks	
KU	PS

5. The grid shows the formulae of some substances.

A	B	C
He	NO_2	H_2
D	E	F
K_2O	O_2	CO_2

- (a) Identify the substance which is ionic.

A	B	C
D	E	F

1

- (b) Identify the **two** substances which exist as **diatomic** molecules.

A	B	C
D	E	F

1

- (c) Identify the substance produced in air during lightning storms.

A	B	C
D	E	F

1

- (d) Identify the gas required for combustion to take place.

A	B	C
D	E	F

1

(4)

[Turn over

Marks	KU	PS

6. The grid shows the names of some sulphates.

A ammonium sulphate	B sodium sulphate	C barium sulphate
D zinc sulphate	E copper sulphate	F magnesium sulphate

- (a) Identify the sulphate which could be produced by a precipitation reaction.

You may wish to use page 5 of the data booklet to help you.

A	B	C
D	E	F

1

- (b) Identify the sulphate which contains an essential element for healthy plant growth.

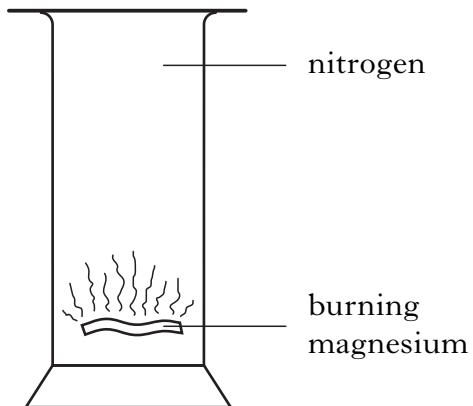
A	B	C
D	E	F

1

(2)

7. The burning of magnesium in nitrogen produces magnesium nitride.

When water is added to magnesium nitride, a gas is produced which turns pH paper blue.



Identify the gas produced which turns pH paper blue.

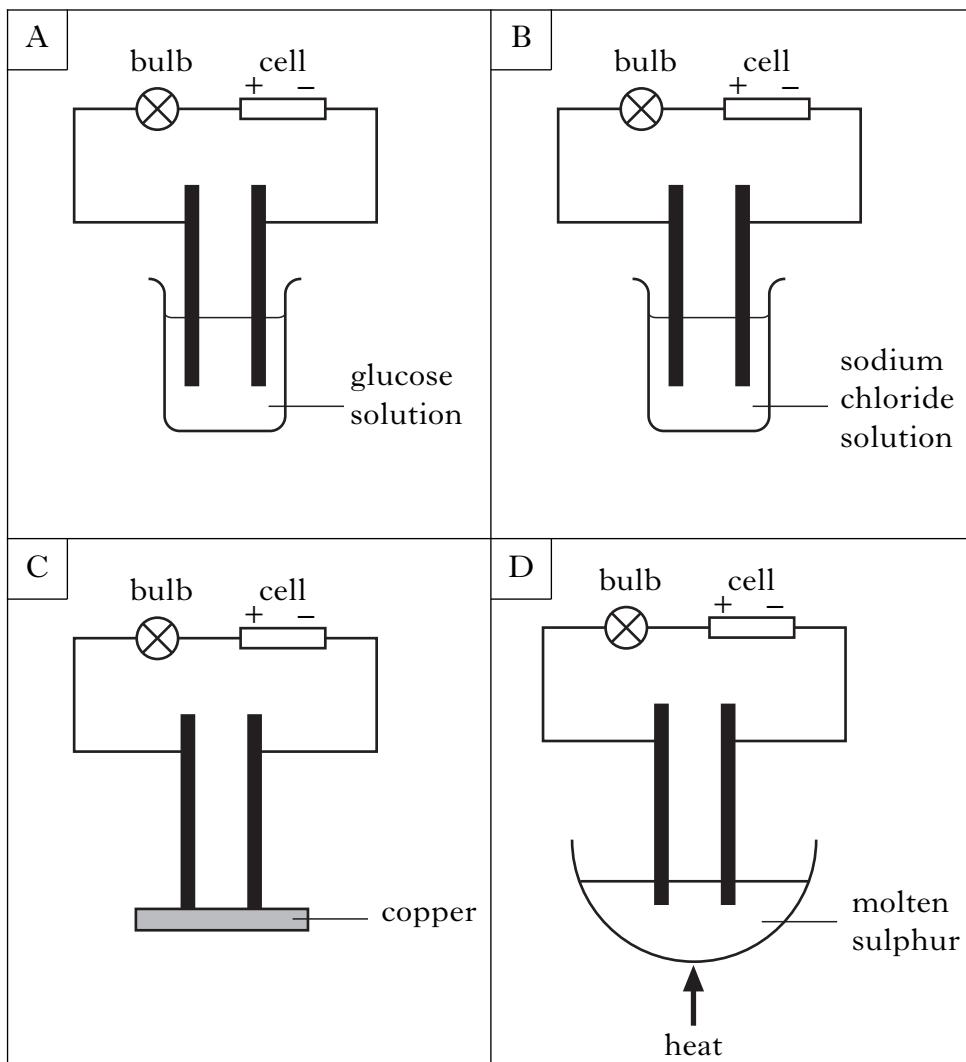
A	oxygen
B	ammonia
C	hydrogen
D	carbon dioxide

A
B
C
D

(1)

[Turn over

8. A teacher set up some experiments to investigate electrical conductivity.



Identify the **two** experiments in which the bulb will light.

A	B
C	D

(2)

[Turn over for Part 2 on *Page twelve*

PART 2

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

9. The Periodic Table lists the names of elements.

- (a) Elements are made up of atoms.

Why are atoms neutral?

1

- (b) The alkali metals, the halogens and the noble gases are groups of elements in the Periodic Table.

Complete the table by **circling** a word in each box to give correct information about each group.

(Two pieces of correct information have already been circled.)

You may wish to use page 1 of the data booklet to help you.

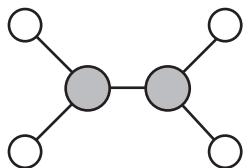
Alkali Metals	Halogens	Noble Gases
(metal) / non-metal	metal / non-metal	metal / non-metal
reactive / unreactive	(reactive) / unreactive	reactive / unreactive

2

(3)

Marks	
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1	
1	
(3)	

10. Hydrazine is a fuel used in rockets. The diagram represents a molecule of hydrazine.



● represents a nitrogen atom (N)

○ represents a hydrogen atom (H)

- (a) Write the molecular formula for hydrazine.

- (b) What holds the atoms together in a molecule of hydrazine?

- (c) Hydrazine is unstable and can break down to produce ammonia, nitrogen and hydrogen.

Write a **word** equation for this reaction.

[Turn over

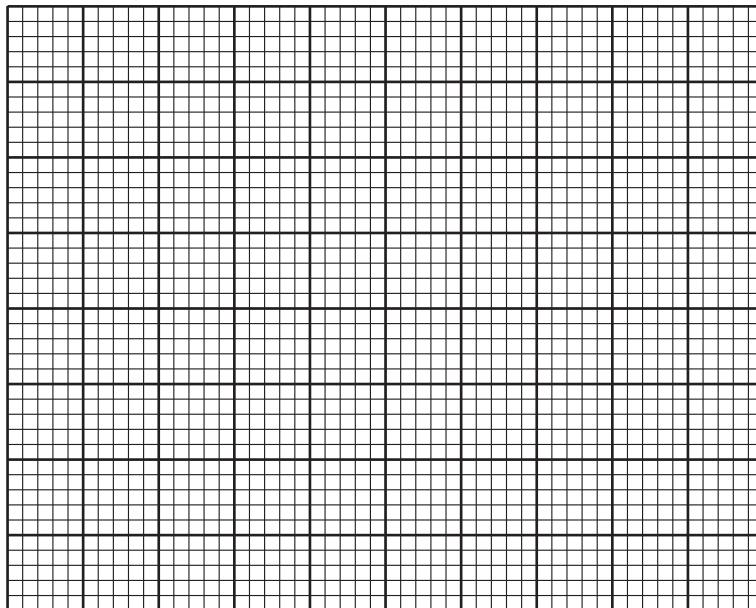
11. (a) The table shows the mass of various pollutants produced by recycling aluminium.

Pollutant	Mass of pollutant produced per tonne of aluminium/kg
sulphur dioxide	1·0
dust	1·5
carbon monoxide	2·5
nitrogen oxides	7·0
hydrocarbons	5·0

Present the information as a bar chart.

Use appropriate scales to fill most of the graph paper.

(Additional graph paper, if required, can be found on page 28.)



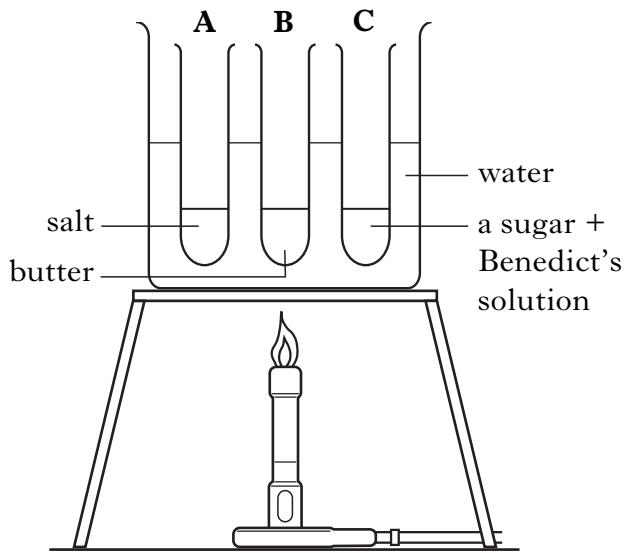
2

- (b) When sulphur dioxide reacts with water in the atmosphere, acid rain is produced.

Give **one** example of a damaging effect of acid rain.

1
(3)

12. The experiment below was carried out to investigate what happens when different substances are heated and then allowed to cool.



The results are shown.

Test tube	Contents	Observation on heating	Observation on cooling
A	salt	no change	no change
B	butter	yellow solid to yellow liquid	yellow liquid to yellow solid
C	a sugar and Benedict's solution	blue liquid to orange solid	orange solid remains

- (a) In which test tube, **A**, **B** or **C**, did a chemical reaction take place?

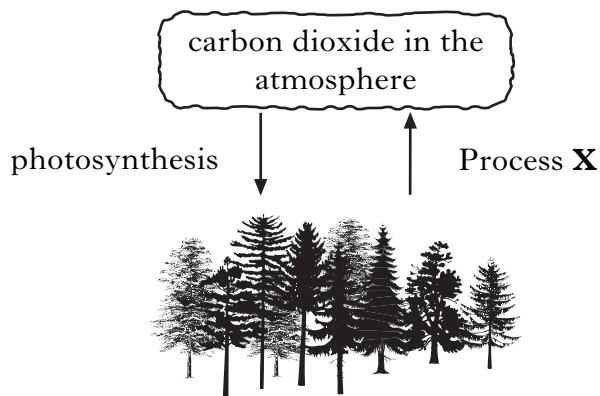
1

- (b) Suggest a name for the sugar in test tube **C**.

1
(2)

[Turn over]

13. Forests are important in maintaining the level of carbon dioxide in the atmosphere.



- (a) Name Process X.

1

- (b) The equation for photosynthesis is:



Name compound Y.

1

- (c) The table shows how the level of carbon dioxide in the atmosphere has changed since 1975.

Year	Level of carbon dioxide/units
1975	330
1985	345
1995	358
2005	374
2015	

Predict the level of carbon dioxide in the atmosphere in 2015 if the trend continues.

 units

1

(3)

Marks		
	KU	PS
1		
1		
(2)		

14. (a) The use of a metal depends on its properties.

Complete the table to show the property of the metal which makes it suitable for each use.

Choose your answer from the following.

conducts heat low density conducts electricity

Use of metal	Property of metal
 aeroplane	
 overhead cables	
 cooking pot	

- (b) Most metals in the Earth's crust are found combined with other elements.

What **term** is used to describe naturally occurring compounds of metals?

1

(2)

[Turn over

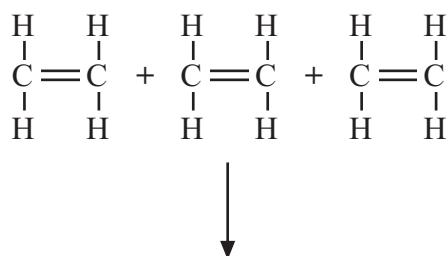
Marks		
	KU	PS
1		
1		
1		

15. Some supermarkets no longer supply free polythene bags because they are non-biodegradable and can cause environmental problems.

(a) (i) What does non-biodegradable mean?

1

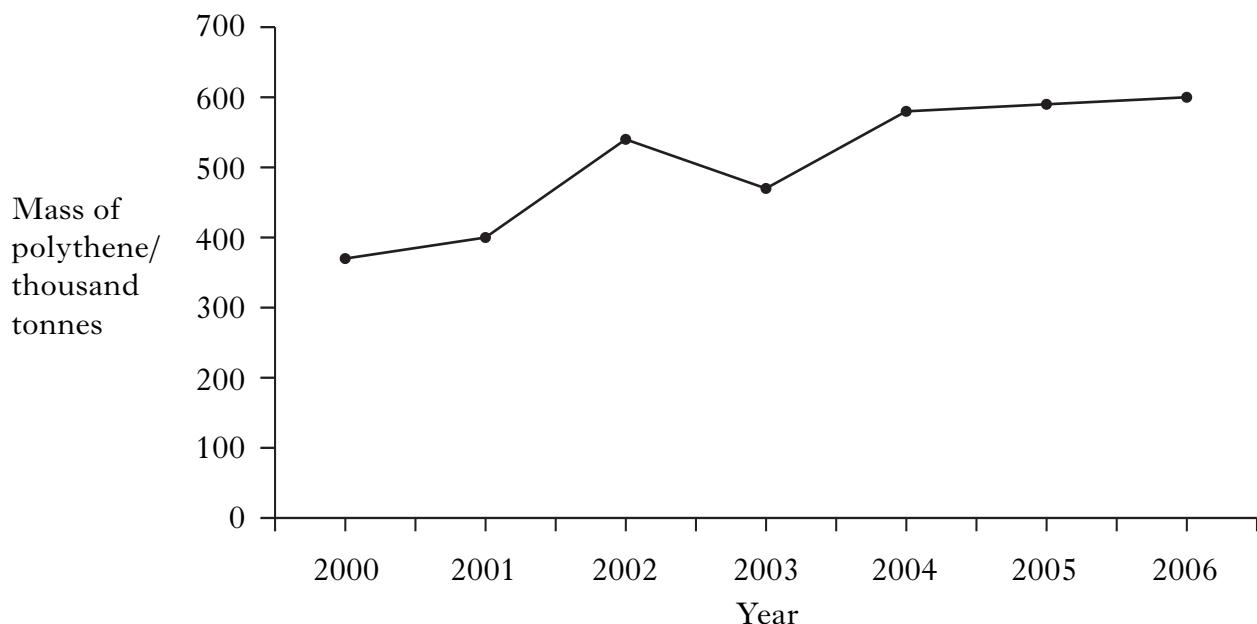
(ii) Draw a section of polythene, showing 3 monomer units joined together.



1

15. (continued)

- (b) The graph shows the mass of polythene used in a European country.



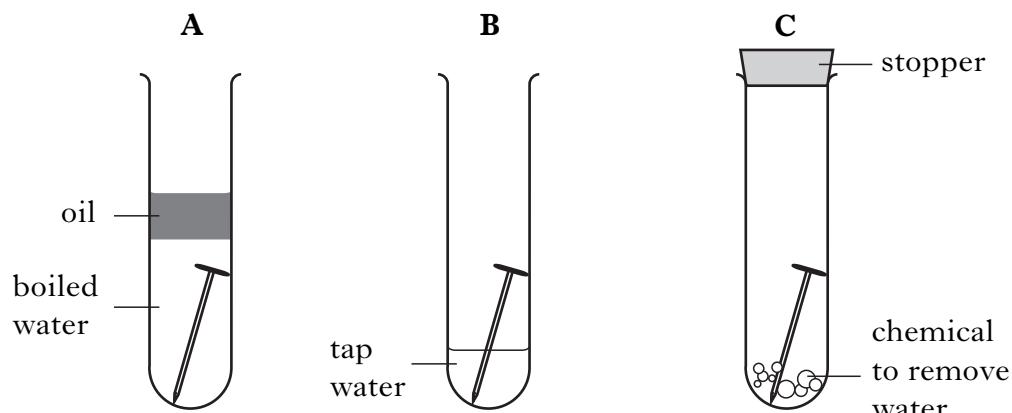
Describe the **general** trend in the mass of polythene used between 2000 and 2006.

1
(3)

[Turn over

16. A student investigated the rusting of iron.

(a) He set up three test tubes each containing a clean iron nail.



Test tube	Observation after one week
A	Nail stayed bright
B	Nail rusted
C	Nail stayed bright

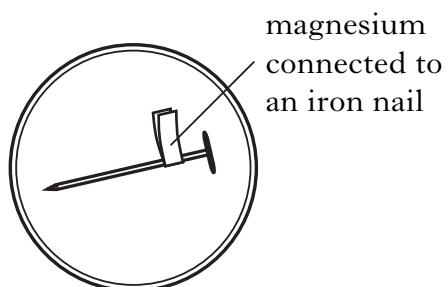
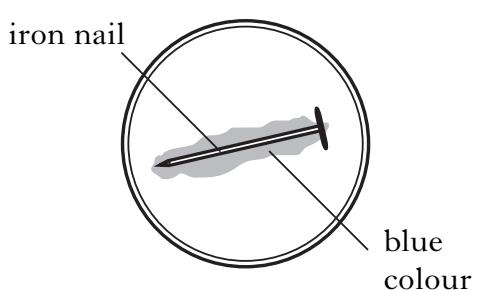
Suggest why the nail in test tube A did not rust.

1

16. (continued)

- (b) The student also set up two dishes containing clean iron nails set in a gel containing ferroxyl indicator.

The diagram below shows the result after 1 day.



- (i) Write the symbol for the iron ion which turns ferroxyl indicator blue.

1

- (ii) Explain **why** the magnesium connected to the iron nail prevents rusting.

1

(3)

[Turn over]

17.

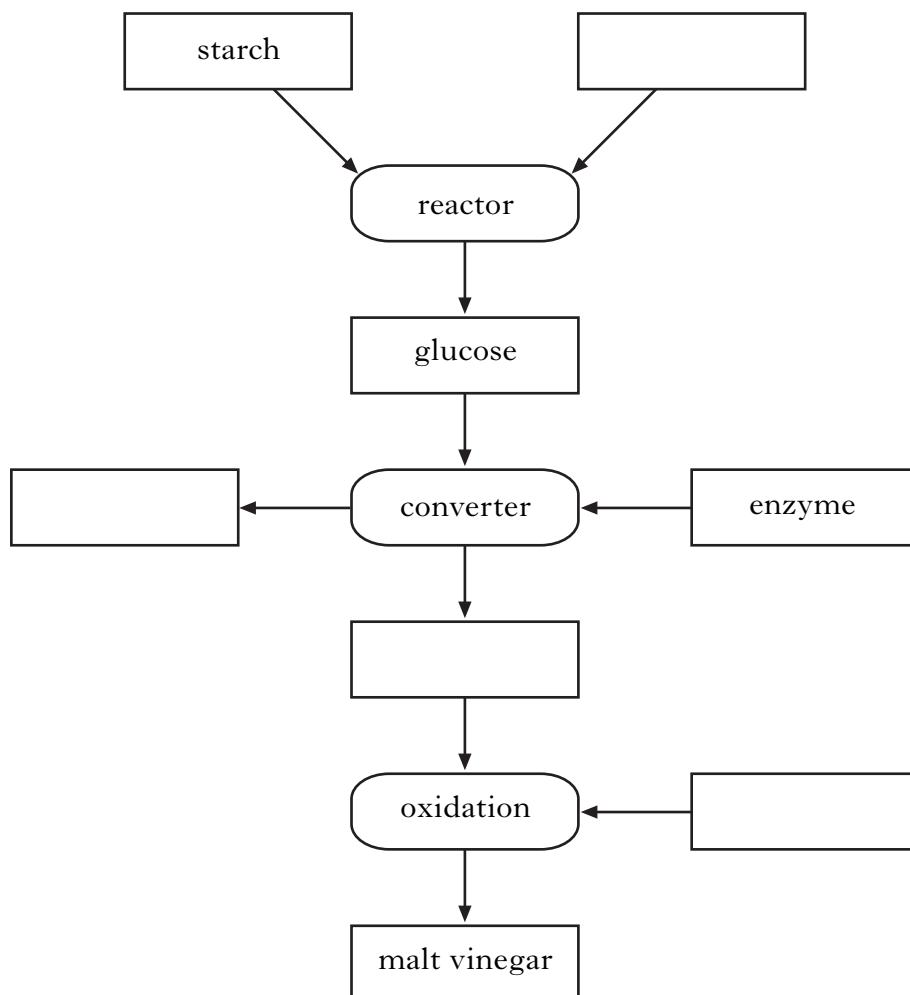
Manufacture of Malt Vinegar

In the manufacture of malt vinegar, starch reacts with water to produce glucose.

Glucose is converted to carbon dioxide and ethanol using an enzyme.

Ethanol is oxidised, by bacteria, producing malt vinegar.

(a) Use the information to complete the flow diagram.



2

Marks														
	KU	PS												
17. (continued)														
(b) A student measured the pH of malt vinegar and other substances. The results are shown.														
<table border="1"><thead><tr><th>Substance</th><th>pH value</th></tr></thead><tbody><tr><td>malt vinegar</td><td></td></tr><tr><td>oven cleaner</td><td>11</td></tr><tr><td>water</td><td>7</td></tr><tr><td>lemon juice</td><td>5</td></tr><tr><td>liquid soap</td><td>8</td></tr></tbody></table>	Substance	pH value	malt vinegar		oven cleaner	11	water	7	lemon juice	5	liquid soap	8		
Substance	pH value													
malt vinegar														
oven cleaner	11													
water	7													
lemon juice	5													
liquid soap	8													
(i) Describe how the student would have used universal indicator or pH paper to measure the pH values.	<hr/> <hr/> <hr/>	1												
(ii) Malt vinegar contains ethanoic acid. Suggest a pH value for malt vinegar.	<hr/>	1												
(c) Lemon juice contains citric acid.														
Complete the sentence below by circling the correct answer.														
When lemon juice is diluted with water the pH $\left\{ \begin{array}{l} \text{decreases} \\ \text{stays the same} \\ \text{increases} \end{array} \right\}$.	1 (5)													
[Turn over														

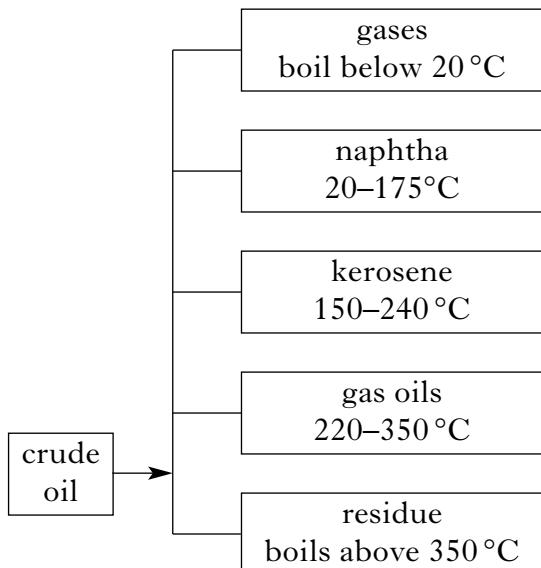
Marks	
KU	PS
1	

18. Crude oil is a fossil fuel.

(a) Name another fossil fuel.

1

(b) Crude oil can be separated into fractions.



(i) Identify the fraction in which butane is present.

You may wish to use page 6 of the data booklet to help you.

1

(ii) The table shows information about the colour of each fraction

Fraction	Colour
gases	colourless
naphtha	light yellow
kerosene	dark yellow
gas oils	brown
residue	black

What is the colour of the fraction which is collected at 250 °C?

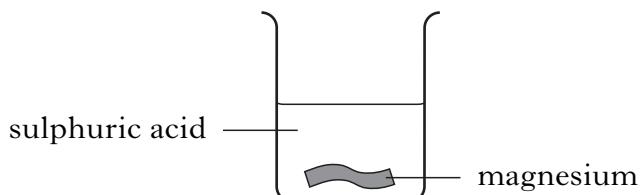
1

(3)

Marks	
KU	PS

19. A student investigated the effect of concentration on the rate of reaction between magnesium and sulphuric acid.

In each case she used the same mass of magnesium ribbon and timed how long it took for the magnesium to disappear.



The results are shown.

	Volume of 2 mol/l sulphuric acid/cm ³	Volume of water/cm ³	Total volume/cm ³	Time/s
Experiment 1	20	0	20	50
Experiment 2	15		20	65

- (a) (i) Complete the table to show the volume of water the student should have used in experiment 2.
- (ii) How did the **speed** of the reaction in experiment 2 compare with the speed of the reaction in experiment 1?

1

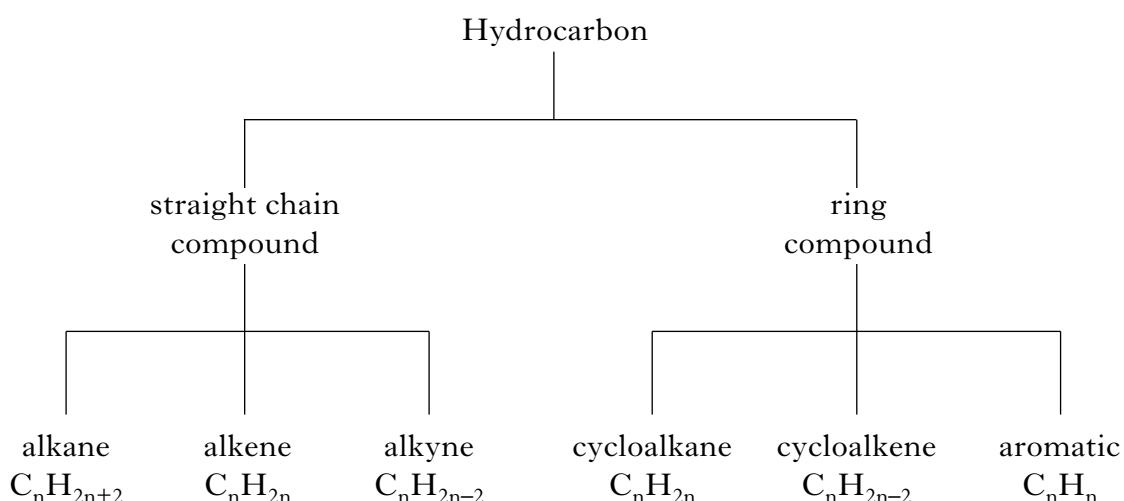
- (b) Magnesium reacts with dilute sulphuric acid to produce magnesium sulphate and hydrogen gas.

State the test for hydrogen gas.

1
(3)

[Turn over

20. The key below shows the name and general formula of some families of hydrocarbons.



- (a) (i) Butyne is an alkyne with 4 carbon atoms.

Using the key, write the **molecular** formula for butyne.

1

- (ii) Hydrocarbon **X** is a ring compound with molecular formula C₆H₆.

Using the key, name the **family** to which it belongs.

1

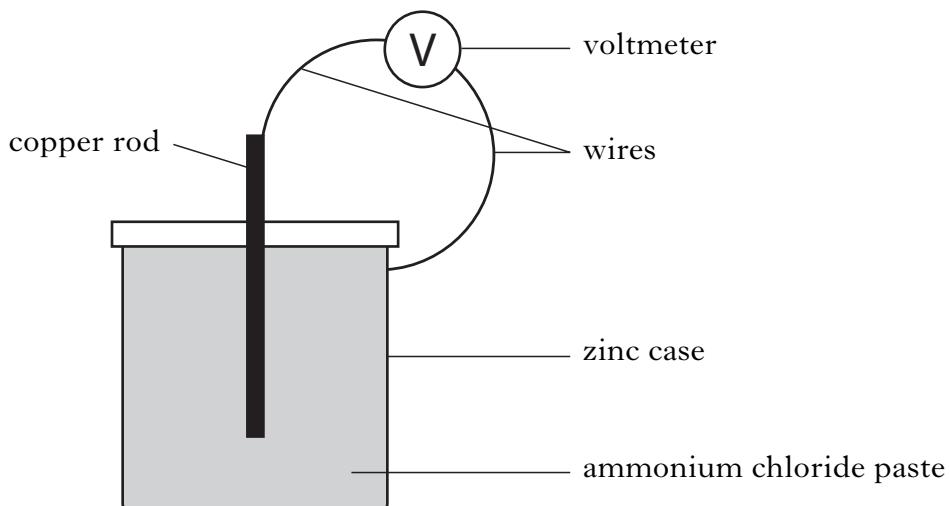
- (b) Draw a structural formula for the alkane pentane.

1

- (c) Describe the chemical test, including the result, which shows that an alkene is unsaturated.

1
(4)

21. (a) A student set up the following cell.



- (i) In this cell, the purpose of the ammonium chloride is to complete the circuit.

What **term** is used to describe an ionic compound, like ammonium chloride, which is used for this purpose?

1

- (ii) **Circle** the correct word, in each bracket, to complete the sentence below.

You may wish to use page 7 of the data booklet to help you.

In the cell the electrons flow from $\left\{ \begin{matrix} \text{copper} \\ \text{zinc} \end{matrix} \right\}$ to $\left\{ \begin{matrix} \text{copper} \\ \text{zinc} \end{matrix} \right\}$ through
the $\left\{ \begin{matrix} \text{paste} \\ \text{wires} \end{matrix} \right\}$.

1

- (b) A battery is a number of cells joined together.

Why do batteries stop producing electricity after some time?

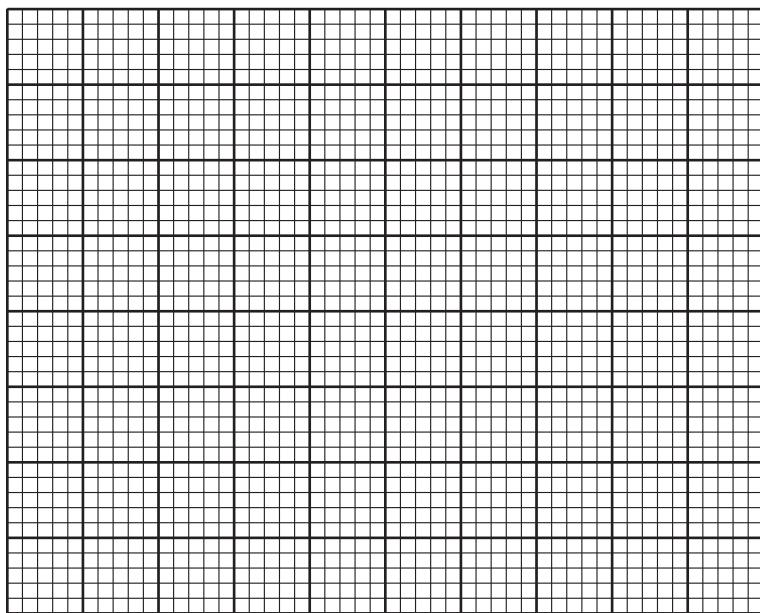
1

(3)

[END OF QUESTION PAPER]

ADDITIONAL SPACE FOR ANSWERS

ADDITIONAL GRAPH PAPER FOR QUESTION 11(a)



KU	PS

ADDITIONAL SPACE FOR ANSWERS

KU	PS

ADDITIONAL SPACE FOR ANSWERS

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ADDITIONAL SPACE FOR ANSWERS

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ADDITIONAL SPACE FOR ANSWERS

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