

FOR OFFICIAL USE

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C

KU PS

Total  
Marks

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**0500/402**

NATIONAL  
QUALIFICATIONS  
2010

FRIDAY, 30 APRIL  
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

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 9 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	B	C
$\text{CH}_4$	$\text{H}_2$	$\text{CO}_2$
D	E	F
CO	$\text{C}_2\text{H}_5\text{OH}$	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

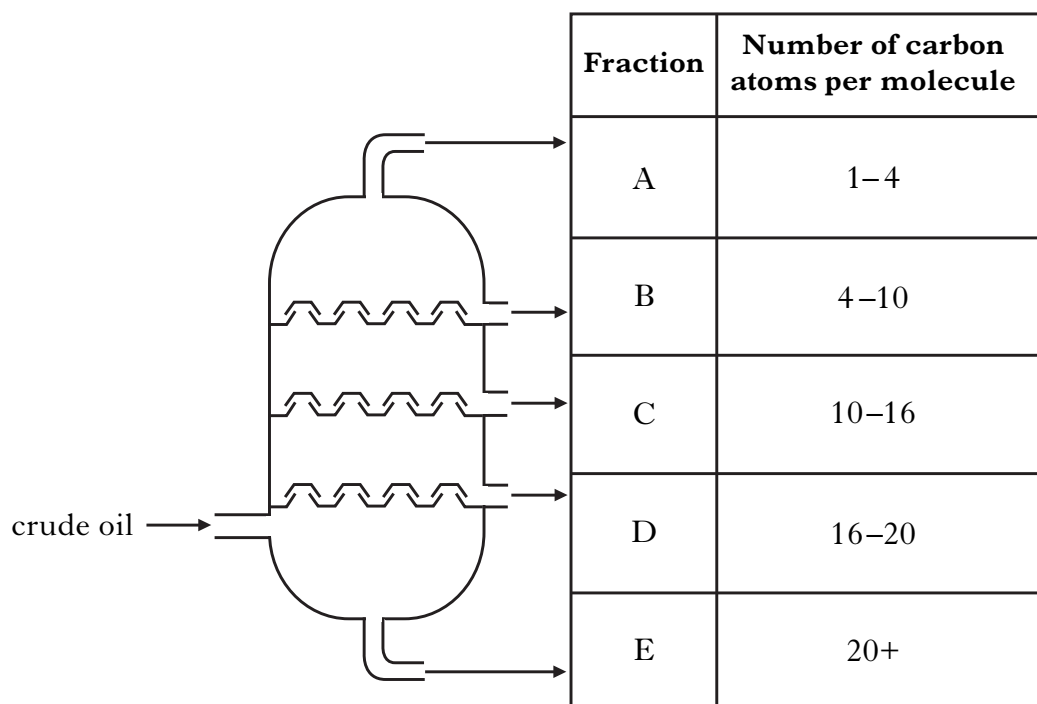
If you want to change back to an answer which has already been scored out, you should enter a tick (✓) in the box of the answer of your choice, thus:

✓ <del>Ⓐ</del>	B	C
<del>Ⓓ</del>	E	F

Marks

	KU	PS
1		
1 (2)		

1. Crude oil can be separated into fractions.



(a) Identify the fraction which is the most viscous.

A
B
C
D
E

1

(b) Identify the fraction used as camping gas.

A
B
C
D
E

1  
(2)

[Turn over

Marks

2. The grid contains the symbols for some common elements.

A	H	B	N	C	Si
D	Al	E	Mg	F	O

- (a) Identify the element which has a density of  $1.74 \text{ g/cm}^3$ .

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

A	B	C
D	E	F

1

- (b) Identify the **two** elements which react together to form a molecule with the same shape as a methane molecule.

A	B	C
D	E	F

1

- (c) Identify the **two** elements which form an ionic compound with a formula of type  $\mathbf{X}_2\mathbf{Y}_3$ , where  $\mathbf{X}$  is a metal.

A	B	C
D	E	F

1

**(3)**

3. The grid shows information about some particles.

A	${}_{11}^{23}\text{Na}$	B	${}_{8}^{18}\text{O}$	C	${}_{19}^{40}\text{K}^{+}$
D	${}_{12}^{24}\text{Mg}^{2+}$	E	${}_{17}^{35}\text{Cl}^{-}$	F	${}_{8}^{16}\text{O}$

(a) Identify the **two** particles with the same number of neutrons.

A	B	C
D	E	F

(b) Identify the particle which has the same electron arrangement as neon.

A	B	C
D	E	F

Marks

KU PS

1

1  
(2)

[Turn over

Marks

4. The grid shows the names of some carbohydrates.

A	fructose
B	glucose
C	maltose
D	sucrose
E	starch

(a) Identify the condensation polymer.

A
B
C
D
E

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

A
B
C
D
E

	KU	PS
1		
1 (2)		

Marks

5. Iron can be coated with different materials which provide a physical barrier against corrosion.

A	oil
B	zinc
C	plastic
D	tin
E	paint

- (a) Identify the coating which is used to galvanise iron.

A
B
C
D
E

- (b) Identify the coating which, if scratched, would cause the iron to rust faster than normal.

A
B
C
D
E

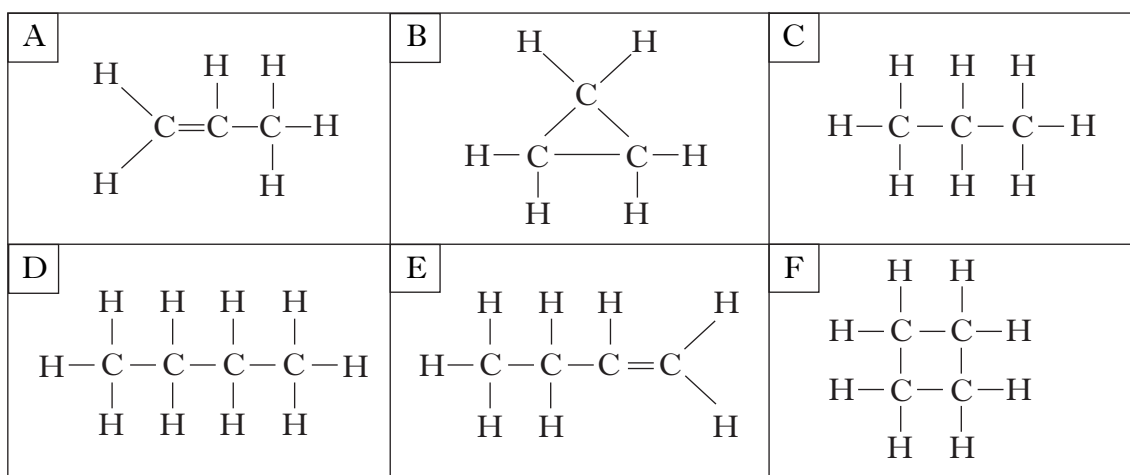
	KU	PS
1		
1		
(2)		

[Turn over

Marks

KU	PS

6. The structures of some hydrocarbons are shown in the grid.



- (a) Identify the **two** hydrocarbons with the general formula  $C_nH_{2n}$ , which do **not** react quickly with bromine solution.

A	B	C
D	E	F

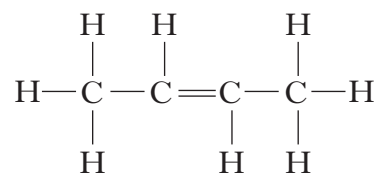
1

- (b) Identify the hydrocarbon which is the first member of a homologous series.

A	B	C
D	E	F

1

- (c) Identify the **two** isomers of



A	B	C
D	E	F

1  
(3)



Marks

7. Elements can be used in different ways.

A	chlorine	B	potassium	C	platinum
D	hydrogen	E	neon	F	iron

(a) Identify the element which is a reactant in the Haber Process.

A	B	C
D	E	F

1

(b) Identify the element used as the catalyst in the manufacture of nitric acid (Ostwald Process).

A	B	C
D	E	F

1  
(2)

[Turn over

Marks

KU PS

8. The grid shows some statements which can be applied to different solutions.

A	It has a pH less than 7.
B	It conducts electricity.
C	It contains less $\text{OH}^{\ominus}(\text{aq})$ ions than pure water.
D	It does not neutralise dilute hydrochloric acid.
E	When diluted the concentration of $\text{OH}^{\ominus}(\text{aq})$ ions decreases.

Identify the **two** statements which are correct for an alkaline solution.

A
B
C
D
E

(2)

Marks

KU PS

9. The grid shows pairs of chemicals.

A	copper carbonate + dilute sulphuric acid	B	lead nitrate solution + potassium iodide solution	C	potassium hydroxide + nitric acid
D	copper + water	E	silver + hydrochloric acid	F	ammonium nitrate + sodium hydroxide

Which **two** boxes contain a pair of chemicals that react together to form a gas?

A	B	C
D	E	F

(2)

[Turn over

<i>Marks</i>	
KU	PS
1	
1	
1	
1	
<b>(4)</b>	

## PART 2

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

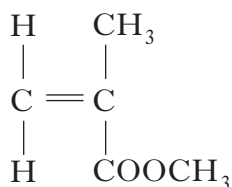
10. Poly(methyl methacrylate) is a synthetic polymer used to manufacture perspex.

(a) What is meant by the term **synthetic**?

\_\_\_\_\_

1

(b) The structure of the methyl methacrylate monomer is shown.



methyl methacrylate

(i) Draw a section of the poly(methyl methacrylate) polymer, showing three monomer units joined together.

1

(ii) Name the type of polymerisation taking place.

\_\_\_\_\_

1

(c) Name a toxic gas produced when poly(methyl methacrylate) burns.

\_\_\_\_\_

1

**(4)**

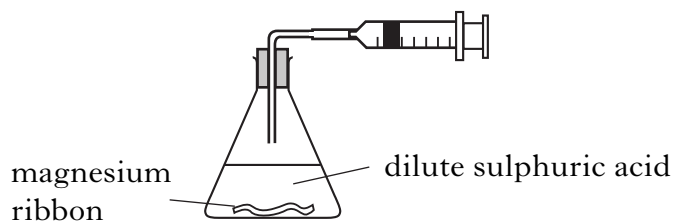


Marks

KU PS

12. A student added magnesium ribbon to an excess of dilute sulphuric acid and measured the volume of hydrogen gas produced.

The reaction stopped when all the magnesium was used up.



The results are shown in the table.

Time/s	0	10	20	40	50	60	70
Volume of hydrogen gas/cm <sup>3</sup>	0	20	32	50	52	53	53

- (a) State the test for hydrogen gas.

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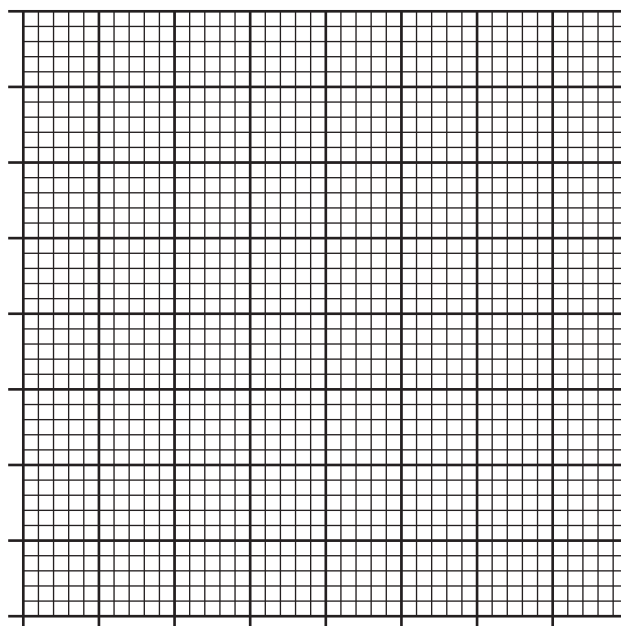
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1

- (b) Draw a line graph of the results.

Use *appropriate scales to fill most of the graph paper*.

(Additional graph paper, if required, will be found on page 24.)



2

Marks

KU	PS

**12. (continued)**

- (c) Using your graph, predict the volume of hydrogen gas produced during the first 30 seconds.

\_\_\_\_\_ cm<sup>3</sup>      **1**

- (d) The student repeated the experiment using a higher concentration of acid. The same volume of acid and the same mass of magnesium ribbon were used.

What volume of hydrogen gas would have been produced after 60 seconds?

\_\_\_\_\_ cm<sup>3</sup>      **1**

- (e) Calculate the mass of hydrogen produced when 4.9 g of magnesium reacts with an excess of dilute sulphuric acid.



\_\_\_\_\_ g      **2**  
**(7)**

**[Turn over**





Marks

KU	PS

14. The Eurofighter "Typhoon" is made from many newly developed materials including titanium alloys.



- (a) The first step in extracting titanium from its ore is to convert it into titanium(IV) chloride.

Titanium(IV) chloride is a liquid at room temperature and does **not** conduct electricity.

What type of bonding, does this suggest, is present in titanium(IV) chloride?

\_\_\_\_\_

**1**

- (b) Titanium(IV) chloride is then reduced to titanium metal.

The equation for the reaction taking place is:



- (i) Balance the equation.
- (ii) What does this reaction suggest about the reactivity of titanium compared to that of sodium?

**1**

\_\_\_\_\_

**1**

**(3)**

**[Turn over**

Marks

KU	PS

15. Scuba divers can suffer from painful and potentially fatal problems if they rise to the surface of the water too quickly. This causes dissolved nitrogen in their blood to form bubbles of nitrogen gas.

Distance from surface of water/m	Concentration of dissolved nitrogen/units
0	11.5
10	23.0
20	34.5
30	46.0
40	57.5

- (a) Describe the relationship between the distance from the surface of the water and the concentration of dissolved nitrogen.

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1

- (b) Predict the concentration of dissolved nitrogen at 60 m.

\_\_\_\_\_ units

1

- (c) A nitrogen molecule is held together by three covalent bonds.

Circle the correct words to complete the sentence.

In a covalent bond the atoms are held together by the attraction

between the positive  $\left\{ \begin{array}{l} \text{electrons} \\ \text{neutrons} \\ \text{protons} \end{array} \right\}$  and the shared pair of negative  $\left\{ \begin{array}{l} \text{electrons} \\ \text{neutrons} \\ \text{protons} \end{array} \right\}$ .

1  
(3)

Marks

KU	PS

16. (a) Galena is an ore containing lead sulphide, PbS.

(i) What is the charge on this lead ion?

\_\_\_\_\_

1

(ii) Calculate the percentage by mass of lead in galena, PbS.

\_\_\_\_\_ % 2

(b) Most metals have to be extracted from their ores.

(i) Name the metal extracted in a Blast furnace.

\_\_\_\_\_

1

(ii) Place the following metals in the correct space in the table.

copper, mercury, aluminium

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

Metal	Method of extraction
	using heat alone
	electrolysis of molten ore
	heating with carbon

1  
(5)

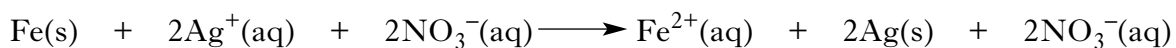
[Turn over

Marks

KU	PS

17. Iron displaces silver from silver(I) nitrate solution.

The equation for the reaction is:



(a) **Circle** the spectator ion in the above equation.

1

(b) Describe a chemical test, including the result, to show that  $\text{Fe}^{2+}(\text{aq})$  ions are formed.

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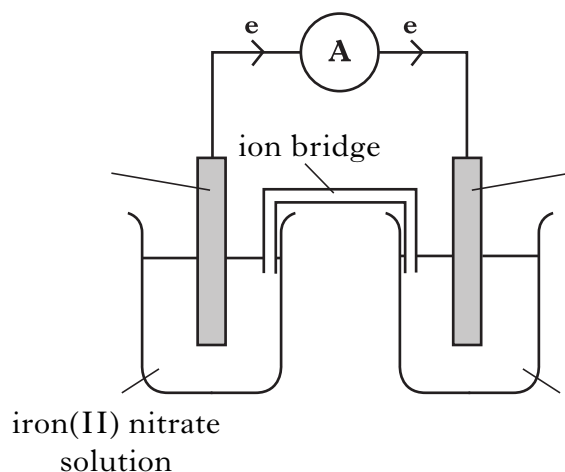
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1

(c) Write the ion-electron equation for the **reduction** step in the reaction.  
You may wish to use the data book to help you.

1

(d) This reaction can also be carried out in a cell.



Complete the three labels on the diagram.

(An additional diagram, if required, will be found on page 24.)

1

(4)

Marks

KU PS

18. Ethers are useful chemicals.  
Some are listed in the table.

Structural formula	Name of ether
$\text{CH}_3\text{CH}_2 - \text{O} - \text{CH}_2\text{CH}_3$	ethoxyethane
$\text{CH}_3 - \text{O} - \text{CH}_2\text{CH}_2\text{CH}_3$	methoxypropane
$\text{CH}_3 - \text{O} - \text{CH}_2\text{CH}_3$	methoxyethane
$\text{CH}_3\text{CH}_2 - \text{O} - \text{CH}_2\text{CH}_2\text{CH}_3$	<b>X</b>

- (a) Suggest a name for ether **X**.

\_\_\_\_\_

1

- (b) The boiling points of ethers and alkanes are approximately the same when they have a **similar** relative formula mass.

Suggest the **boiling point** of ethoxyethane (relative formula mass 74).

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

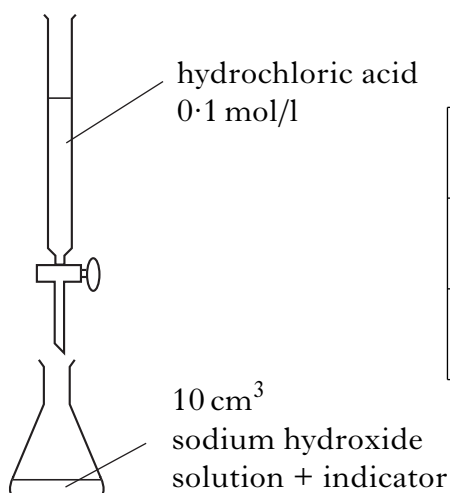
\_\_\_\_\_ °C 1  
(2)

[Turn over

Marks

KU	PS

19. A student carried out a titration using the chemicals and apparatus below.

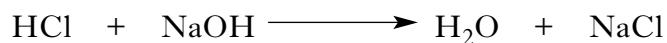


	Rough titre	1st titre	2nd titre
<b>Initial burette reading/cm<sup>3</sup></b>	0.3	0.2	0.5
<b>Final burette reading/cm<sup>3</sup></b>	26.6	25.3	25.4
<b>Volume used/cm<sup>3</sup></b>	26.3	25.1	24.9

- (a) Using the results in the table, calculate the **average** volume of hydrochloric acid required to neutralise the sodium hydroxide solution.

\_\_\_\_\_ cm<sup>3</sup>      1

- (b) The equation for the reaction is:



Using your answer from part (a), calculate the concentration of the sodium hydroxide solution.

**Show your working clearly.**

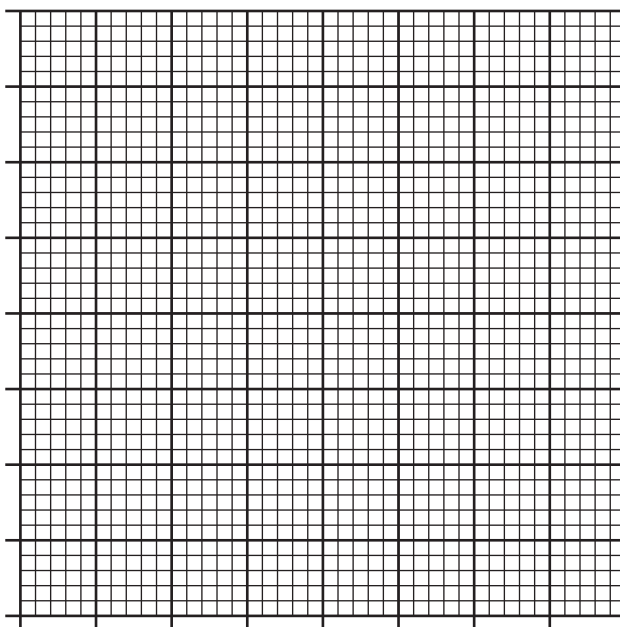
\_\_\_\_\_ mol/l      2  
(3)



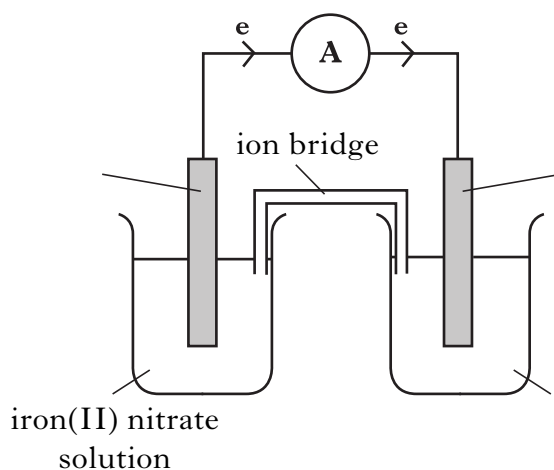
**ADDITIONAL SPACE FOR ANSWERS**

KU	PS

ADDITIONAL GRAPH PAPER FOR QUESTION 12(b)



ADDITIONAL DIAGRAM FOR QUESTION 17(d)





**ADDITIONAL SPACE FOR ANSWERS**

KU	PS

**ADDITIONAL SPACE FOR ANSWERS**

KU	PS

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