

FOR OFFICIAL USE

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C

KU PS

Total
Marks

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0500/31/01

NATIONAL
QUALIFICATIONS
2012

MONDAY, 14 MAY
10.50 AM – 12.20 AM

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

(a) Identify the hydrocarbon.

<input checked="" type="radio"/> A	<input type="radio"/> B	<input type="radio"/> C
<input type="radio"/> D	<input type="radio"/> E	<input type="radio"/> F

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

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

<input type="radio"/> A	<input checked="" type="radio"/> B	<input type="radio"/> C
<input type="radio"/> D	<input type="radio"/> E	<input checked="" type="radio"/> 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:

<input checked="" type="radio"/> A	<input type="radio"/> B	<input type="radio"/> C
<input checked="" type="radio"/> D	<input type="radio"/> E	<input type="radio"/> 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:

<input checked="" type="radio"/> A	<input type="radio"/> B	<input type="radio"/> C
<input checked="" type="radio"/> D	<input type="radio"/> E	<input type="radio"/> F

Marks

1. The grid shows the formulae of some gases.

A	CO	B	NO ₂	C	CO ₂
D	H ₂	E	HCl	F	O ₂

(a) Identify the **two** toxic gases produced during the burning of polyvinylchloride (PVC).

A	B	C
D	E	F

(b) Identify the gas which burns with a pop.

A	B	C
D	E	F

1

1

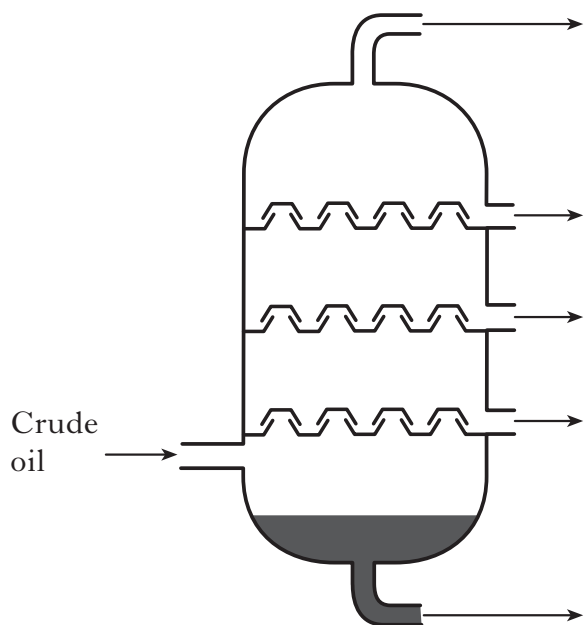
(2)

[Turn over

Marks

	KU	PS
1		
1		
(2)		

2. The table shows some fractions from crude oil.



Fraction	Boiling range/ $^{\circ}\text{C}$	Name of fraction
A	-160 to 20°C	Refinery Gas
B	20 to 120°C	Naphtha
C	120 to 240°C	Kerosene
D	240 to 350°C	Gas Oils
E	Over 350°C	Residue

(a) Identify the fraction with the longest chain length.

A
B
C
D
E

1

(b) Identify the fraction which is used as fuel for aeroplanes.

A
B
C
D
E

1

(2)

Marks

4. The grid shows information about some particles.

Particle	Number of		
	protons	neutrons	electrons
A	11	12	11
B	9	10	9
C	11	13	11
D	19	20	18
E	9	10	10

- (a) Identify the particle which is a negative ion.

A
B
C
D
E

1

- (b) Identify the particle which would give a lilac flame colour.

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

A
B
C
D
E

1

- (c) Identify the **two** particles which are isotopes.

A
B
C
D
E

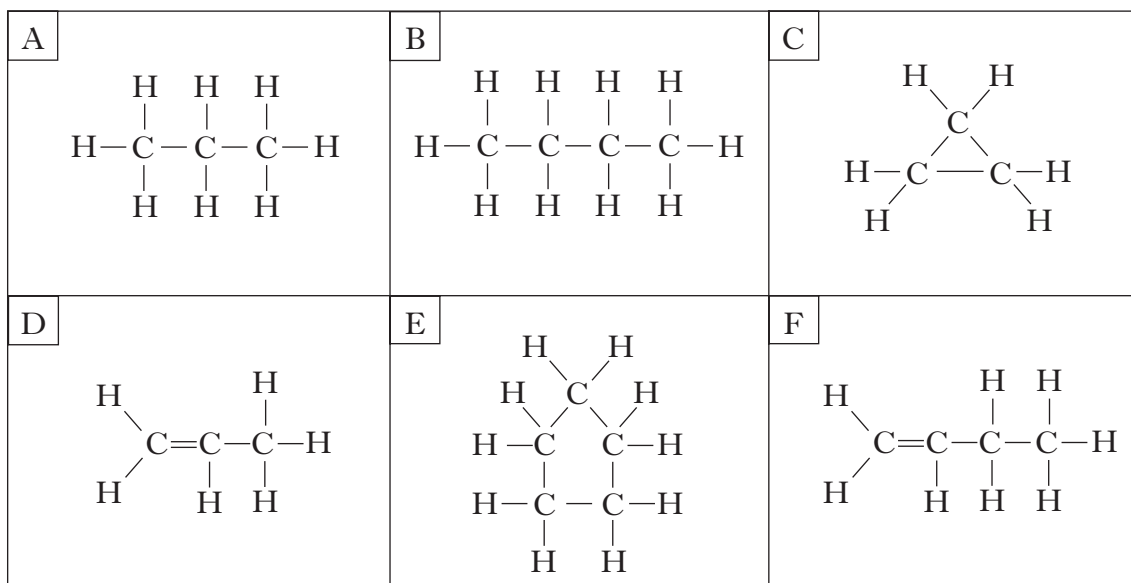
1

(3)

Marks

KU	PS

5. The grid shows the structural formulae of some hydrocarbons.



(a) Identify the hydrocarbon which reacts with hydrogen to form butane.

A	B	C
D	E	F

1

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

A	B	C
D	E	F

1

(c) Identify the structural formula which represents propene.

A	B	C
D	E	F

1

(3)

[Turn over]

Marks

KU PS

6. Equations are used to represent chemical reactions.

A	$\text{Zn(s)} \longrightarrow \text{Zn}^{2+}(\text{aq}) + 2\text{e}^{-}$
B	$\text{C}_2\text{H}_5\text{OH}(\ell) + 3\text{O}_2(\text{g}) \longrightarrow 2\text{CO}_2(\text{g}) + 3\text{H}_2\text{O}(\ell)$
C	$\text{SO}_2(\text{g}) + \text{H}_2\text{O}(\ell) \longrightarrow 2\text{H}^{+}(\text{aq}) + \text{SO}_3^{2-}(\text{aq})$
D	$\text{H}^{+}(\text{aq}) + \text{OH}^{-}(\text{aq}) \longrightarrow \text{H}_2\text{O}(\ell)$
E	$\text{SO}_4^{2-}(\text{aq}) + 2\text{H}^{+}(\text{aq}) + 2\text{e}^{-} \longrightarrow \text{SO}_3^{2-}(\text{aq}) + \text{H}_2\text{O}(\ell)$

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

A
B
C
D
E

1

(b) Identify the equation which represents combustion.

A
B
C
D
E

1

(2)

Marks

	KU	PS
1		
1		
1		
(3)		

7. The grid shows the names of some soluble compounds.

A	sodium iodide	B	potassium chloride	C	lithium chloride
D	barium bromide	E	sodium hydroxide	F	potassium sulphate

- (a) Identify the base.

A	B	C
D	E	F

- (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

- (c) Identify the compound with a formula of the type \mathbf{XY}_2 , where \mathbf{X} is a metal.

A	B	C
D	E	F

[Turn over

Marks

	KU	PS
1		
1		
(2)		

8. The grid shows the names of some processes.

A	distillation
B	precipitation
C	filtering
D	electrolysis
E	dissolving

(a) Identify the process which is used to increase the alcohol concentration of fermentation products.

A
B
C
D
E

1

(b) Identify the **two** processes which should be used to separate magnesium carbonate from a mixture of solid magnesium carbonate and solid magnesium chloride.

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

A
B
C
D
E

1

(2)

Marks	KU	PS
1		
1		
1		
(3)		

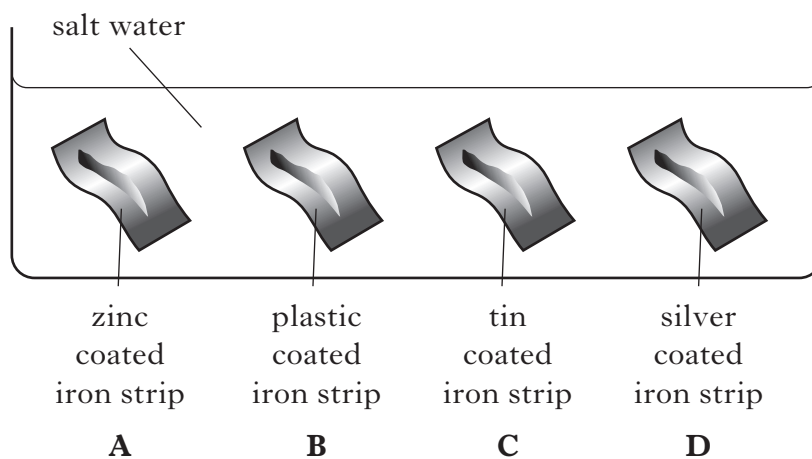
PART 2

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

10. Iron can be coated with a physical barrier to prevent rusting.

(a) How does coating iron prevent rusting?

(b) A student investigated the rusting of iron. The coatings on four strips of iron were **scratched** to expose the iron. The strips were then placed in salt water.



(i) Which iron strip has been galvanised, **A**, **B**, **C** or **D**?

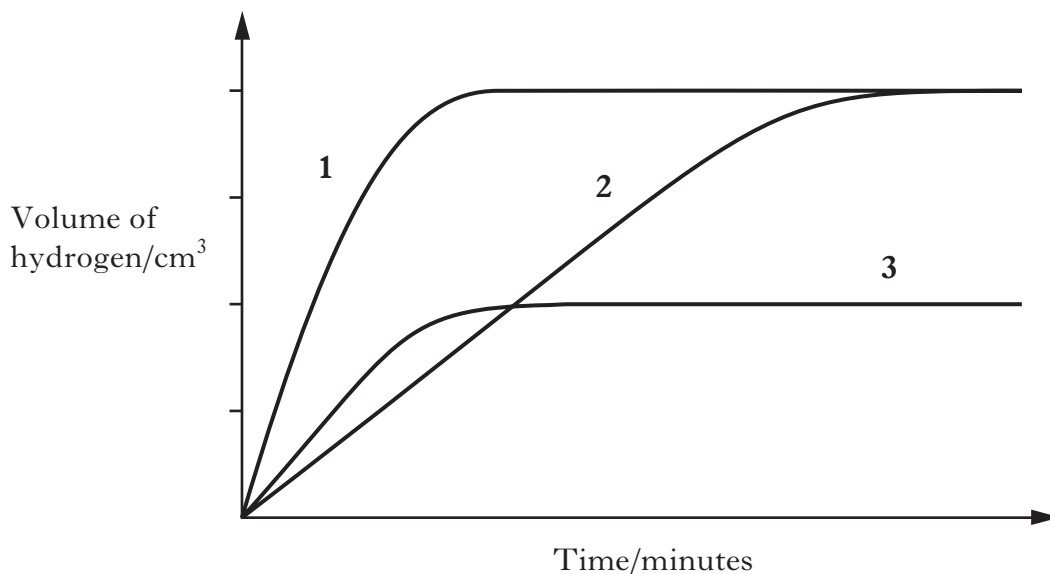
(ii) Which iron strip would have rusted most quickly, **A**, **B**, **C** or **D**?

Marks

	KU	PS
1		
1		
1 (3)		

11. A student carried out some experiments between zinc and excess 1 mol/l hydrochloric acid.

The graph shows the results of each experiment.



(a) In which experiment did the reaction take longest to finish, **1**, **2** or **3**?

1

(b) In **all** three experiments she kept the temperature the same and used the same volume of 1 mol/l hydrochloric acid.

(i) Suggest one factor that could have been changed from experiment **1** to produce the results in experiment **2**.

1

(ii) 1 g of zinc was used in experiment **1**.

What mass of zinc was used in experiment **3**?

_____ g

1

(3)

[Turn over

Marks

KU PS

12. Ammonia is produced in the Haber process.

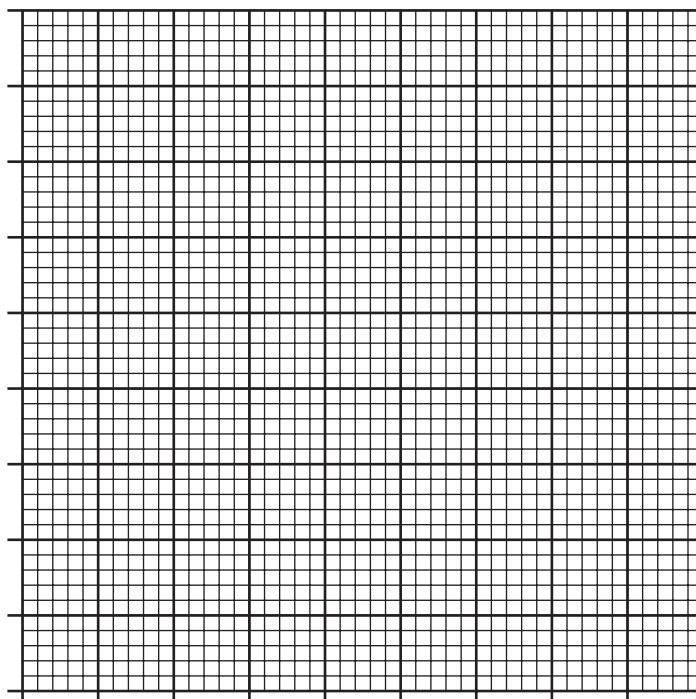
The percentage yield of ammonia, obtained at different pressures, is shown in the table.

Pressure/ atmospheres	Percentage yield of ammonia
50	6
100	10
150	14
200	19
250	22
350	29
400	32

(a) Draw a line graph of the results.

Use appropriate scales to fill most of the graph paper.

(Additional graph paper, if required, can be found on page 26.)



2

Marks

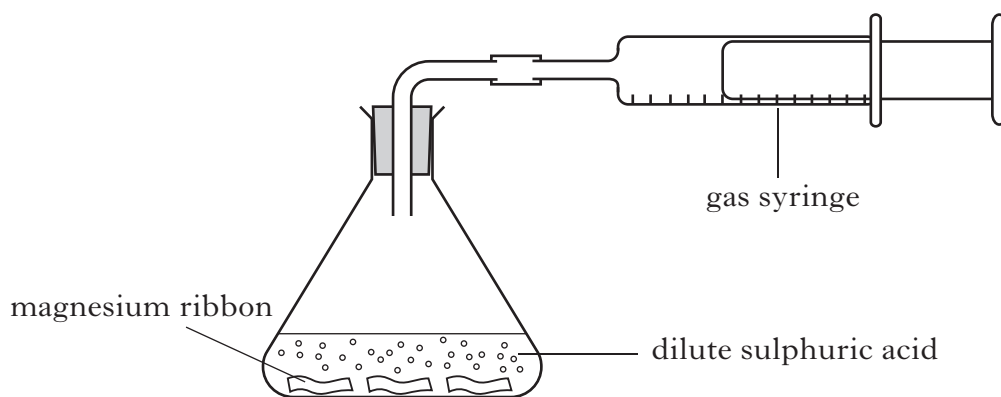
KU PS

13. Hydrogen gas is made up of diatomic molecules.

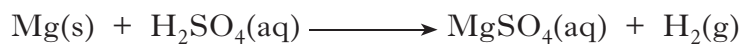
- (a) Draw a diagram to show how the electrons are arranged in a molecule of hydrogen, H₂.

1

- (b) Hydrogen gas is produced when magnesium reacts with dilute sulphuric acid.



The equation for the reaction is:



- (i) Circle the formula for the salt in the above equation.

1

Marks

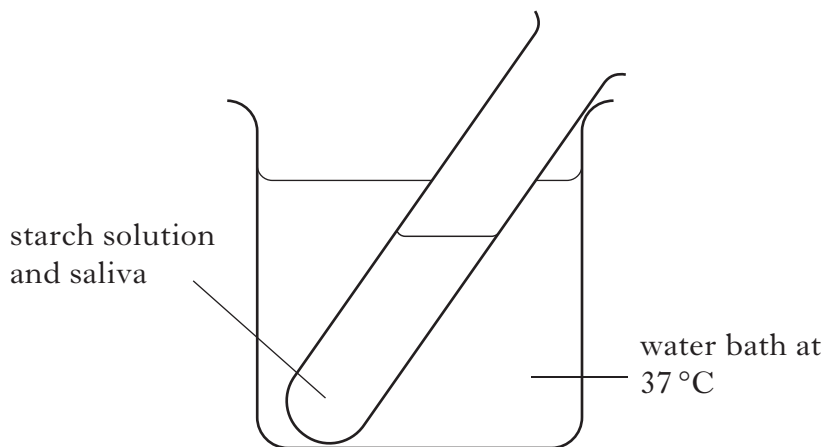
KU	PS

14. Saliva contains an enzyme which breaks down starch.

(a) Name the type of chemical reaction taking place when starch breaks down.

1

(b) A student carried out an experiment to break down starch.



He repeated the experiment using water at 100 °C.

What effect would this have on the activity of the enzyme?

1

(c) The monosaccharide glucose is produced when starch is broken down. Name another monosaccharide.

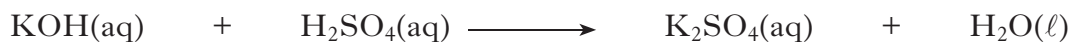
1

(3)

Marks

KU	PS

15. Potassium hydroxide reacts with sulphuric acid to form potassium sulphate, which can be used as a fertiliser.



(a) Balance the above equation.

1

(b) Name the type of chemical reaction taking place.

1

(c) Calculate the percentage, by mass, of potassium in potassium sulphate, K_2SO_4 .

Show your working clearly.

_____ % 2

(d) Ammonium phosphate is also used as a fertiliser.

Write the **ionic** formula for ammonium phosphate.

1

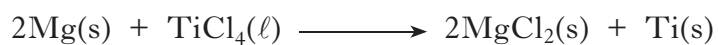
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[Turn over

Marks	Marks	
	KU	PS
1		
1		
1 (3)		

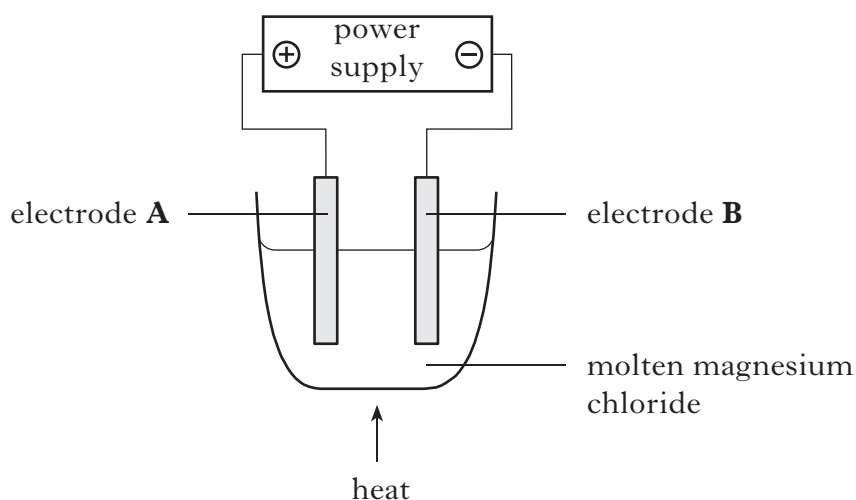
16. Titanium is an important metal used in aircraft manufacture.

(a) Titanium can be produced from titanium chloride as shown.



Name the type of chemical reaction represented by the equation.

(b) The magnesium chloride produced can be electrolysed as shown.



(i) At which electrode would magnesium be produced, **A** or **B**?

(ii) Write the ion-electron equation for the formation of chlorine.

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

Marks

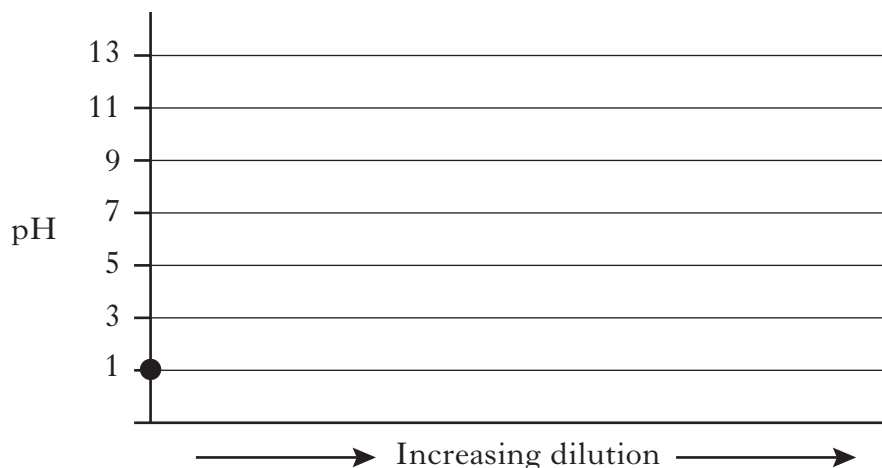
KU	PS

17. A solution of 0.1 mol/l hydrochloric acid has a pH of 1.

(a) (i) What colour would universal indicator turn when added to a solution of hydrochloric acid?

1

(ii) Starting at pH 1, draw a line to show how the pH of this acid changes when diluted with water.



1

(b) Calculate the number of moles of hydrochloric acid in 50 cm³ of 0.1 mol/l hydrochloric acid solution.

_____ mol

1
(3)

[Turn over

Marks

KU	PS

18. A student investigated how the concentration of sodium chloride in water affected the freezing point.

- (a) What type of bond is broken in sodium chloride when it dissolves in water?

1

- (b) The table shows information about the freezing point of different sodium chloride solutions.

Concentration of sodium chloride solution (mol/l)	0	0.09	0.18	0.27	0.37	0.46
Freezing point (°C)	0	-0.2	-0.5	-0.8	-1.1	-1.5

Describe the relationship between the concentration and freezing point.

1

- (c) Predict the freezing point of a 0.55 mol/l sodium chloride solution.

_____°C

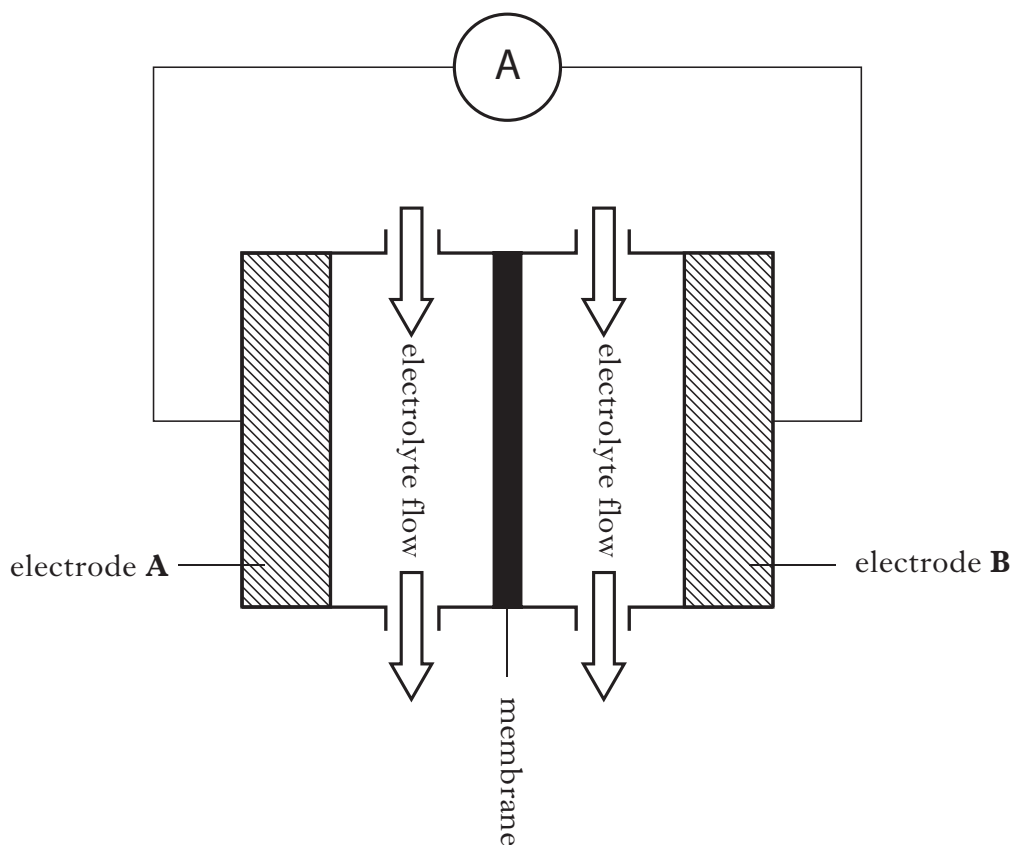
1

(3)

Marks

KU	PS

19. In Australia flow cells are used to store the energy from solar cells.



(a) The reaction taking place at electrode **A** when the cell is providing electricity is:



Name the type of chemical reaction taking place at electrode **A**.

1

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

1

(c) Name the non-metal, that conducts electricity, which could be used as an electrode.

1

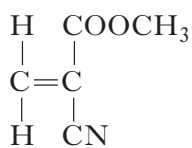
(3)

[Turn over

Marks

	KU	PS
1		
1		
1		
(3)		

20. The monomer in superglue has the following structure.



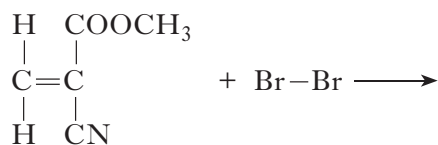
(a) Draw a section of the polymer, showing **three** monomer units joined together.

1

(b) The polymer does **not** change shape on heating.
What term is used to describe this type of polymer?

1

(c) Bromine reacts with the monomer to produce a saturated compound.
Draw the structural formula for this compound.



1

(3)

Marks

KU	PS

21. Aluminium is extracted from the ore bauxite.

(a) (Circle) the correct phrase to complete the sentence.

Aluminium is extracted from its ore $\left\{ \begin{array}{l} \text{by heating with carbon} \\ \text{by heating alone} \\ \text{by electrolysis} \end{array} \right\}$.

1

(b) Aluminium can be mixed with other metals to make a magnet.

What term is used to describe a mixture of metals?

1

(c) The composition of a 250 g magnet is shown.

Metal	aluminium	nickel	cobalt	copper	titanium	iron
% by mass	10	25	20	4	1	40

(i) Calculate the mass, in grams, of aluminium in the magnet.

Show your working clearly.

_____ g 1

(ii) Using your answer to (c)(i), calculate the number of moles of aluminium in the magnet.

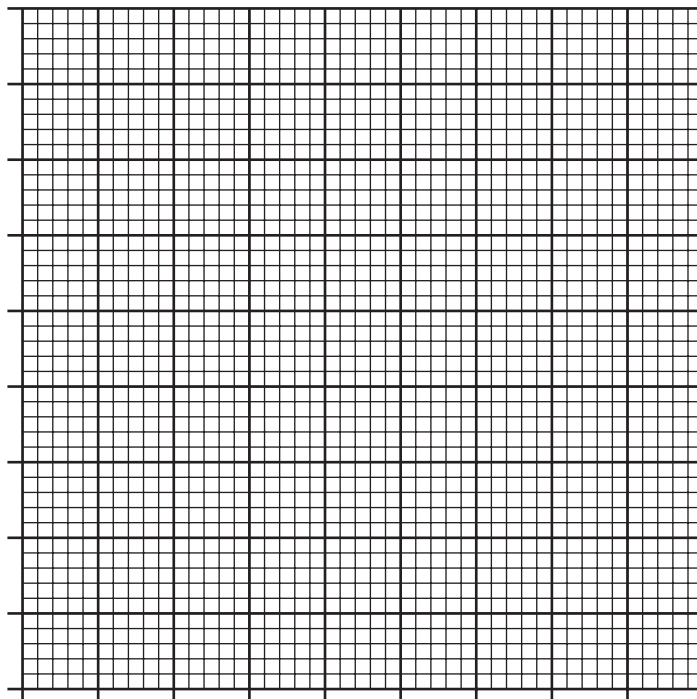
Show your working clearly.

_____ mol 1
(4)

[END OF QUESTION PAPER]

ADDITIONAL SPACE FOR ANSWERS

ADDITIONAL GRAPH PAPER FOR QUESTION 12(a)



ADDITIONAL SPACE FOR ANSWERS

KU	PS

ADDITIONAL SPACE FOR ANSWERS

KU	PS