Please check the examination details be	ow before entering your candidate information						
Candidate surname	Other names						
Pearson Edexcel International Advanced Level	ntre Number Candidate Number						
Tuesday 7 May	2019						
Afternoon (Time: 1 hour 20 minutes)	Paper Reference WCH13/01						
<b>Chemistry</b> International Advanced Subsidiary / Advanced Level Unit 3: Practical Skills in Chemistry I							
Candidates must have: Scientific ca Ruler	Total Marks						

# Instructions

- Use **black** ink or **black** ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
  - there may be more space than you need.

# Information

- The total mark for this paper is 50.
- The marks for **each** question are shown in brackets
  - use this as a guide as to how much time to spend on each question.
- You will be assessed on your ability to organise and present information, ideas, descriptions and arguments clearly and logically, including your use of grammar, punctuation and spelling.
- There is a Periodic Table on the back page of this paper.

### **Advice**

- Read each question carefully before you start to answer it.
- Show all your working in calculations and include units where appropriate.
- Check your answers if you have time at the end.

Turn over ▶







# Answer ALL the questions.

# Write your answers in the spaces provided.

1 The use of ammonium carbonate in smelling salts is due to the formation of ammonia which counters the effects that cause fainting.

When ammonium carbonate is heated gently, it decomposes to form ammonia, water and carbon dioxide.

(a) Write the equation for the decomposition of ammonium carbonate. State symbols are not required.

(1)

(b) Complete the table, giving a **chemical** test, not involving indicators, and its result for each of the products of the decomposition of ammonium carbonate.

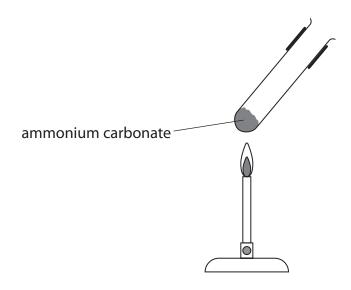
(6)

Product	Chemical test	Result of test
ammonia		
water		
carbon dioxide		



(c) Complete the diagram to show how you would collect the carbon dioxide obtained by heating ammonium carbonate, using another test tube as the **only** additional apparatus.

(1)



(d) A sample of ammonium carbonate was dissolved in distilled water and the solution tested.

Complete the table to give the expected observations and the identity of the observed products.

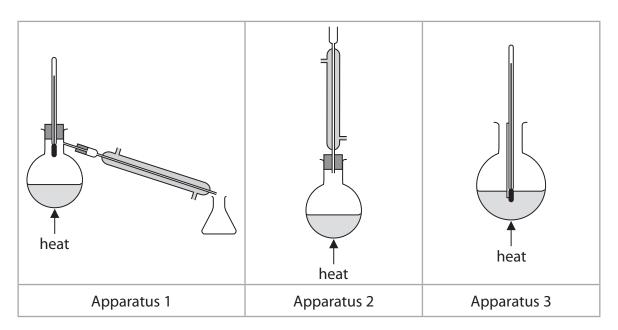
	Test	Observation	Observed product	
(i)	About 1 cm <sup>3</sup> of barium chloride solution was added to 5 cm <sup>3</sup> of the			
	ammonium carbonate solution			(2
(ii)	About 5 cm <sup>3</sup> of hydrochloric acid was			
	added to the mixture from (i)			(2
				(2

(Total for Question 1 = 12 marks)

- **2** A group of students was asked to investigate a liquid organic compound **A**. They were told that it was an alcohol with molecular formula  $C_4H_{10}O$ .
  - (a) A chemical test may be used to confirm the presence of the hydroxyl group in **A**. Identify a suitable reagent for this test, giving the positive result.

(2)

(b) The students suggested that oxidation of **A** would help to identify it. The sets of apparatus shown below were provided for the students' use.



(i) Identify the reagent mixture that can be used to oxidise **A**.

(1)

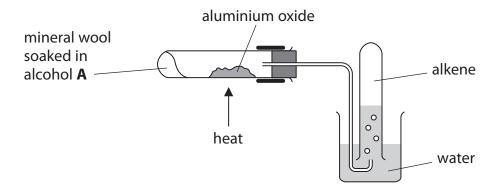


Identify which apparatus (1, 2 or 3) should be used for this oxidation. Justify your answer.	
	(2)
(iii) A chemical test may be used to confirm the presence of an aldehyde. Identify the reagent used, giving the positive result of the test.	(2)
(iv) State whether or not a positive result for the test in (b)(iii), together wind molecular formula, would allow the alcohol <b>A</b> to be identified.	th the
Justify your answer.	(1)
(v) Another student said that if <b>A</b> was a secondary alcohol this could be sh oxidising it to the corresponding ketone.	nown by
Identify which apparatus (1, 2 or 3) should be used for this oxidation.  Justify your answer.	(2)



(c) In a further experiment, the students passed the vapour of **A** over heated aluminium oxide to form an alkene.

The apparatus used is shown.



(i) Give <b>two</b> reasons for the use of the mineral	al wool
--	---------

(2)

(ii)	Explain why it is necessary to remove the delivery tube from the heated tube
	immediately when heating stops.

(2)



	e alkene formed in (c) was reacted with a small amount of bromine giving a mpound with molecular formula $C_4H_8Br_2$ .	
(i)	State the colour <b>change</b> when the alkene reacts with bromine.	(1)
(ii)	The mass spectrum of $C_4H_8Br_2$ had a pair of peaks at $m/z = 107$ and $m/z = 109$ and also peaks at $m/z = 79$ and $m/z = 81$ due to the isotopes of bromine.	
	One student suggested that these peaks showed that alcohol <b>A</b> must be butan-2-ol.	
	Explain how these peaks support the student's suggestion.	(3)
	(Total for Question 2 = 18 mai	rks)



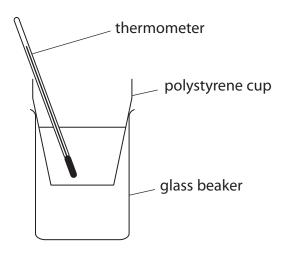
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**3** A group of students carried out a thermochemistry experiment to determine the relative atomic mass of a metal, **M**.

### Procedure

- Step **1** Transfer 50.0 cm<sup>3</sup> of a 1.35 mol dm<sup>-3</sup> solution of copper(II) sulfate to an expanded polystyrene cup placed in a glass beaker.
- Step 2 Weigh out, as accurately as possible, a known mass of the finely powdered metal **M**.
- Step 3 Measure the temperature of the copper(II) sulfate solution.
- Step **4** Quickly add all of the powdered metal, stir the mixture continuously and note the highest temperature reached.



- (a) Each student carried out the experiment using a different mass of the metal.
  - (i) Give a reason, other than preventing heat loss, for placing the polystyrene cup in a glass beaker.

(ii) Name the piece of apparatus suitable for measuring 50.0 cm<sup>3</sup> of copper(II) sulfate solution.

(1)

(1)



(iii) Powdered metal reacts much faster than filings or granules.

Suggest why this is important in this experiment.

(1)

(b) The students' results were collected in a table.

Mass of metal / g	Initial temperature / °C	Final temperature / °C	Temperature change /°C
0.50	20.0	27.0	7.0
1.10	20.0	34.0	14.0
2.00	21.0	58.0	37.0
3.10	20.0	58.5	38.5
3.80	20.5	70.5	50.0
5.10	19.0	74.5	55.5
6.00	20.0	74.0	54.0
7.00	21.0	76.0	55.0
8.30	20.0	75.0	55.0

(i) Plot a labelled graph of mass of metal on the horizontal axis against temperature change on the vertical axis.

(3)



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<del></del>	<del>                                      </del>	<del></del>	
<del></del>	<del>                                      </del>	<del></del>	

(ii) Determine the mass of metal **M** that reacts exactly with 50.0 cm<sup>3</sup> of 1.35 mol dm<sup>-3</sup> copper(II) sulfate by drawing appropriate best-fit straight lines. You **must** show your working on the graph.

(2)

Mass of metal **M** ......g



(iii) The equation for the reaction of **M** with copper(II) sulfate is

$$M(s) + CuSO_4(aq) \rightarrow MSO_4(aq) + Cu(s)$$

Use the equation and your answer to (b)(ii) to calculate the relative atomic mass of **M**.

Give your answer to an appropriate number of significant figures.

(3)

(iv) One mass of **M** in the experiment gave an anomalous data point. Suggest a reason, other than measurement error, for this anomaly.

(1)

(Total for Question 3 = 12 marks)



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4 Solid sodium hydroxide absorbs water from the air.

The purity of a sample of sodium hydroxide may be determined by titration.

### **Procedure**

- Step 1 Weigh a sample of sodium hydroxide in a beaker.
- Step 2 Dissolve the sodium hydroxide in distilled water and transfer the solution and washings to a 250.0 cm<sup>3</sup> volumetric flask. Make the solution up to the mark with distilled water and mix thoroughly.
- Step **3** Pipette 25.0 cm<sup>3</sup> of the sodium hydroxide solution into a conical flask and add a few drops of methyl orange indicator.
- Step **4** Titrate the sodium hydroxide solution with hydrochloric acid of known concentration. Repeat the titration until concordant results are obtained.

### Results

Mass of solid sodium hydroxide = 0.95 g

Concentration of hydrochloric acid = 0.0950 mol dm<sup>-3</sup>

### **Titration Results**

Burette readings	Rough	1	2	3
Final reading / cm <sup>3</sup>	25.05	26.10	24.70	29.30
Initial reading / cm <sup>3</sup>	0.00	2.00	1.00	5.00
Titre / cm³	25.05	24.10	23.70	24.30

(a) State what is meant by the term 'concordant results'.

(1)

(b) Using appropriate titres, calculate the mean titre.

(1)



(c) State the colour **change** at the endpoint of the titration.

(2)

rioin .....

(d) The equation for the reaction is

$$NaOH(aq) + HCl(aq) \rightarrow NaCl(aq) + H_2O(I)$$

Calculate the purity of the sodium hydroxide, NaOH, as a percentage by mass.

(4)

(Total for Question 4 = 8 marks)

**TOTAL FOR PAPER = 50 MARKS** 



# The Periodic Table of Elements

0 (8)	(18)	4.0	He	helium 2	20.7	Ne	neon	10	39.9	Ar	argon	18
7				(17)	19.0	L	fluorine	6	35.5	ວ	chlorine	17
9				(16)	16.0	0	oxygen	∞	32.1	S	sulfur	16
2				(15)	14.0	z	nitrogen	7	31.0	۵	phosphorus	15
4				(14)	12.0	U	carbon	9	28.1	Si	silicon	4
m				(13)	10.8	В	boron	5	27.0	¥	aluminium	13
				'								(12)
												(11)
												(10)
	_											(6)
	,	<u>:</u> :	<b>L</b>	1								(8)
												(2)
					mass	pol		nmper				(9)
				Key	ve atomic	mic sym	name	(proton) n				(2)
					relati	ato		atomic				(3) (4) (5)
2				(2)	9.0	Be	beryllium	4	24.3	Ag	magnesium	12
-				(1)	6.9	ב	lithium	n	23.0	Na	sodium	7
	2 6 7	3 4 5 6 7	3 4 5 6 7	3 4 5 6 7	1.0 H hydrogen 1 (13) (14) (15) (16) (17)	2 1.0 H hydrogen 1 2) Key (2) Key Trelative atomic mass (2) The hydrogen 1 (10) The hydrogen 1 (11) The hydrogen 1 (12) The hydrogen 1 (13) The hydrogen 1 (14) The hydrogen 1 (15) The hydrogen 1 (16) The hydrogen 1 (17) The hydrogen 1 (18) The hydrogen 1 (19) The hy	2 1.0 H hydrogen 1 2) Key  Telative atomic mass Be atomic symbol 2  1.0 H hydrogen 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	2 1.0 H hydrogen 1 2) Key 2) Key Telative atomic mass Be atomic symbol name name name name name name name atomic name atomic name name name name name name name name	2  1.0  Hydrogen  (2)  Key  1.0  Hydrogen  (2)  Telative atomic mass  Be  atomic symbol  name  name  horon carbon number  4  atomic (proton) number  4  1.0  Hydrogen  1.0  Hydrogen  1.0  1.0  Hydrogen  1.0  1.0  1.0  1.0  1.0  1.0  1.0  1.	2 1.0 Hydrogen 1.0 Key 1.2 (13) (14) (15) (16) (17) (19.0 Be atomic symbol atomic (proton) number 4 atomic (proton) number 4 24.3 (24.3 to 1.0	2 3 4 5 6 7  1.0 H hydrogen (2) Key  1.0 Se atomic mass atomic mass atomic (proton) number atomic (proton) number 4 atomic (proton) number  Mg Mg Mg  2.2.3 Se 4 5 6 7  6.1 Se 7 (17)  1.0	2

83.8 **Kr** krypton 36

79.9 **Br**bromine
35

Se selenium 134

**As** arsenic

72.6 **Ge** germanium

**Ga** gallium 31

**Zn** zinc 30

63.5 **Cu** copper 29

**S**8.7 **Ni** nickel 28

**58.9 Co** cobalt

55.8 Fe iron 26

54.9

50.9 52.0

V
Cr
vanadium chromium

47.9 **Ti** titanium

Sc

40.1 Ca calcium 20

**K** potassium

19

45.0

39.1

27

manganese 25

24

22

74.9

69.7

131.3 **Xe** 

126.9

127.6

121.8

114.8

32

iodine 53 [210]

Sb Te antimony tellurium

**Sn** tin tin 50

In indium 49

Cd cadmium 48

**Ag** silver 47

Pd palladium 46

 95.9
 [98]
 101.1
 102.9

 Mo
 Tc
 Ru
 Rh

 molybdenum
 technetium
 ruthenium
 rhodium

 42
 43
 44
 45

92.9 **Nb** niobium

91.2 **Zr** zirconium

88.9 **×** 

87.6 Sr strontium 38

85.5 **Rb** rubidium 37

106.4

[222] **Rn**radon
86

At astatine 85

polonium

Bi bismuth | 1-83

207.2 **Pb** lead lead 82

200.6 **Hg** mercury 80

197.0 **Au** gold 79

195.1 Pt platinum 78

I**r** iridium 192.2

190.2 Os osmium

186.2 **Re** rhenium

183.8 ≥

180.9

178.5 **Hf** 

138.9

137.3

La\* 27

**Ba** barium

132.9 Cs

26

22

4

9

yttrium 39

75

tungsten 74

73

**Ta** tantalum

anthanum hafnium

[223]
Fr
francium
87

thallium 204.4 **Tl** 

8

[209]

209.0

ן אַ		
oeen repor	175 <b>Lu</b> lutetium 71	[257] Lr lawrencium
116 have l	173 <b>Yb</b> ytterbium 70	[254] No nobelium
Elements with atomic numbers 112-116 have been reporte but not fully authenticated	169 Tm thulium 69	[256] Md mendelevium 101
atomic nur but not f	167 <b>Er</b> erbium 68	[253] <b>Fm</b> fermium 100
ents with	165 <b>Ho</b> holmium 67	Es n einsteinium 99
ЕГет	163  Dy dysprosium ho	Cf Cf californium 98
Rg roentgenium	159 <b>Tb</b> terbium 65	[245] <b>BK</b> berketium 97
Ds damstadtium 110	157 <b>Gd</b> gadolinium 64	[247] <b>Cm</b> curium 96
[268]  Mt meitnenium 109	152 <b>Eu</b> europium 63	[243] <b>Am</b> americium 95
[277] <b>Hs</b> hassium 108	150 Sm samarium 62	[242] Pu plutonium 94
[264] <b>Bh</b> bohrium 107	[147] Pm promethium 61	[237] Np neptunium
Sg seaborgium 106	144 <b>Nd</b> neodymium 60	238 U uranium 92
[262] <b>Db</b> dubnium 105	141 Pr praseodymium 59	[231] Pa protactinium 91
[261] Rf rutherfordium 104	140 <b>Ce</b> cerium 58	232 <b>Th</b> thorium 90
[227] AC* actinium 89	sa	
[226] <b>Ra</b> radium 88	nanide series ide series	

\* Lantha

\* Actinid

