



# UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

CANDIDATE NAME				
CENTRE NUMBER		CANDIDATE NUMBER		

**COMBINED SCIENCE** 

0653/53

Paper 5 Practical Test

May/June 2010

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials:

As listed in Instructions to Supervisors.

#### **READ THESE INSTRUCTIONS FIRST**

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use a pencil for any diagrams, graphs or rough working.

Do not use staples, paper clips, highlighters, glue or correction fluid.

DO **NOT** WRITE IN ANY BARCODES.

Answer all questions.

Chemistry practical notes for this paper are printed on page 16.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use									
1									
2									
3									
Total									

This document consists of 11 printed pages and 5 blank pages.

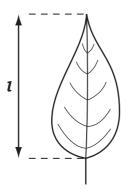


1 This question is about variation in leaves.

For Examiner's Use

(a) You are provided with 20 leaves of the same species. Measure the length *I* of each leaf in millimetres as shown in Fig. 1.1a. If the lamina does not meet the petiole evenly on either side of the leaf use the longer measurement. See Fig. 1.1b.

Enter your measurements in Table 1.1.





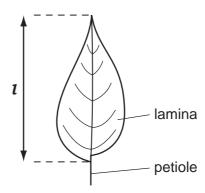


Fig. 1.1b

Table 1.1

length of leaf // mm										
1	11									
2	12									
3	13									
4	14									
5	15									
6	16									
7	17									
8	18									
9	19									
10	20									

[2]

(b) Calculate the average (mean) length of the 20 leaves. Show your working.

average = \_\_\_\_ mm

[2]

(c)	The	e difference betwee	en the greatest leng	th and the s	smallest length	ı is the range.	
	Cor	mplete the followin	g.				
	the	greatest length =			mm		
	the	smallest length =			mm		
	the	range =			. mm		[1]
(d)		e the grid provided th square is 1 cm².	on page 5 to estim	ate the are	a of <b>one</b> of the	e leaves. The are	a of
	•	Place the leaf on	the grid provided.				
	•	Carefully draw ro	und the leaf then re	move it.			
	•	Write the letter squares.	C in the complet	<b>e</b> squares.	Count the r	number of comp	olete
		nur	mber of complete (C	) squares =	:		
	•	Write the letter <b>P</b> more.	in any incomplete	squares tha	at have an are	a of half a squar	e or
		numl	ber of incomplete (P	) squares =	:	•••••	
	•	Ignore the rest of	the squares.				
	•	Add C + P to esti	mate the area of the	leaf.			
				leaf area =	=	cm <sup>2</sup>	[3]

© UCLES 2010 0653/53/M/J/10


(e)	The leaves in the sample were all of the same species yet they showed variation in
	length.

Suggest and e	explain a reas	son for this.	

reason	
explanation	
	[2]

You are going to find the specific heat capacity of the material of a can. The specific he capacity of a material is the heat energy required to raise 1 g of the material by 1 °C.	eat
(a) Find the mass of the can to the nearest gram.	
Record its mass below.	
mass of can, $\mathbf{m_1}$ , =g	[1]
(b) Place the lagging around the can. Place the thermometer inside the can and leave two minutes. Read the temperature, t₁, to the nearest 0.5 °C and record it below.	for
temperature of can, <b>t</b> <sub>1</sub> =°C	[1]
(c) (i) Heat enough water in a beaker to about one-third fill the can. When the temperature is just above 70 °C, remove the Bunsen. As soon as the temperature of the water has cooled to exactly 70.0 °C pour the water into the can. Read the temperature, t <sub>2</sub> , to the nearest 0.5 °C of the water after exactly two minutes Record this temperature.	ure the
temperature of water, <b>t</b> <sub>2</sub> =oC	[1]
(ii) Remove the lagging and pour the water into a measuring cylinder. Record to volume.	the
volume of water =cm <sup>3</sup>	[1]
(iii) 1 cm³ of water has a mass of 1 g. Calculate the mass, m₂, of the volume of wayou recorded in (c)(ii).	iter
mass of water, $\mathbf{m_2} = \phantom{aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa$	[1]
(d) Calculate	
(i) $\mathbf{t}_3$ , the fall in temperature of the hot water, $\mathbf{t}_3$ = (70.0 - $\mathbf{t}_2$ ).	
$t_3 = \underline{\hspace{1cm}}^{\circ} C$ (ii) $t_4$ , the rise in temperature of the can, $t_4 = (t_2 - t_1)$ .	
t <sub>4</sub> =°C	[2]

0653/53/M/J/10
WWW.XTRENEPHPERS.NET

2

(e) Use the equation to calculate the specific heat capacity, **shc**, of the material of the can.

$$\text{shc} \quad = \quad \frac{m_2 \quad \text{x} \quad t_3 \quad \text{x} \quad 4.2}{t_4 \quad \text{x} \quad m_1}$$

specific heat capacity of the material of the can = 
$$Jg^{-1} \circ C^{-1}$$
 [3]

**3** You are going to investigate the rate of reaction between magnesium and hydrochloric acid.

Read through the procedure before starting the experiment.

- (a) (i) Set up the apparatus as shown in Fig. 3.1.
  - Fill the 100 cm<sup>3</sup> measuring cylinder and trough with water.

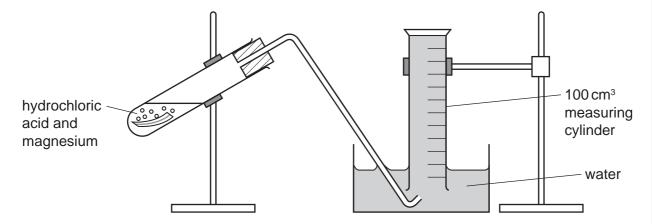


Fig. 3.1

- (ii) Place 20 cm<sup>3</sup> of the hydrochloric acid in the large test-tube.
  - Cut 6 cm of magnesium ribbon from the length provided.
  - Loosely fold the piece of magnesium ribbon and place it in the acid contained in the test-tube. Immediately replace the stopper and delivery tube and start the timer.
  - Read the volume of gas in the measuring cylinder after 20, 40, 60 and 80 seconds.
  - Record the volumes in Table 3.1. [2]
- **(b) (i)** You will now repeat the procedure using the same length of magnesium but different volumes of acid and water.
  - Wash out the contents of the test-tube.
  - Refill the measuring cylinder with water.
  - Place 16 cm<sup>3</sup> of hydrochloric acid in the test-tube and 4 cm<sup>3</sup> of water.
  - Cut 6 cm of magnesium ribbon and place it in the acid. Replace the stopper and delivery tube.
  - Immediately start the timer.
  - Read the volume of gas in the measuring cylinder after 20, 40, 60 and 80 seconds.
  - Record the volumes in Table 3.1.

(ii) Repeat the experiment **two** more times using volumes of acid and water as shown in Table 3.1. Record the results in Table 3.1. [2]

For Examiner's Use

#### Table 3.1

volume of 2 mol/dm³	volume of water / cm <sup>3</sup>	concentration of acid in the	volume of gas collected/cm <sup>3</sup> after								
hydrochloric acid/cm <sup>3</sup>		mixture/mol/ dm <sup>3</sup>	20 s	40 s	60 s	80 s					
20	0	2.0									
16	4	1.6									
12	8	1.2									
4	16	0.4									

(c) Draw a graph of volume of gas collected **after 40 s** (vertical axes) against concentration of hydrochloric acid. Include the origin in your plots and draw a smooth curve.

For Examiner's Use

H	Т	т	Н	Н	+	+	+	Н	Н	Н	-	+	+	+	+	Н	$\dashv$	+	+	+	+	Н	+	╫	Н	+	+	Н	+	+	╀	+	$\vdash$	Н	Н
	+	Н	Н	Н	+	+	+	Н	Н	Н	$\dashv$	+	+	+	+	Н	$\dashv$	+	$\vdash$	+	+	Н	+	╀	Н	+	+	Н	+	+	╫	+	$\vdash$	Н	Н
	+	+	-	Н	+	+	+	Н	Н	Н	$\rightarrow$	+	+	+	+	$\vdash$	$\dashv$	+	$\vdash$	+	+	Н	+	╀	Н	+	+	Н	+	+	╀	+	$\vdash$	$\vdash$	Н
Н-	+	$\vdash$	_	Н	-	+	╀	Н	Н	Н	-	4	+	+	+	$\vdash$	-	+	$\vdash$	+	+	Н	+	╄	Н	+	+	Н	+	-	╀	$\vdash$	-	$\vdash$	Н
Щ	┸	Ш		Щ	$\perp$	_	$\perp$	Ш	Ш	Ш	_	_	_	_	$\perp$	ш	_		Ш	_	ш	Ш	_	┺	Ш	4	_	Ш	_	$\perp$	┸	┺			Ш
				Ш				П								ш								1				ш			1				ш
П	Т	П		П	П	Т	Т	П	П	П	П	Т	Т	Т	Т	П	╗		П	Т	П	П	$\top$	Т	П	$\neg$	Т	П	$\neg$	П	Т	П	П	П	П
$\vdash$	+	-		Н	$\top$	$^{-}$	-	т	П	П	$\neg$	$^{+}$	$^{+}$	$^{+}$	+	$\vdash$	$\dashv$	-	$\vdash$	$^{+}$	-	$\vdash$	$\top$	$^{-}$	Н	$\neg$	+	Н	-	+	+	1		-	Н
$\vdash$	+	+	Н	Н	+	+	+	Н	Н	Н	$\rightarrow$	+	+	+	+	$\vdash$	$\dashv$	+	$\vdash$	+	+	$\vdash$	+	-	Н	+	+	Н	+	+	╫	+	$\vdash$	$\vdash$	Н
₩	+	+	_	Н	+	+	╀	Н	Н	Н	-	+	+	+	+	Н	$\dashv$	+	$\vdash$	+	+	Н	+	╀	Н	+	+	Н	+	+	╀	+	$\vdash$	$\vdash$	Н
ш	_	$\perp$		Ш	_	$\perp$	$\perp$	Ш	Ш		_	4	4	_	$\perp$	ш	_		Н	_	$\perp$	Ш	_	┺	Ш	_	$\perp$	ш	_	-	┸	_	╙	╙	Ш
Щ	_	ш		Ш	$\perp$	$\perp$	$\perp$	Ш		Ш	_	4	4	$\perp$	$\perp$	ш	_		Ш	$\perp$		Ш	$\perp$	┺	Ш	_	$\perp$	ш		$\perp$	┸		┖	┖	Ш
				Ш				П								ш								1				ш			1				ш
П	Т	П		П	П	Т	Т	П	П	П	П	Т	Т	Т	Т	П	П		П	Т	П	П	Т	Т	П	Т	Т	П	Т	П	Т	П	Г	П	П
$\vdash$	+	$\vdash$		Н	$^{+}$	+	+	Н	Н	Н	_	+	$^{+}$	+	+	$\vdash$	$\dashv$		$\vdash$	+	+	$\vdash$	$\pm$	+	Н	$^{+}$	+	Н	-	+	$^{+}$		$\vdash$	т	Н
$\vdash$	+	+	_	Н	+	+	+	Н	Н	$\vdash$	$\rightarrow$	+	+	+	+	$\vdash$	$\dashv$	+	$\vdash$	+	+	$\vdash$	+	+	Н	+	+	Н	+	+	+	+	$\vdash$	+	Н
₩	+	+	_	Н	+	+	+	Н	Н	Н	-	+	+	+	+	Н	$\dashv$	-	$\vdash$	+	+	$\vdash$	+	┿	Н	$\rightarrow$	+	Н	-	-	┿	+	$\vdash$	$\vdash$	Н
Н-	+	$\perp$		Н	$\vdash$	+	$\perp$	Н	Ш	Н	-	4	4	_	+	Н	$\dashv$	_	$\sqcup$	+	$\perp$	Н	+	┺	Ш	_	+	ш	_	$\perp$	╀	-			ш
ш	$\perp$							Ш				_	_			ш				$\perp$			$\perp$	┸		_					┸				Ш
				Ш				П								ш								1				ш			1				ш
П	T	П		П	$\Box$		Т	П	П			$\neg$	$\top$		Т	П	$\neg$				П	П	$\neg$	Т				П			Т				П
$\vdash$	+	$\vdash$		Н	$\vdash$			П	П		_	1	+		+	$\Box$	$\neg$		$\Box$	$^{-}$		$\Box$	$\top$	1		$\neg$					$^{+}$				Н
$\vdash$	+	+	_	Н	+	+	+	Н	Н	Н	$\rightarrow$	+	+	+	+	$\vdash$	$\dashv$	_	$\vdash$	+	+	$\vdash$	+	+	Н	$\rightarrow$	+	Н	+	+	┿	+	$\vdash$	$\vdash$	Н
Н-	+	$\vdash$	_	Н	$\rightarrow$	+	+	Н	Н	Н	-	-	+	+	+	$\vdash$	$\rightarrow$	_	$\vdash$	+	+	$\vdash$	+	┺	Н	$\rightarrow$	+	Н	+	+	╄	-	-	$\vdash$	Н
Щ.	+	$\perp$		Щ	$\perp$	-	-	ш	Ш	Ш	_	4	4	+	+	ш	_	_	ш	+	$\perp$	ш	+	┺	Ш	_	+	ш	_	$\perp$	╄	-			ш
ш																ш															L				
	Т			П	П	Т	Т	П		П		Т	Т	Т	Т	П	П			Т	П	П	П	Т			Т	П			Т	П			П
т	$\top$	П	П	П	$\neg$			П	П	П		7	$\top$	$\top$		П	$\neg$		П	$\top$		П	$\top$	т		$\neg$	$\top$	П	$\neg$		T				П
$\vdash$	-	-		Н	$\overline{}$	-	-	т	$\overline{}$	$\vdash$	$\neg$	_	$^{+}$	$\overline{}$	_	$\vdash$	$\dashv$	$\overline{}$	$\overline{}$	$\overline{}$	$\overline{}$	$\overline{}$	$\overline{}$	+	Н	$\neg$	+	Н	$\overline{}$	_	+				Н
$\vdash$	+	Н	H	Н	+	+	+	Н	Н	$\vdash$	+	+	+	+	+	H	$\dashv$	+	+	+	+	$\vdash$	+	+	Н	+	+	Н	+	+	+	+	+	1	Н
$\vdash$	+	$\vdash$	$\vdash$	Н	+	+	+	Н	Н	$\vdash$	+	+	+	+	+	$\vdash$	$\dashv$	+	$\vdash$	+	+	$\vdash$	+	+	$\vdash$	+	+	$\vdash$	+	+	+	+	$\vdash$	-	Н
$\vdash$	+	$\vdash$	L	ш	$\perp$	$\perp$	+	ш	Ш	ш	-	$\perp$	$\perp$	$\perp$	+	$\sqcup$	$\dashv$	+	$\vdash$	$\perp$	$\vdash$	Ц	$\perp$	+	ш	$\perp$	+	$\sqcup$	$\perp$	+	+	+	$\vdash$	-	ш
$\perp$	$\perp$	$\perp$	L	Ш	$\perp$	1	$\perp$	$\perp$	$\sqcup$	Ш	$\perp$	$\perp$	$\perp$	$\perp$	$\perp$	Ш	$\Box$	$\perp$	ш	$\perp$	$\perp$	Ш	$\perp$	$\perp$	Ш	$\perp$	$\perp$	$\sqcup$	$\perp$	$\sqcup$	$\perp$	$\perp$			Ш
$\Box$	1	LΠ	Ľ	LΊ	LΤ	ſ	Ι_	LΠ	Lī	LΊ	_T	_T	_[	╝	1	LΤ	_7		LΤ	╝	T	LΤ	$\Box\Gamma$	1	L₹	_T	╧	$\Box$		LΤ	1	Ι_	L	L	LT
	Т	П	Г	П	$\top$	T	П	П	П	П	$\neg$	$\top$	$\top$	$\top$	Т	П	$\neg$	$\top$	П	$\top$	П	$\Box$	$\top$	Т	П	$\top$	Т	П		$\sqcap$	Т	Т			П
$\vdash$	+	Н	Т	Н	+	+	+	П	Н	Н	$\dashv$	$^{+}$	+	+	+	Н	$\dashv$	_	$\vdash$	+	Н	$\vdash$	+	+	Н	+	+	Н	+	$\vdash$	+	$\top$	т		Н
$\vdash$	+	Н	H	Н	+	+	+	Н	Н	Н	+	+	+	+	+	Н	$\dashv$	+	+	+	+	$\vdash$	+	+	Н	+	+	Н	+	+	+	+	$\vdash$	1	Н
$\vdash$	+	Н	H	Н	+	+	+	Н	Н	Н	+	+	+	+	+	$\vdash$	-	+	$\vdash$	+	+	$\vdash$	+	+	Н	+	+	Н	+	+	+	+	$\vdash$	-	Н
$\vdash$	+	$\vdash$	L	ш	$\perp$	+	+	ш	Ш	ш	_	4	$\perp$	$\perp$	+	$\vdash$	_	+	$\vdash$	$\perp$	$\vdash$	Ц	$\perp$	+	Н	$\perp$	+	$\sqcup$	$\perp$	$\vdash$	+	+	$\vdash$	-	ш
$\perp$	$\perp$	$\perp$	L	Ш	Ц	$\perp$	1	$\perp$	Ш	Ш		$\perp$			$\perp$	ш		$\perp$	Ш	$\perp$	$\perp$	Ш	$\perp$	$\perp$	Ш	$\perp$	$\perp$	ш	$\perp$	$\sqcup$	┸	$\perp$	L		ш
ட	⊥_	LΠ	Ľ	LΊ	∟Τ	╧	Ι.	LΠ	L7	LΊ	_T	_T	_[	╝	⊥_	LΤ	_1	┙	LΤ	╝	Ţ	LΤ	_ר	Ι_	LΊ	_T	╧	LΠ		LΤ	1	Ι_	L	L	LΊ
	T	П	Г	П		T	П	П	П	П	$\neg$	T	T	$\top$	Т	П	$\neg$	Т	$\Box$	T	П	$\Box$	$\top$	Г	П	$\top$	Т	П		$\Box$	Т	П	Г		П
$\vdash$	$\top$	Н	Т	Н	$\forall$	+	$\top$	П	Н	Н	$\dashv$	$^{+}$	$^{+}$	+	$^{+}$	Н	$\dashv$		$\vdash$	+	т	$\vdash$	+	t	М	$^{+}$	$^{+}$	Н	$^{+}$	$\vdash$	$^{+}$	$\top$	т	т	П
$\vdash$	+	Н	Н	Н	+	+	+	Н	Н	$\vdash$	$\rightarrow$	+	+	+	+	$\vdash$	$\dashv$	+	+	+	+	$\vdash$	+	+	Н	+	+	Н	+	+	+	+	$\vdash$		Н
$\vdash$	+	+	H	Н	+	+	+	Н	Н	$\vdash$	+	+	+	+	+	$\vdash$	$\dashv$	+	+	+	+	$\vdash$	+	+	$\vdash$	+	+	$\vdash$	+	+	+	+	$\vdash$	-	Н
ш	+	Ш		Н	-	$\perp$	╀	Ш	Ш	Ш	_	4	4	+	+	Н	$\dashv$	_	Ш	+	$\perp$	Н	+	╄	Ш	+	+	Ш	_	$\perp$	╀	$\perp$			Ш
ш								Ш								ш												ш			L				Ш
				Ш				П								ш								1				ш			1				ш
П	T	П		П	$\Box$		Т	П	П			T	$\top$		Т	П	$\neg$				П	П	$\neg$	Т				П		П	Т				П
$\vdash$	+	$\vdash$		Н	$\vdash$			П	П	П	_	+	$^{+}$			$\vdash$	$\neg$		$\vdash$	$^{-}$		$\Box$	$\top$	+		$\neg$			-		$^{+}$				Н
$\vdash$	+	+	_	Н	+	+	+	Н	Н	Н	$\rightarrow$	+	+	+	+	$\vdash$	$\dashv$	_	$\vdash$	+	+	$\vdash$	+	+	Н	$\rightarrow$	+	Н	+	+	+	+	$\vdash$	$\vdash$	Н
₩	+	+	_	Н	+	+	-	Н	Н	Н	-	+	+	+	+	Н	$\dashv$	-	$\vdash$	+	+	Н	+	╌	Н	-	+	Н	-	++	╀	┿	⊢	Н	Н
Щ.	$\perp$	ш		Щ	4	+	╄	ш			_	4	4	4	+	ш	_	_	ш	+	$\perp$	Щ	+	╄		4	+	Ш	_	$\perp$	╄	$\perp$			Ш
ш	$\perp$			Ш	$\perp$	$\perp$	┖							$\perp$	$\perp$	ш				$\perp$				L			$\perp$				L				
				Ш				П								ш								1				ш			1				ш
П	Т			П	П	Т	Т	П		П		Т	Т	Т	Т	П	П			Т	П	П	П	Т			Т	П			Т	П			П
H	$^{\dagger}$	П	П	Н	$\top$	$\top$	T	П	П	П	$\neg$	_	1	$\top$	$^{+}$	П	$\neg$	=	Ħ	$\top$	$\top$	П	$\top$	T	Н	$\top$	+	Н	$\neg$		т	T			П
$\vdash$	+	+	Н	Н	+	+	-	Н	Н	Н	$\dashv$	+	+	+	+	Н	$\dashv$	_	$\vdash$	+	+	$\vdash$	+	+	Н	$^+$	+	Н	_	++	╈	+	Н	Н	Н
$\vdash$	+	+	_	Н	+	+	+	Н	Н	Н	$\rightarrow$	+	+	+	+	$\vdash$	$\dashv$	-	$\vdash$	+	+	$\vdash$	+	╌	Н	$\rightarrow$	+	Н	-	++	╀	+	$\vdash$	$\vdash$	Н
ш.	+	1 1									-	4	4	-	+	Н	-		Н	-	$\perp$	Ш	-	┺	Ш	-	+	ш	-	-	╄		_	-	ш
ш			_	$\vdash$	-	+	+	-	-	$\overline{}$														┖						1 1					
	-					$\pm$	İ				_	4	4	_	$\perp$	$\vdash$	_		$\vdash$	_	-										_		-	_	-
$\Box$	t	F	_	H	+	‡	F			_	+	+	+	+	+	Н	$\dashv$	$\top$	Ħ	$^{+}$	Ħ	Н	$\top$	Г	П	$\top$	$\top$	Н	$\top$	$\top$	$^{+}$	H	H	H	Н
	Ŧ	H				+	F				#	+	+	+	ŧ	H	-		H	Ŧ	F		Ŧ	F	Н	7	Ŧ	H	$\mp$	H	ŧ	H	F	F	H
Н	Ė					+						+	+	+	Ė					ļ				F		-	ł				ŧ				
Ħ	Ė																			+				F		-									
Ħ																																			

volume of gas collected after 40 s/cm<sup>3</sup>

concentration of acid/moldm<sup>-3</sup>

[3]

(d)	How is the rate of reaction affected by concentration of acid? Explain how your results enable you to decide this.	For Examiner's Use
	[2]	
(e)	Had any of the reactions finished by the time 80 s had been reached? Explain your answer.	
	F41	

0653/53/M/J/10

#### **CHEMISTRY PRACTICAL NOTES**

#### **Test for anions**

anion	test	test result
carbonate (CO <sub>3</sub> <sup>2-</sup> )	add dilute acid	effervescence, carbon dioxide produced
chloride (Cl <sup>-</sup> ) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
nitrate (NO <sub>3</sub> -) [in solution]	add aqueous sodium hydroxide then aluminium foil; warm carefully	ammonia produced
sulfate (SO <sub>4</sub> <sup>2-</sup> ) [in solution]	acidify then add aqueous barium chloride <i>or</i> aqueous barium nitrate	white ppt.

#### Test for aqueous cations

cation	effect of aqueous sodium hydroxide	effect of aqueous ammonia
ammonium (NH <sub>4</sub> <sup>+</sup> )	ammonia produced on warming	-
copper(II) (Cu <sup>2+</sup> )	light blue ppt., insoluble in excess	light blue ppt., soluble in excess giving a dark blue solution
iron(II) (Fe <sup>2+</sup> )	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) (Fe <sup>3+</sup> )	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
zinc (Zn <sup>2+</sup> )	white ppt., soluble in excess giving a colourless solution	white ppt., soluble in excess giving a colourless solution

#### **Test for gases**

gas	test and test results
ammonia (NH <sub>3</sub> )	turns damp red litmus paper blue
carbon dioxide (CO <sub>2</sub> )	turns limewater milky
chlorine (Cl <sub>2</sub> )	bleaches damp litmus paper
hydrogen (H <sub>2</sub> )	"pops" with a lighted splint
oxygen (O <sub>2</sub> )	relights a glowing splint

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

University of Cambridge International Examinations is part of the Cambridge Assessment Group. Cambridge Assessment is the brand name of University of Cambridge Local Examinations Syndicate (UCLES), which is itself a department of the University of Cambridge.

© UCLES 2010 0653/53/M/J/10