



Cambridge International Examinations

Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER			
CHEMISTRY								0(620/51
Paper 5 Practical	al Test						Ma	y/June	e 2016
							1 houi	· 15 m	inutes
Candidates ans	wer on th	e Questi	on Papei	·.					
Additional Mate	rials:	As listed	I in the C	onfidenti	al Instructions				

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 an HB pencil for any diagrams or graphs.

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

DO **NOT** WRITE IN ANY BARCODES.

Answer all questions.

Electronic calculators may be used.

You may lose marks if you do not show your working or if you do not use appropriate units.

Practical notes are provided on pages 7 and 8.

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			
Total			

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of 8 printed pages.



1 You are going to investigate the reaction between aqueous sodium carbonate and two different solutions of dilute hydrochloric acid labelled **A** and **B**.

Read all the instructions carefully before starting the experiments.

Instructions

You are going to carry out three experiments.

(a) Experiment 1

Use a measuring cylinder to pour 25 cm³ of aqueous sodium carbonate into a conical flask. Add ten drops of thymolphthalein indicator to the conical flask.

Fill the burette provided up to the 0.0 cm³ mark with solution **A** of dilute hydrochloric acid. Add solution **A** from the burette while swirling the flask, until the solution just changes colour. Record the burette readings in the table below.

Experiment 2

Empty the conical flask and rinse it with distilled water.

Repeat Experiment 1 using methyl orange indicator instead of thymolphthalein.

Record the burette readings in the table below and complete the table.

	Experiment 1	Experiment 2
final burette reading/cm ³		
initial burette reading/cm³		
difference/cm ³		

[4]

(b) Experiment 3

Empty the conical flask and rinse it with distilled water.

Pour away the contents of the burette and rinse the burette with solution **B** of dilute hydrochloric acid.

Repeat Experiment 1 using solution **B** instead of solution **A**.

Record the burette readings in the table below and complete the table.

	Experiment 3
final burette reading/cm3	
initial burette reading/cm³	
difference/cm ³	

[2]

(c) What colour change was observed in the flask in Experiment 1?

from [1]

(d)	State one observation, other than colour change, when hydrochloric acid was added to sodium carbonate.
	[1]
(e)	Complete the sentence below.
	Experiment needed the largest volume of hydrochloric acid to change the colour of the indicator. [1]
(f)	What would be a more accurate method of measuring the volume of the aqueous sodium carbonate?
	[1]
(g)	What would be the effect on the results, if any, if the solutions of sodium carbonate were warmed before adding the hydrochloric acid? Give a reason for your answer. effect on results
	reason
	[2]
(h)	(i) Determine the ratio of volumes of dilute hydrochloric acid used in Experiments 1 and 3.
	(ii) Use your answer to (h)(i) to deduce how the concentration of solution A differs from that of solution B.
	[1]
(i)	Suggest a different method, using standard laboratory chemicals, to determine which of the solutions of dilute hydrochloric acid, A or B , is more concentrated.
	[3]
(j)	Hydrochloric acid is hazardous.
	Suggest one safety precaution to follow when using hydrochloric acid.
	[1]

[Total: 18]

2 You are provided with two substances. Solid **C** is a salt and solution **D** is an aqueous solution of a different salt.

Carry out the following tests on each substance, recording all of your observations at each stage.

test	tests on solid C				
Add	abo	out half of solid C to about 10 cm ³ of distilled water in a test-tube and shake to dissolve.			
Divi	de tl	ne solution into two equal portions in two test-tubes, and carry out the following tests.			
(a)	(i)	Test the pH of the first portion of the solution.			
		pH[1]			
((ii)	To the second portion of the solution, add about 1 cm³ of dilute nitric acid followed by aqueous silver nitrate. Record your observations.			
		[2]			
(b)		ry out a flame test on the rest of solid C . cord your observations. [1]			
(c)	lder	ntify solid C .			
(-)		[2]			
test	ts o	n solution D			
Divi	de t	he solution D into three equal portions in three test-tubes and carry out the following tests.			
(d)	(i)	Describe the appearance of the solution.			
		[1]			
	(ii)	To the first portion of the solution, add drops of aqueous sodium hydroxide until a change is seen. Now add an excess of aqueous sodium hydroxide to the mixture. Record your observations.			

(1	iii)	To the second portion of the solution, add drops of aqueous ammonia until a change is seen. Now add an excess of aqueous ammonia to the mixture. Record your observations.
		[2]
(1	iv)	To the third portion of the solution, add about 1 cm³ of dilute nitric acid followed by aqueous silver nitrate. Record your observations.
		[2]
(e)	Wh	at conclusions can you draw about solution D ?
		[2]
		[Total: 16]

Calcium burns in air to form calcium oxide. The reaction is vigorous and some of the calcium oxide can be lost as smoke. Plan an investigation to determine the maximum mass of oxygen that combines to form calcium oxide when 2g of calcium granules are burnt in air. You are provided with common laboratory apparatus and calcium granules.
[6
[Total: 6

NOTES FOR USE IN QUALITATIVE ANALYSIS Test for anions

anion	test	test result
carbonate (CO ₃ ²⁻)	add dilute acid	effervescence, carbon dioxide produced
chloride (C <i>l</i> ⁻) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
bromide (Br ⁻) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	cream ppt.
iodide (I ⁻) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	yellow ppt.
nitrate (NO ₃ ⁻) [in solution]	add aqueous sodium hydroxide, then aluminium foil; warm carefully	ammonia produced
sulfate (SO ₄ ²⁻) [in solution]	acidify, then add aqueous barium nitrate	white ppt.
sulfite (SO ₃ ²⁻)	add dilute hydrochloric acid, warm gently and test for the presence of sulfur dioxide	sulfur dioxide produced will turn acidified aqueous potassium manganate(VII) from purple to colourless

Test for aqueous cations

cation effect of aqueous sodium hydroxide		effect of aqueous ammonia	
aluminium (A l^{3+}) white ppt., soluble in excess giving a colourless solution		white ppt., insoluble in excess	
ammonium (NH ₄ ⁺) ammonia produced on warming		_	
calcium (Ca ²⁺)	white ppt., insoluble in excess	no ppt. or very slight white ppt.	
chromium(III) (Cr³+) green ppt., soluble in excess		grey-green ppt., insoluble in excess	
copper (Cu ²⁺) light blue ppt., insoluble in excess		light blue ppt., soluble in excess, giving a dark blue solution	
iron(II) (Fe ²⁺)	green ppt., insoluble in excess	green ppt., insoluble in excess	
iron(III) (Fe ³⁺)	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess	
zinc (Zn²+) 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 ₃)	turns damp, red litmus paper blue			
carbon dioxide (CO ₂)	turns limewater milky			
chlorine (Cl ₂)	bleaches damp litmus paper			
hydrogen (H ₂)	'pops' with a lighted splint			
oxygen (O ₂)	relights a glowing splint			
sulfur dioxide (SO ₂)	turns acidifed aqueous potassium manganate(VII) from purple to colourless			

Flame tests for metal ions

metal ion	flame colour
lithium (Li ⁺)	red
sodium (Na ⁺)	yellow
potassium (K ⁺)	lilac
copper(II) (Cu ²⁺)	blue-green

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.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge International Examinations Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cie.org.uk after the live examination series.

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.