Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

CHEMISTRY **0620/51**

Paper 5 Practical Test **May/June 2016**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential 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.

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CAMBRIDGE International Examinations

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*

View solution

Use a measuring cylinder to pour 25 cm^3 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 cm^3 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 / cm^3		
difference / cm^3		

[4]

(b) *Experiment 3*

View solution

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 / cm^3	
initial burette reading / cm^3	
difference / cm^3	

[2]

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

from ..... to ..... [1]

View solution

(d) State **one** observation, other than colour change, when hydrochloric acid was added to sodium carbonate.

..... [1]

View solution

(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.

..... [1]

(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.

View solution

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.

tests on solid C

Add about half of solid **C** to about 10 cm^3 of distilled water in a test-tube and shake to dissolve.

Divide the 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.

View solution

pH ..... [1]

(ii) To the second portion of the solution, add about 1 cm^3 of dilute nitric acid followed by aqueous silver nitrate.
Record your observations.

View solution

..... [2]

(b) Carry out a flame test on the rest of solid **C**.
Record your observations.

View solution

..... [1]

(c) Identify solid **C**.

..... [2]

tests on solution D

View solution

Divide the solution **D** into three equal portions in three test-tubes and carry out the following tests.

(d) (i) Describe the appearance of the solution.

View 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.

View solution

.....

..... [3]

(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.

View solution

.....

..... [2]

(iv) To the third portion of the solution, add about 1 cm^3 of dilute nitric acid followed by aqueous silver nitrate.
Record your observations.

View solution

.....

..... [2]

(e) What conclusions can you draw about solution **D**?

View solution

.....

..... [2]

[Total: 16]

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3 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 2 g of calcium granules are burnt in air.
You are provided with common laboratory apparatus and calcium granules.

View solution

.....

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.....

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..... [6]

[Total: 6]

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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 (Cl^-) [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 (Al^{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) (Cr^{3+})	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 (Zn^{2+})	white ppt., soluble in excess, giving a colourless solution	white ppt., soluble in excess, giving a colourless solution

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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

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