Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

CHEMISTRY **0620/53**

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 11 and 12.

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 **9** printed pages and **3** blank pages.

© UCLES 2016

CAMBRIDGE International Examinations

1 You are going to investigate what happens when dilute hydrochloric acid and copper(II) sulfate solution react with different metals.

Read all the instructions carefully before starting the experiments.

Instructions
You are going to carry out five experiments.

(a) *Experiment 1*

Use a measuring cylinder to pour 10 cm^3 of dilute hydrochloric acid into a boiling tube. Put the boiling tube into a rack for support.
Measure the temperature of the hydrochloric acid and record it in the table below.
Add 1 g of zinc to the boiling tube and stir the mixture with the thermometer.
Measure and record the maximum temperature reached by the mixture. Pour the mixture away and rinse the boiling tube.

View solution

Experiment 2

Repeat Experiment 1 using 1 g of iron instead of zinc.
Record your results in the table.

Experiment 3

Repeat Experiment 1 using 1 g of magnesium instead of zinc.
Record your results in the table. Complete the final column in the table.

experiment	initial temperature of acid / °C	maximum temperature reached / °C	temperature rise / °C
1			
2			
3			

[3]

(b) *Experiment 4*

Use a measuring cylinder to pour 10 cm^3 of copper(II) sulfate solution into a boiling tube.
Measure the temperature of the solution and record it in the table on page 3.
Add 1 g of magnesium to the boiling tube and stir the mixture with the thermometer.
Test the gas given off with a splint and record your result in the space below. Measure the maximum temperature reached by the mixture and record it in the table. Pour the mixture away and rinse the boiling tube.

test .....

result .....

[1]

View solution

(c) *Experiment 5*

Repeat Experiment 4 using 1 g of iron instead of magnesium. You do **not** need to test the gas. Record your observations in the space below and record your temperatures in the table.

View solution

Complete the final column in the table.

experiment	initial temperature / °C	maximum temperature / °C	temperature rise / °C
4			
5			

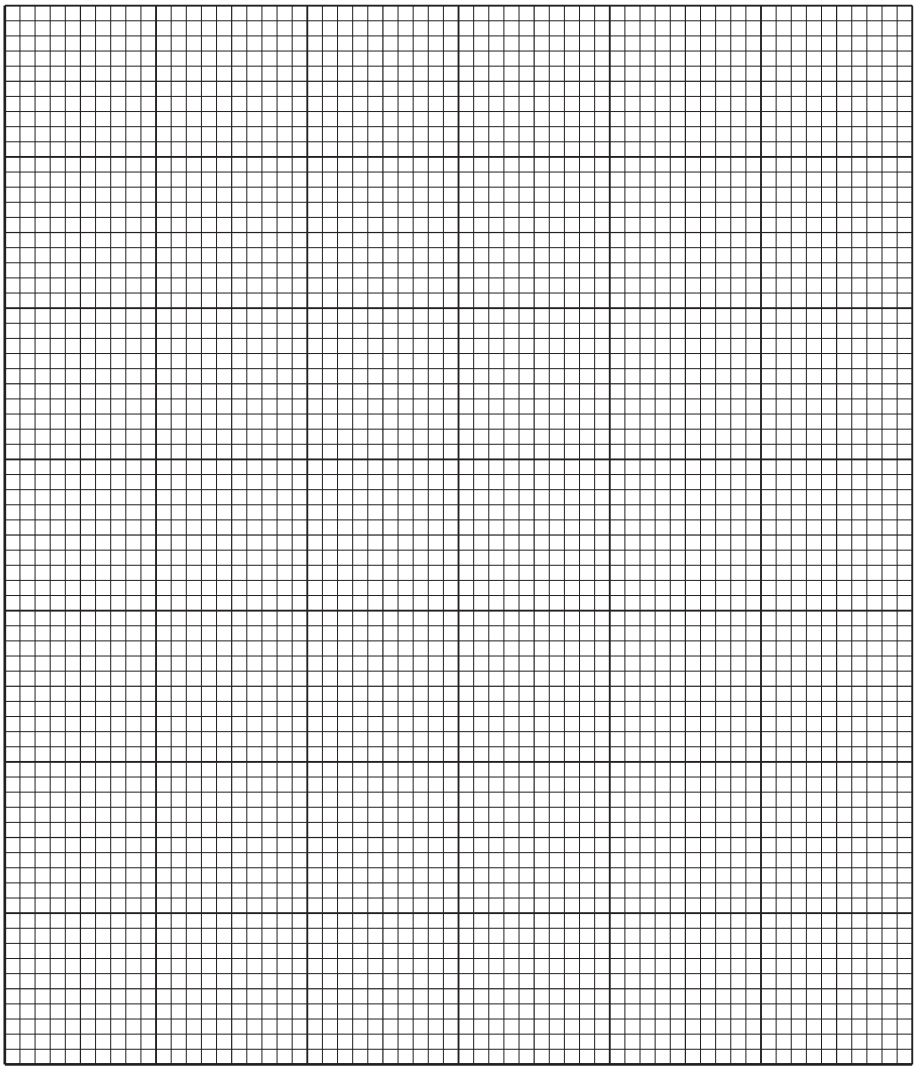
observation .....

[3]

(d) Draw a labelled bar chart for the results of Experiments 1, 2, 3, 4 and 5 on the grid.

View solution

temperature rise / °C



[3]

Use your results and observations for Experiments 1, 2 and 3 to answer the following questions.

(e) **(i)** Which experiment, 1, 2 or 3, produced the largest temperature rise? View solution

..... [1]

(ii) Suggest why this experiment produced the largest temperature rise. View solution

.....

..... [1]

(f) Name the gas given off in Experiment 4. View solution

..... [1]

(g) Suggest why potassium was **not** used as one of the metals in these experiments. View solution

..... [1]

(h) Give **one** advantage of using a measuring cylinder to add the hydrochloric acid to the boiling tube.

..... [1]

(i) Suggest and explain **one** change to improve the accuracy of these experiments. View solution

.....

.....

..... [2]

[Total: 17]

© UCLES 2016

2 You are provided with a mixture of two solids, **G** and **H**.
Solid **G** is water soluble and solid **H** is insoluble in water.
Carry out the following tests on the mixture, recording all of your observations at each stage.

Add about 15 cm^3 of distilled water to the mixture in a boiling tube.
Shake the boiling tube for one minute. Filter the contents of the tube, keeping the filtrate and the residue. Divide the filtrate into four equal portions in four test-tubes and carry out the following tests.

tests on filtrate

(a) (i) Add several drops of aqueous sodium hydroxide to the first portion of the solution and shake the test-tube.
Now add excess aqueous sodium hydroxide to the test-tube.
Record your observations.

View solution

.....

.....

..... [3]

(ii) Using the second portion of the solution, repeat the test in **(a)(i)** using aqueous ammonia instead of aqueous sodium hydroxide.
Record your observations.

View solution

.....

..... [2]

(iii) Add a few drops of dilute nitric acid to the third portion of the solution followed by about 1 cm^3 of aqueous silver nitrate.
Record your observations.

View solution

..... [1]

(iv) Pour the fourth portion of the solution into a boiling tube.
Add about 1 cm^3 of aqueous sodium hydroxide and a small piece of aluminium foil.
Warm the mixture carefully and test the gas given off.
Record your observations.

View solution

.....

.....

..... [3]

(b) Identify solid **G**.

View solution

.....

..... [2]

tests on the residue

(c) Use a spatula to transfer some of the residue into a test-tube.
To the residue, add about 2 cm^3 of dilute hydrochloric acid. Test any gases given off.
Record your observations.

View solution

.....

.....

..... [3]

(d) Carry out a flame test on the residue.
Record your observations.

View solution

..... [1]

(e) Identify solid **H**.

View solution

.....

..... [2]

[Total: 17]

3 Nickel sulfate-6-water, $NiSO_4.6H_2O$, is a blue crystalline salt.
Plan an experiment to obtain a sample of pure water from this salt. Your answer should include a diagram of the apparatus, any expected observations and a test to show the presence of pure water.
You are provided with common laboratory apparatus.

View solution

.....

.....

.....

.....

.....

.....

..... [6]

[Total: 6]

BLANK PAGE

BLANK PAGE

BLANK PAGE

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

© UCLES 2016

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.