UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

3666449567

CHEMISTRY **0620/53**

Paper 5 Practical Test **October/November 2012**

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 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.
Practical notes are provided on page 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	

This document consists of **8** printed pages.

1 You are going to investigate what happens when aqueous sodium hydroxide reacts with two different acids, **G** and **H**.

Read all the instructions below carefully before starting the experiments.

Instructions
You are going to carry out two experiments.

(a) *Experiment 1*

Use a measuring cylinder to pour 20 cm^3 of solution **G** into the polystyrene cup provided. Put the cup into a 250 cm^3 beaker for support. Measure the initial temperature of the solution and record it in the table below.

Fill the burette with the aqueous sodium hydroxide provided to the 0.0 cm^3 mark.
Add 5.0 cm^3 of aqueous sodium hydroxide to the solution of **G** in the cup and stir the mixture.

Measure and record the maximum temperature of the solution in the table below. Add a further 5.0 cm^3 of aqueous sodium hydroxide to the cup and stir the mixture. Measure and record the maximum temperature of the mixture in the table below.

Continue to add 5.0 cm^3 portions of aqueous sodium hydroxide to the cup, until a total volume of 40 cm^3 of aqueous sodium hydroxide has been added. Stir after each addition and measure and record the maximum temperatures in the table.

Pour the solution away and rinse the polystyrene cup.

volume of aqueous sodium hydroxide added / cm^3	maximum temperature of solution in polystyrene cup / °C
0.0	
5.0	
10.0	
15.0	
20.0	
25.0	
30.0	
35.0	
40.0	

[3]

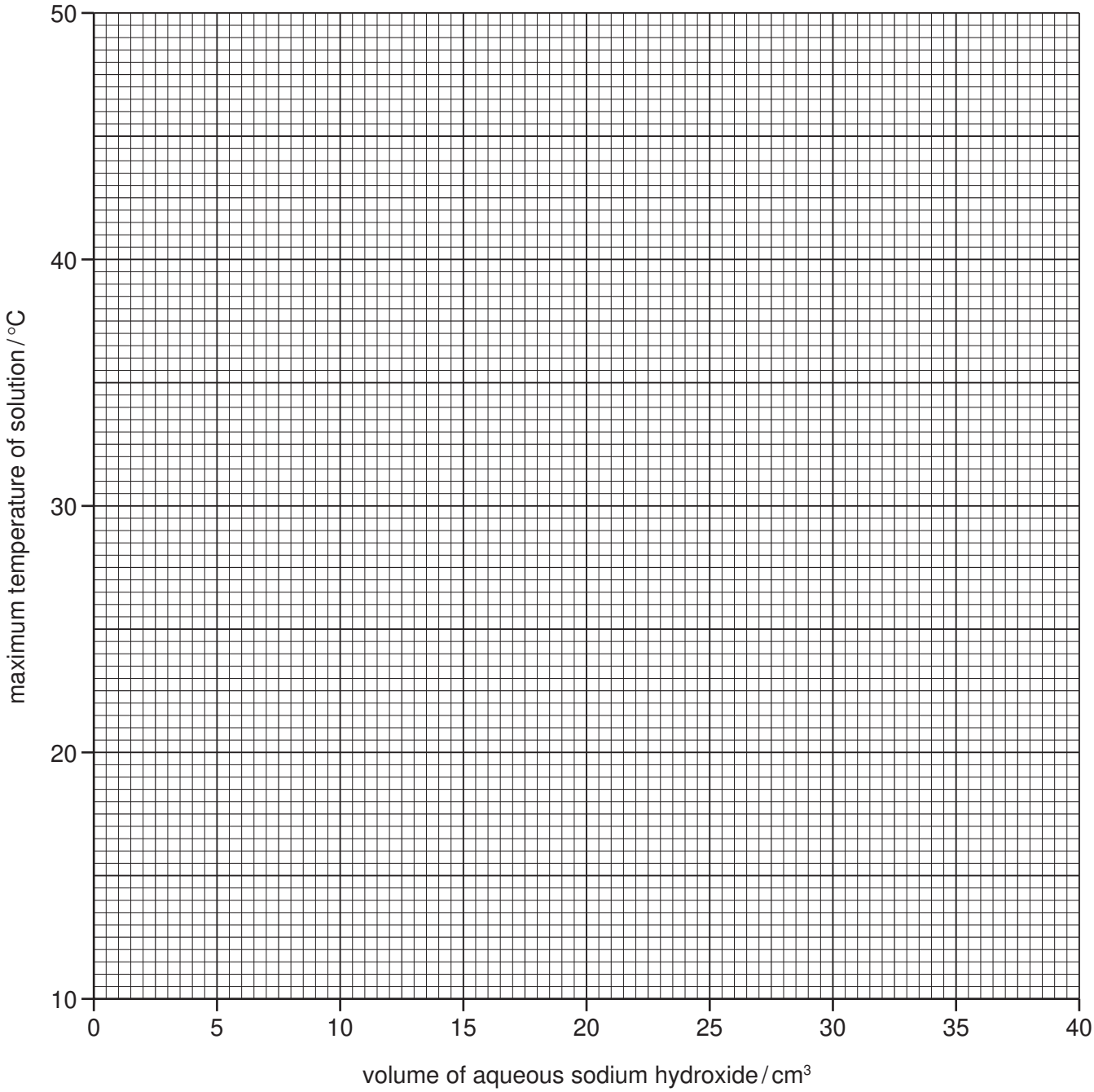
(b) *Experiment 2*

Repeat Experiment 1 using 20 cm^3 of solution **H** instead of 20 cm^3 of solution **G**. Record your results in the table below.

volume of aqueous sodium hydroxide added / cm^3	maximum temperature of solution in polystyrene cup / °C
0.0	
5.0	
10.0	
15.0	
20.0	
25.0	
30.0	
35.0	
40.0	

[3]

(c) Plot the results for Experiments 1 and 2 on the grid and draw two smooth line graphs. Clearly label your graphs.



[6]

(d) **Use your graph** to estimate the maximum temperature of the reaction mixture when 8 cm^3 of aqueous sodium hydroxide were added to 20 cm^3 of the solution of acid **G**. Show clearly **on the graph** how you worked out your answer.

..... [2]

(e) What type of chemical reaction, other than neutralisation, occurs when acid **H** reacts with aqueous sodium hydroxide?

..... [1]

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(f) **(i)** In which experiment is the temperature change greater?

..... [1]

(ii) Suggest why the temperature change is greater in this experiment.

.....

..... [1]

(g) Predict the temperature of the mixture in Experiment 2 after two hours. Explain your answer.

.....

..... [2]

[Total: 19]

2 You are provided with two salt solutions, **J** and **K**.
Carry out the following tests on **J** and **K**, recording all of your observations in the table.
Conclusions must **not** be written in the table.

tests	observations
tests on solution **J** **(a)** Describe the appearance of **J**.	..... [1]
(b) To about 1 cm^3 of the solution, add an equal volume of aqueous sodium hydroxide. Leave to stand for five minutes. Note any changes.	.... [2]
(c) To about 1 cm^3 of the solution, add an equal volume of hydrogen peroxide. Test the gas given off.	.... [3]
(d) To about 1 cm^3 of the solution, add about 1 cm^3 of aqueous ammonia.	..... [1]
(e) To about 1 cm^3 of the solution, add a few drops of dilute nitric acid followed by aqueous silver nitrate.	..... [1]
(f) To about 1 cm^3 of the solution, add a few drops of dilute nitric acid followed by barium nitrate solution.	..... [2]

tests	observations
tests on solution **K** **(g)** Describe the appearance of **K**.	..... [1]
(h) To about 1 cm^3 of the solution, add 5 drops of aqueous sodium hydroxide. Now add excess aqueous sodium hydroxide.	.... [3]
(i) To about 1 cm^3 of the solution, add about 2 cm^3 of aqueous sodium hydroxide and one spatula measure of aluminium powder. Heat the mixture gently. Test the gas given off.	.... [2]

(j) What conclusions can you draw about solution **J**?

.....

..... [3]

(k) What conclusions can you draw about solution **K**?

.....

..... [2]

[Total: 21]

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.
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 with dilute nitric acid, then aqueous barium nitrate	white ppt.

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.
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

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