Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

9556806722

CHEMISTRY **0620/51**

Paper 5 Practical Test **October/November 2018**

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.
Notes for use in qualitative analysis 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	
1	
2	
3	
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.

1 You are going to investigate the rate of reaction between solution **S** and solution **T** at different temperatures. When these chemicals react they form iodine. Sodium thiosulfate solution and starch solution can be used to show how fast the reaction proceeds.

Read all the instructions carefully before starting the experiments.

Instructions
You are going to do four experiments.

Experiment 1

- Place the conical flask on the white tile. Use measuring cylinder **A** to add 10 cm^3 of solution **S** to the conical flask.
- Use measuring cylinder **B** to add 20 cm^3 of sodium thiosulfate solution to the conical flask.
- Use the teat pipette to add about 1 cm^3 of starch solution to the mixture.
- Measure and record the initial temperature of the mixture in the table.
- Use measuring cylinder **C** to start the reaction by adding 10 cm^3 of solution **T** to the conical flask. Start the timer immediately and swirl the mixture.
- Measure the time taken for the mixture to turn blue-black and record the time taken in the table.
- Measure and record the final temperature of the mixture in the table.
- Empty the conical flask and rinse it with distilled water.

Experiment 2

- Repeat Experiment 1 but first heat the mixture of solution **S**, sodium thiosulfate solution and starch solution in the conical flask to about 30 °C.
- Measure and record the initial temperature of the mixture in the table.
- Use measuring cylinder **C** to add 10 cm^3 of solution **T** to the conical flask. Start the timer immediately and swirl the mixture.
- Measure the time taken for the mixture to turn blue-black and record the time taken in the table.
- Measure and record the final temperature of the mixture in the table.
- Empty the conical flask and rinse it with distilled water.

Experiment 3

- Repeat Experiment 2 but first heat the mixture of solution **S**, sodium thiosulfate solution and starch solution in the conical flask to about 40 °C before adding solution **T**.

Experiment 4

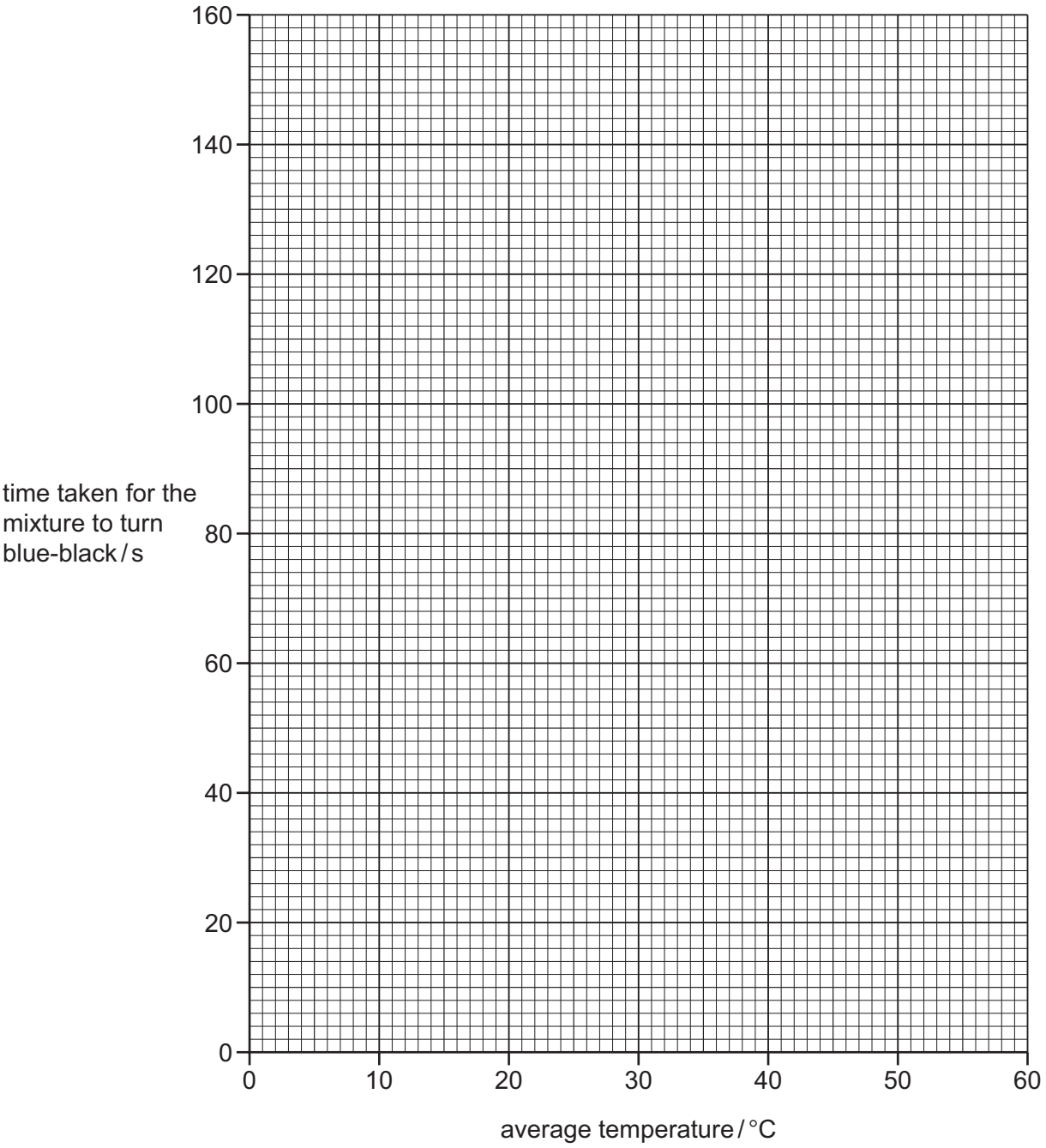
- Repeat Experiment 2 but first heat the mixture of solution **S**, sodium thiosulfate solution and starch solution in the conical flask to about 50 °C before adding solution **T**.

(a) Record your results from Experiments 1–4 in the table. Calculate the average temperatures to complete the table.

experiment number	initial temperature / °C	final temperature / °C	average temperature / °C	time taken for the mixture to turn blue-black / s
1				
2				
3				
4				

[4]

(b) Plot your results for Experiments 1–4 on the grid. Draw a smooth line graph.



[4]

(c) **From your graph**, deduce the average temperature needed for the mixture to turn blue-black in 60 s.

Show clearly **on the grid** how you worked out your answer.

..... [3]

(d) (i) In which experiment, 1, 2, 3 or 4, was the rate of reaction greatest?

..... [1]

(ii) Explain, in terms of particles, why the rate of reaction was greatest in this experiment.

.....

.....

..... [2]

(e) Pipettes or burettes could be used to measure the volumes of solution **S** and the sodium thiosulfate solution more accurately.

State and explain **one other** way to improve the accuracy of the results of these experiments.

way to improve the accuracy .....

explanation .....

.....
[2]

(f) A student predicted that using a burette to add solution **T** would improve the accuracy of the results of these experiments.

Suggest why the student's prediction would **not** improve the accuracy of the results of these experiments.

.....

..... [2]

[Total: 18]

2 You are provided with two solids, solid **P** and solid **Q**.
Do the following tests on solid **P** and solid **Q**, recording all of your observations at each stage.

(a) Describe the appearance of:

solid **P** .....

solid **Q** .....
[1]

tests on solid P

Divide solid **P** into three portions.

(b) (i) Place the first portion of solid **P** in a boiling tube. Add a small piece of aluminium foil and about 2 cm^3 of aqueous sodium hydroxide to the boiling tube. Heat the mixture and test the gas produced with indicator paper.
Record your observations.

.....

.....

..... [2]

(ii) Use your results from **(b)(i)** to identify the gas produced.

..... [1]

(c) (i) Place the second portion of solid **P** in a test-tube. Add about 2 cm^3 of distilled water to the test-tube. Stopper and shake the test-tube to dissolve solid **P**. Add a few drops of dilute nitric acid and about 1 cm^3 of aqueous barium nitrate.
Record your observations.

..... [1]

(ii) What conclusion can you draw about solid **P** from your observations in **(c)(i)**?

..... [1]

(d) Do a flame test on the third portion of solid **P**.
Record your observations.

..... [1]

(e) Identify solid **P**.

..... [2]

[Turn over

tests on solid Q

(f) Heat about half of solid **Q** in a hard glass test-tube.
Record your observations.

.....

..... [2]

Add about 4 cm^3 of distilled water to the rest of solid **Q** in a test-tube. Stopper and shake the test-tube to dissolve solid **Q**.

Divide the solution into two equal portions in two test-tubes.

(g) (i) Add an excess of aqueous sodium hydroxide to the first portion of the solution. Leave the mixture to stand for approximately 5 minutes.
Record your observations.

..... [2]

(ii) Add a few drops of dilute nitric acid and about 1 cm^3 of aqueous silver nitrate to the second portion of the solution.
Record your observations.

..... [1]

(h) What conclusions can you draw about the identity of solid **Q**?

.....

..... [2]

[Total: 16]

3 Some cleaning products are mixtures. The three substances present in a cleaning product are listed in the table.

substance	state at room temperature	physical property
sodium carbonate	solid	melts at 858 °C
ethanol	liquid	boils at 78 °C
limonene	liquid	boils at 176 °C

Use the information in the table to plan an experiment to obtain a sample of each substance from a mixture of the three substances.

You are provided with a mixture of the three substances and common laboratory apparatus.

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.....

.....

..... [6]

[Total:6]

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Notes for use in qualitative analysis
Tests 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

Tests 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(II) (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

Tests for gases

gas	test and test result
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 acidified 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