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CHEMISTRY **0620/53**

Paper 5 Practical Test **May/June 2026**

1 hour 15 minutes

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

INSTRUCTIONS
- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen. Do **not** use correction fluid or tape.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION
- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].
- Notes for use in qualitative analysis are provided in the question paper.

For Examiner's Use	
1	
2	
3	
Total	

This document has **12** pages. Any blank pages are indicated.

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1 You are going to investigate the temperature change when sodium thiosulfate is dissolved in water.

Read all the instructions carefully before starting the experiments.

Instructions
You are going to do five experiments.

Experiment 1

- Place the cup into the 250 cm^3 beaker for support.
- Use the 25 cm^3 measuring cylinder to pour 20 cm^3 of distilled water into the cup.
- Use the thermometer to measure the initial temperature of the water. Record the temperature in Table 1.1.
- Add 1.0 g of sodium thiosulfate powder to the distilled water in the cup and immediately start the stop-watch. Stir the mixture with the thermometer.
- Measure the temperature of the solution at 1 minute. Record the temperature in Table 1.1.
- Rinse out the cup with distilled water.

Experiment 2

- Repeat Experiment 1 using 2.0 g of sodium thiosulfate powder instead of 1.0 g.

Experiment 3

- Repeat Experiment 1 using 3.0 g of sodium thiosulfate powder instead of 1.0 g.

Experiment 4

- Repeat Experiment 1 using 4.0 g of sodium thiosulfate powder instead of 1.0 g.

Experiment 5

- Repeat Experiment 1 using 5.0 g of sodium thiosulfate powder instead of 1.0 g.

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(a) Complete Table 1.1.

View solution

Calculate the temperature change using the equation shown.

temperature change = initial temperature – final temperature

Table 1.1

experiment	mass of sodium thiosulfate / g	volume of water / cm^3	initial temperature / °C	final temperature / °C	temperature change / °C
1		20			
2		20			
3		20			
4		20			
5		20			

[5]

(b) On Figure 1.1, write a suitable scale on the *y*-axis and plot your results from Experiments 1 to 5. Draw a line of best fit.

View solution

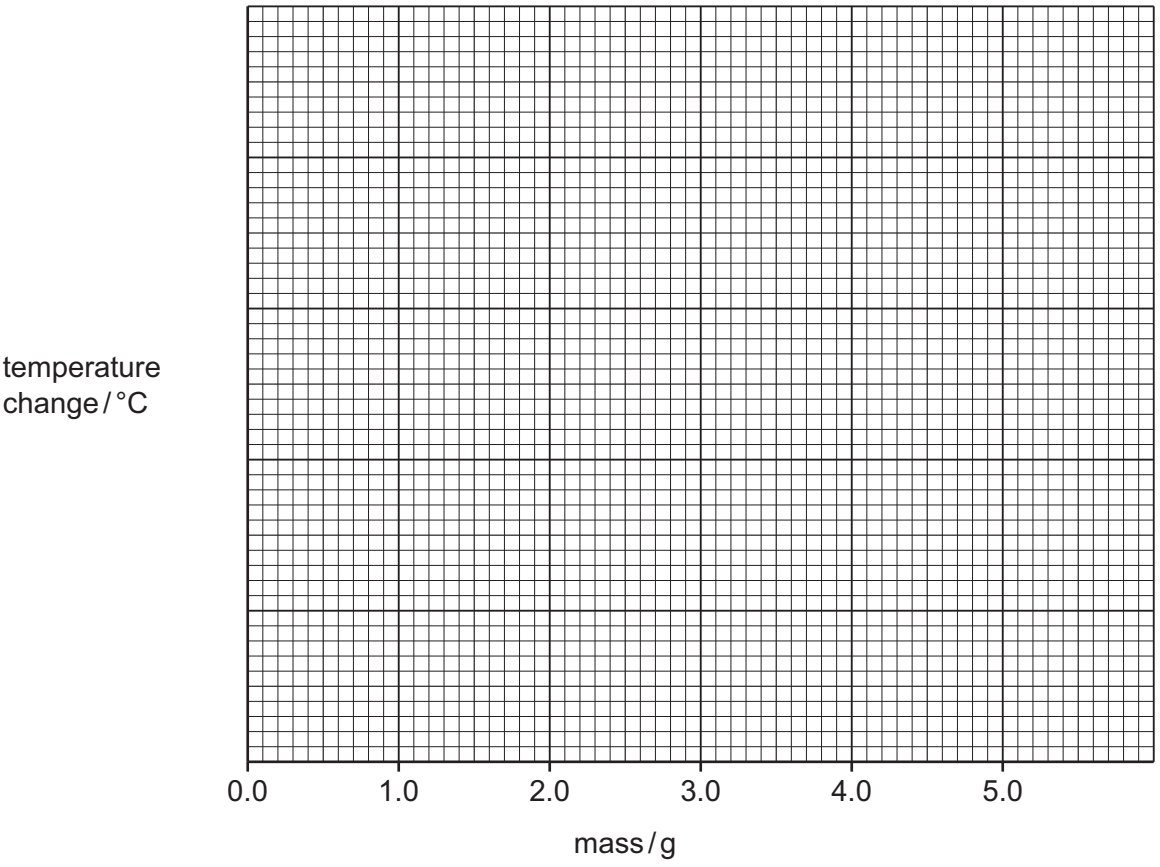

Figure 1.1

[4]

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(c) On Figure 1.1, extrapolate your line of best fit to deduce the temperature change if 5.7 g of sodium thiosulfate powder is added to 20 cm^3 of distilled water.

View solution

Show clearly on Figure 1.1 how you worked out your answer.

temperature change = ... °C
[3]

(d) Suggest why sodium thiosulfate powder is used in the experiments rather than large lumps.

..... [1]

(e) Explain why it would be an improvement to measure the volume of distilled water in a burette rather than a measuring cylinder.

View solution

..... [1]

(f) State if the energy change when sodium thiosulfate powder is dissolved in distilled water is exothermic or endothermic.

View solution

Use the results in Table 1.1 to explain your answer.

energy change .....

explanation .....

.....
[1]

(g) Suggest why it is an improvement to use a lid on the cup.

View solution

.....

..... [1]

(h) Suggest why the initial temperature of the distilled water does **not** need to be the same in each experiment.

View solution

..... [1]

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(i) The energy change in each experiment is calculated using the equation shown.

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energy change = volume of water × 4.18 × temperature change

Calculate the energy change when sodium thiosulfate powder dissolves in Experiment 3.

energy change = ... J [1]

[Total: 18]

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2 You are provided with two substances: solid **A** and solid **B**.

Do the following tests on solid **A** and solid **B**. Record all of your observations at each stage.

Tests on solid A

(a) Carry out a flame test on solid **A**.

View solution

.....

..... [1]

(b) Add about 10 cm^3 of distilled water to the remaining solid **A** in the boiling tube.
Place a stopper in the boiling tube and shake the boiling tube to dissolve solid **A** and form solution **A**.
Divide solution **A** into three approximately equal portions into one test-tube and two boiling tubes.

View solution

(i) To the first portion of solution **A** in a test-tube, add about a 1 cm depth of dilute nitric acid followed by a few drops of aqueous silver nitrate.

Record your observations.

.....

..... [1]

(ii) To the second portion of solution **A** in a boiling tube, add aqueous sodium hydroxide dropwise and then in excess.

View solution

Record your observations.

.....

..... [2]

(iii) To the third portion of solution **A** in a boiling tube, add about a 2 cm depth of dilute sulfuric acid. Leave the mixture to stand for 2 minutes.

View solution

Keep the contents of the boiling tube for use in 2(b)(iv).

Record your observations.

.....

..... [1]

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(iv) To the contents of the boiling tube from **2(b)(iii)**, add about a 2 cm depth of aqueous sodium hydrogencarbonate.

View solution

Record your observations.

.....

..... [1]

(c) Identify solid **A**.

View solution

.....

..... [2]

Tests on solid B

(d) To solid **B** in the boiling tube, add about 10 cm^3 of distilled water. Place a stopper in the boiling tube and shake the boiling tube to dissolve solid **B** and form solution **B**.

View solution

Divide solution **B** into four approximately equal portions in one boiling tube and three test-tubes.

(i) To the first portion of solution **B** in the boiling tube, add aqueous sodium hydroxide dropwise and then in excess.

Record your observations.

.....

..... [2]

(ii) To the second portion of solution **B** in a test-tube, add a 1 cm length of magnesium ribbon.

View solution

Record your observations.

.....

..... [2]

(iii) To the third portion of solution **B** in a test-tube, add about a 1 cm depth of dilute nitric acid followed by a few drops of aqueous barium nitrate.

View solution

Record your observations.

.....

..... [1]

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(iv) To the fourth portion of solution **B** in a test-tube, add about a 1 cm depth of dilute nitric acid followed by a few drops of aqueous silver nitrate.

View solution

Record your observations.

.....

..... [1]

(e) Identify solid **B**.

View solution

.....

..... [2]

[Total:16]

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3 Rhubarb plant leaves contain oxalic acid. Oxalic acid is soluble in water.

Acidified aqueous potassium manganate(VII) changes from purple to colourless when it reacts with oxalic acid.

View solution

Plan an experiment to find which of two rhubarb plant leaves, **A** and **B**, contains the highest concentration of oxalic acid.

You are provided with two rhubarb plant leaves, **A** and **B**, acidified aqueous potassium manganate(VII) and common laboratory apparatus.

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Notes for use in qualitative analysis

Tests for anions

anion	test	test result
carbonate, CO_3^{2-}	add dilute acid, then test for carbon dioxide gas	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 with dilute nitric acid, then add aqueous barium nitrate	white ppt.
sulfite, SO_3^{2-}	add a small volume of acidified aqueous potassium manganate(VII)	the acidified aqueous potassium manganate(VII) changes colour 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	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, ppt. turns brown near surface on standing	green ppt., insoluble in excess, ppt. turns brown near surface on standing
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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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
calcium, Ca^{2+}	orange-red
barium, Ba^{2+}	light green
copper(II), Cu^{2+}	blue-green

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