



GCSE

**MONDAY, 8 JANUARY –
FRIDAY, 9 FEBRUARY 2024**

**APPLIED SCIENCE
(Double Award) – Unit 5 (3445U50)**

PRACTICAL ASSESSMENT

**INVESTIGATING EXOTHERMIC
REACTIONS**

SECTION B

1 hour, plus your additional time allowance

Surname _____

First name(s) _____

Centre Number _____

Candidate Number 0 _____

ADDITIONAL MATERIALS

A calculator and your Section A exam paper.

INSTRUCTIONS TO CANDIDATES

Use black ink, black ball-point pen or your usual method.

Write your name, centre number and candidate number in the spaces provided on the front cover.

Answer ALL questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional pages at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

The total number of marks available for this section of the task is 24.

The number of marks is given in brackets at the end of each question or part-question.

This task is in 2 sections, A and B.

You will have completed Section A in a previous lesson.

For Examiner's use only		
	Maximum Mark	Mark Awarded
Section B	24	

SECTION B

Answer ALL questions.

2 (a)(i)

State the independent variable in this experiment. [1 mark]

(ii) State the dependent variable in this experiment. [1 mark]

(Turn over)

2 (a)(iii)

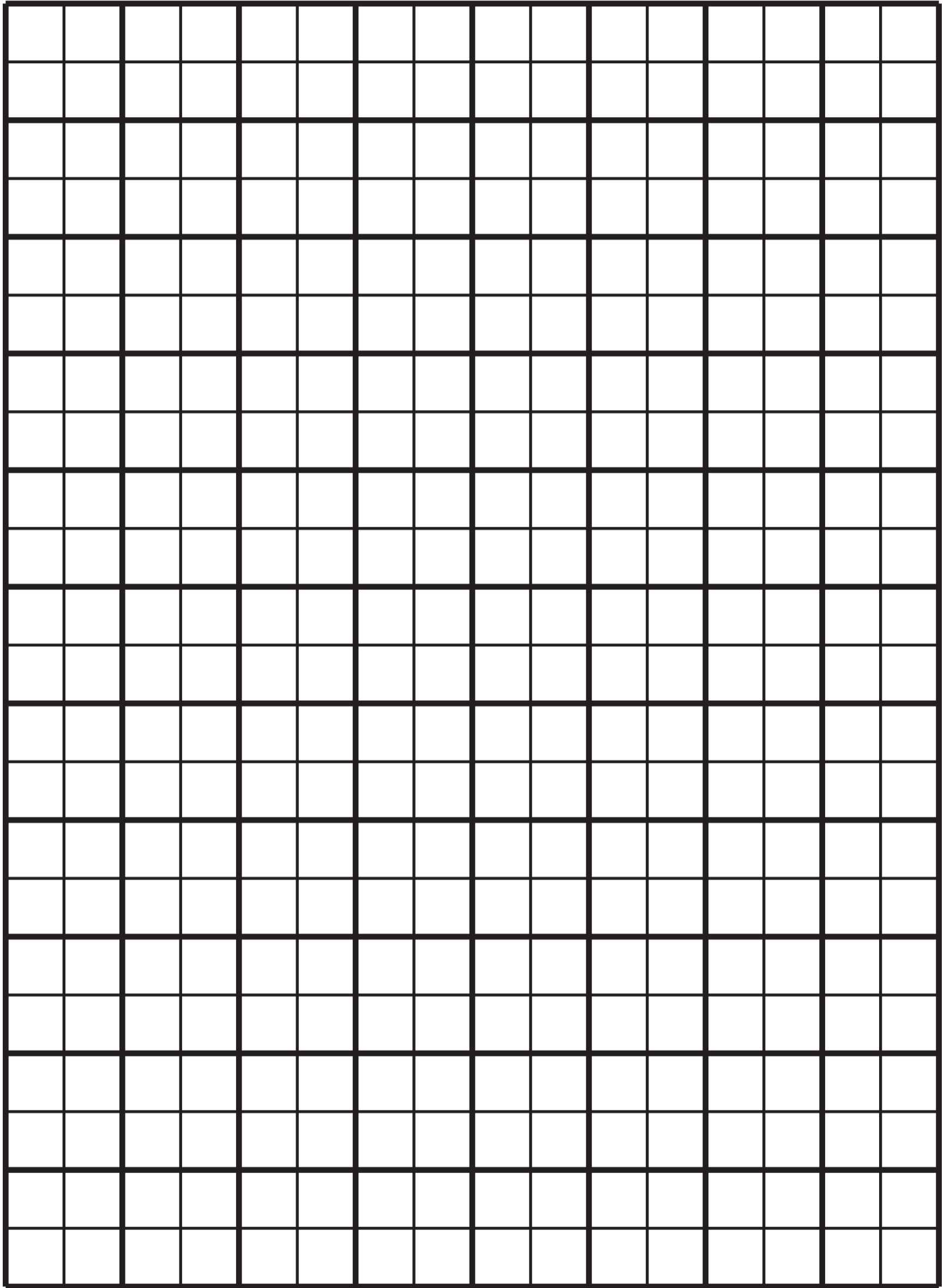
Complete the table below by stating one controlled variable in this experiment AND describe how it was controlled. [2 marks]

Controlled variable
How it was controlled

(Turn over)

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TURN OVER



2 (b)(i)

Use your results from Section A to draw a graph of temperature (vertical axis) against time (horizontal axis) on the grid opposite.

Include a plot for the start temperature at 0 seconds. [5 marks]

(ii) I. USE YOUR GRAPH to find the MAXIMUM TEMPERATURE reached in the experiment. [1 mark]

**maximum
temperature = _____ °C**

II. Use your answer to part (b)(ii) I and the temperature at the start of the experiment to calculate the maximum temperature change. [1 mark]

**maximum
temperature change = _____ °C**

(Turn over)

2 (b)(iii)

The energy change for the reaction can be found by using the following equation:

$$\text{Energy change} = 4.2 \times m \times \Delta T$$

where:

m = mass of copper(II) sulfate solution (assumed to be 25 g)

ΔT = maximum temperature change

Use the equation and your answer to part (b)(ii) to calculate the energy change in this experiment. [2 marks]

energy change = _____ J

(Turn over)

2 (b)(iv)

Use your graph to:

- I. Describe the relationship between time and temperature in this reaction. [1 mark]**

(Turn over)

2 (b)(iv) continued

II. Explain the shape of your graph in terms of the reaction taking place. [2 marks]

(Turn over)

2 (b)(v)

If the temperature of the reaction mixture continued to be recorded until there was no further change, state the final temperature you would expect.

Give a reason for your answer.

[1 mark]

Final temperature _____ °C

Reason

(Turn over)

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Inaccuracy	Improvement
HEAT LOSS	
	USE A BURETTE / PIPETTE TO MEASURE THE VOLUME OF COPPER(II) SULFATE SOLUTION

2 (c) Complete the table on the opposite page to give the missing inaccuracy AND missing improvement in the experiment. [2 marks]

(Turn over)

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TURN OVER

	Maximum temperature rise when added to copper(II) sulfate solution (°C)		
Metal	Trial 1	Trial 2	Trial 3
zinc	20	23	22
magnesium	39	40	42
iron	11	15	19

2 (d) A group of students used the same method to investigate the temperature change when different metals reacted with copper(II) sulfate solution.

Their results are given on the opposite page.

(i) Use the results to place zinc, magnesium and iron in order of reactivity. [1 mark]

**MOST
REACTIVE**



1. _____

2. _____

3. _____

(Turn over)

2 (d)(ii)

Comment on the precision of the results of the group. [2 marks]

(Turn over)

Question number	Additional page, if required. Write the question numbers in the left-hand margin.

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