

Surname	Centre Number	Candidate Number
First name(s)		0



GCSE



MONDAY, 8 JANUARY – FRIDAY, 9 FEBRUARY 2024

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

PRACTICAL ASSESSMENT

INVESTIGATING HEAT RADIATION

SECTION B

1 hour

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

3445U501B
01

ADDITIONAL MATERIALS

A calculator and your Section **A** exam paper.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen or correction fluid.

You may use a pencil for graphs and diagrams only.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet. If you run out of space, use the additional page(s) 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.



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SECTION BAnswer **all** questions.

2. (a) (i) State the independent variable in this experiment. [1]
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- (ii) State the range of the dependent variable for the **black** container. [1]
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- (iii) The two containers used in this experiment were made from the same material. State **one** other controlled variable **and** describe how it was controlled. [2]
- Controlled variable
- How it was controlled
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- (b) Use your results from Section **A** to draw a graph of temperature (vertical axis) against time (horizontal axis) for the **black container only** on the grid opposite. [5]



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- (c) Use your graph to describe the relationship between time and temperature for the **black container**. [2]

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- (d) Two groups of students carried out the same investigation. Their results are given in the table.

Time (minutes)	Temperature (°C)			
	Group 1		Group 2	
	Container painted black	Container wrapped in aluminium foil	Container painted black	Container wrapped in aluminium foil
0	17	17	18	17
1	17	17	19	18
2	18	18	19	18
3	19	18	20	19
4	20	19	20	19
5	20	19	21	19
6	21	19	22	19
7	21	19	22	19
8	21	19	23	19
9	22	20	23	20
10	23	20	24	20

- (i) Explain how the students could check the repeatability of the data they collected. [1]

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- (ii) Explain whether the data collected by the two groups is reproducible. [2]

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- (iii) Use the results from **Group 1** to calculate the increase in temperature of the air inside each container over 10 minutes. [2]

Container painted black

increase in temperature = °C

Container wrapped in aluminium foil

increase in temperature = °C

- (iv) Use the equation:

$$\text{rate of increase in temperature} = \frac{\text{increase in temperature}}{\text{time taken}}$$

to calculate the rate of increase in temperature of the air inside the **black container** for **Group 1** over 10 minutes. [1]

rate of increase in temperature = °C/min

- (v) State what the results show about the effect of colour on how well different surfaces absorb heat radiation. [1]

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- (e) (i) The students used a 100 W lamp in their experiment.

Use the equation:

$$\text{energy transfer (J)} = \text{power (W)} \times \text{time (s)}$$

to calculate the energy transferred by the lamp in the 10 **minutes**.

[2]

energy transfer = J

- (ii) Not all of this energy is transferred to the air in the containers.
Give a reason why.

[1]

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(f) Elin makes the following hypothesis:

‘A cup of tea in a white mug will cool more quickly than a cup of tea in a black mug.’

Using only the apparatus listed below plan an experiment to test this hypothesis **and** state how you would use your results to come to a conclusion.
You do not need to carry out this experiment.

[3]

Apparatus:

- 1 × white mug
- 1 × black mug
- 1 × kettle
- 2 × thermometer
- 1 × stopwatch
- 1 × measuring cylinder

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END OF PAPER

24



