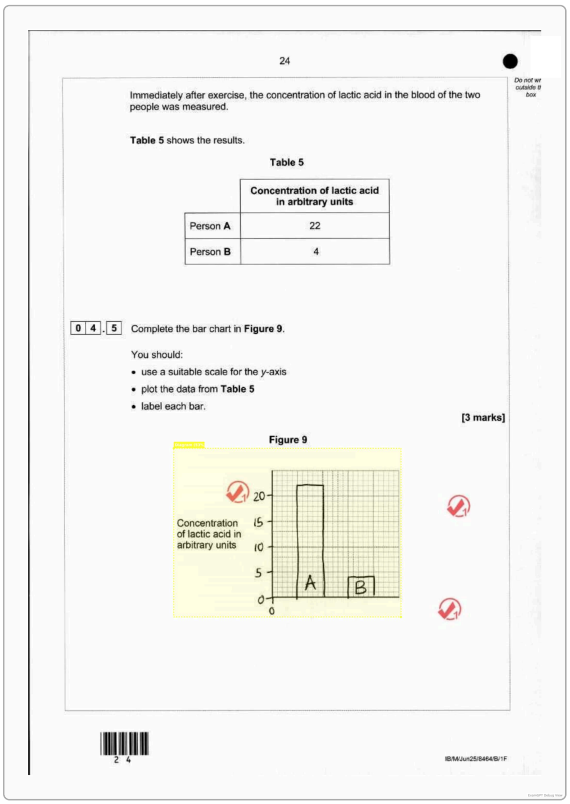
Question 4.5

Bioenergetics > Respiration > Response to exercise

4.4.2.2

Q: Immediately after exercise, the concentration of lactic acid in the blood of the two people was measured. Table 5 shows: Person A - 22 arbitrary units; Person B - 4 arbitrary units. Complete the bar chart in Figure 9. You should: use a suitable scale for the y-axis (Concentration of lactic acid in arbitrary units); plot the data from Table 5; label each bar.



24

Immediately after exercise, the concentration of lactic acid in the blood of the two people was measured.

Table 5 shows the results.

Table 5

	Concentration of lactic acid in arbitrary units
Person A	22
Person B	4

0 4 . 5 Complete the bar chart in Figure 9.

You should:

- use a suitable scale for the y-axis
- plot the data from Table 5
- label each bar.

[3 marks]

Figure 9

Student Response (OCR) ⚡:

```
Based on the student's handwritten response to complete the
bar chart in Figure 9, the following additions have been
made:

* **y-axis scale:** The student has labelled the major grid
lines with the values: 0, 5, 10, 15, 20. There is also a '0'
written at the origin on the x-axis.
* **First bar:** A bar is drawn to a height of 22 on the y-
axis. It is labelled with the letter 'A' written inside the
bottom of the bar.
* **Second bar:** A bar is drawn to a height of 4 on the y-
axis. It is labelled with the letter 'B' written inside the
bottom of the bar.
```

Marking Analysis ⚡: Gemini 3.1 Pro

AO2.1: Awarded — The response used a suitable scale for the y-axis, spacing markings of 0, 5, 10, 15 and 20 evenly so that the maximum value of 22 uses at least half of the graph paper.

AO2.2: Awarded — The response plotted both bars correctly, drawing the first bar up to 22 units and the second bar up to 4 units.

AO2.3: Awarded — The response labelled the bars correctly by writing 'A' and 'B' inside them to identify which person they represent.

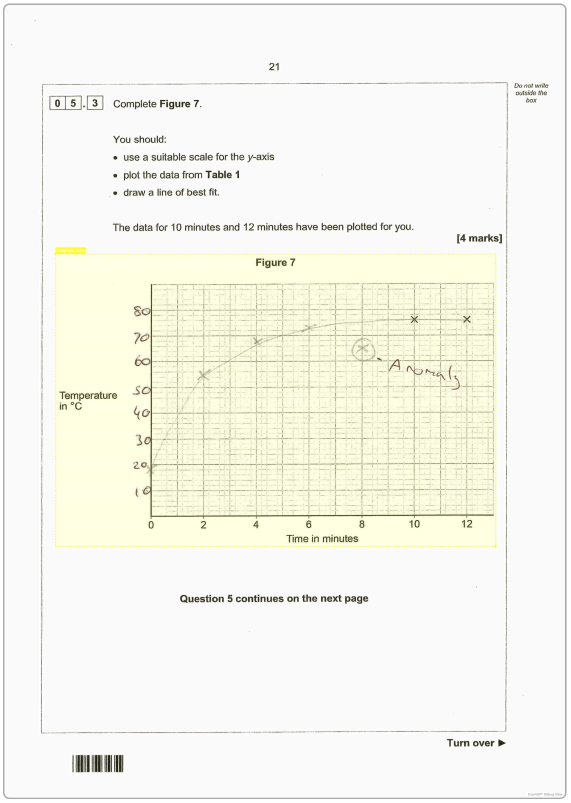
Total Marks: 3/3

Question 5.3

Waves > Black body radiation (physics only) > Emission and absorption of infrared radiation

6.6.3.1

Q: The student investigated how the colour of an object affects the rate of change of temperature. Method: make two identical clay cubes, paint one black and one white, push a temperature probe into the centre of each, place 10 cm from an infrared heater, record temperature every two minutes. Table 1 (white cube): Time (min): 0, 2, 4, 6, 8, 10, 12; Temperature (°C): 18, 55, 68, 73, 65, 76, 76. Complete Figure 7. You should: use a suitable scale for the y-axis; plot the data from Table 1; draw a line of best fit. The data for 10 and 12 minutes have been plotted for you.



21

0 5 . 3 Complete **Figure 7**.

You should:

- use a suitable scale for the y-axis
- plot the data from **Table 1**
- draw a line of best fit.

The data for 10 minutes and 12 minutes have been plotted for you.

[4 marks]

Figure 7

Question 5 continues on the next page

Turn over ▶

Student Response (OCR) ⚡:

```
The student has completed the graph in Figure 7 with the
following details:

* **y-axis scale**: The student has labelled the y-axis from
10 to 80 in increments of 10, where each major grid square
represents 5 units (10 small squares = 10 units).
* **Plotted points**: The student has plotted points ('x'
marks) at the following coordinates:
* (0, 18)
* (2, 55)
* (4, 68)
* (6, 73)
* (8, 65)
* **Line of best fit**: A smooth curve has been drawn
starting from the first point at (0, 18), passing through
the points at x = 2, 4, and 6, ignoring the point at x = 8,
and continuing through the pre-plotted points at x = 10 and
12.
* **Annotations**: The point plotted at (8, 65) has been
circled, and the student has handwritten the word "-
Anomaly" pointing towards it.
```

Marking Analysis ⚡: Gemini 3.1 Pro

AO2.1: Awarded — The mark required a y-axis scale of 10 °C per cm. You have correctly labelled the y-axis in increments of 10 for every major grid square (which represents 1 cm).

AO2.2: Awarded — The mark required all points to be plotted correctly. You have accurately plotted all five data points from the table within the allowed tolerance of ± ½ small square.

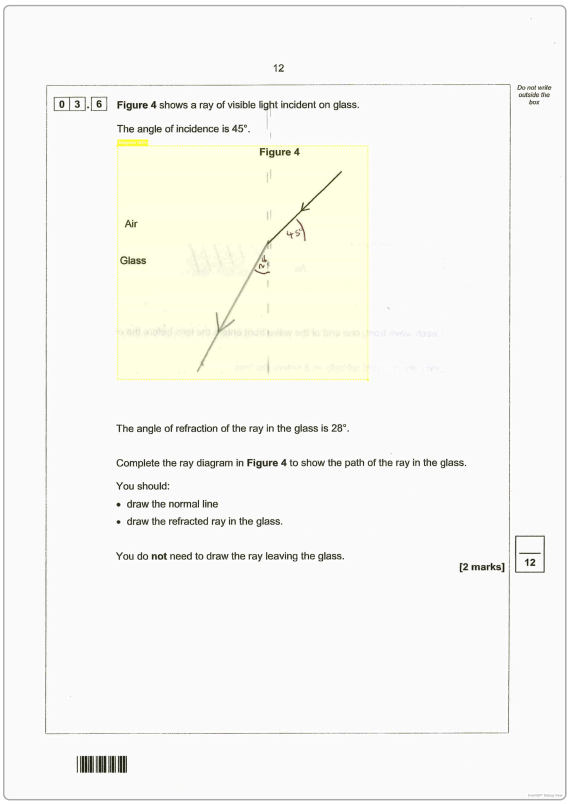
AO3: Awarded — The mark required a curved line of best fit ignoring the anomalous point at 8 minutes. You have successfully drawn a smooth curve that follows the main trend of the data and correctly bypassed the point at 8 minutes (which you also helpfully labelled as an anomaly).

Total Marks: 4/4

Question 3.6

Waves > Electromagnetic waves > Properties of electromagnetic waves 1 | 6.6.2.2

Q: Figure 4 shows a ray of visible light incident on glass, travelling from air, with the angle of incidence 45°. The angle of refraction of the ray in the glass is 28°. Complete the ray diagram in Figure 4 to show the path of the ray in the glass. You should: draw the normal line; draw the refracted ray in the glass. You do not need to draw the ray leaving the glass.



12

0 3 . 6 **Figure 4** shows a ray of visible light incident on glass.

The angle of incidence is 45°.

Figure 4

The angle of refraction of the ray in the glass is 28°.

Complete the ray diagram in **Figure 4** to show the path of the ray in the glass.

You should:

- draw the normal line
- draw the refracted ray in the glass.

You do **not** need to draw the ray leaving the glass.

[2 marks]

12

Do not write outside the box

Student Response (OCR) ⚡:

```
Based on the image provided, here is the description of the
student's handwritten response on the diagram:

* A vertical dashed line has been drawn passing through the
point where the incident ray meets the boundary between Air
and Glass, representing the normal line.
* An arc has been drawn between the incident ray and the
normal line in the Air section, labelled "45°".
* A solid line representing the refracted ray has been drawn
starting from the point of incidence and continuing into the
Glass section, bending towards the normal line. An arrowhead
is drawn on this line indicating the direction of travel.
* An arc has been drawn between the refracted ray and the
normal line in the Glass section, labelled "28°".
```

Marking Analysis ⚡: Gemini 3.1 Pro

AO2.1: Awarded — The mark scheme requires a 'normal line drawn'. You have correctly drawn a dashed vertical line perpendicular to the boundary at the point where the incident ray meets the glass.

AO2.2: Awarded — The mark scheme requires the 'ray drawn with an angle of refraction of 28°'. You have correctly drawn the refracted ray bending towards the normal in the glass and clearly labelled the angle as 28°.

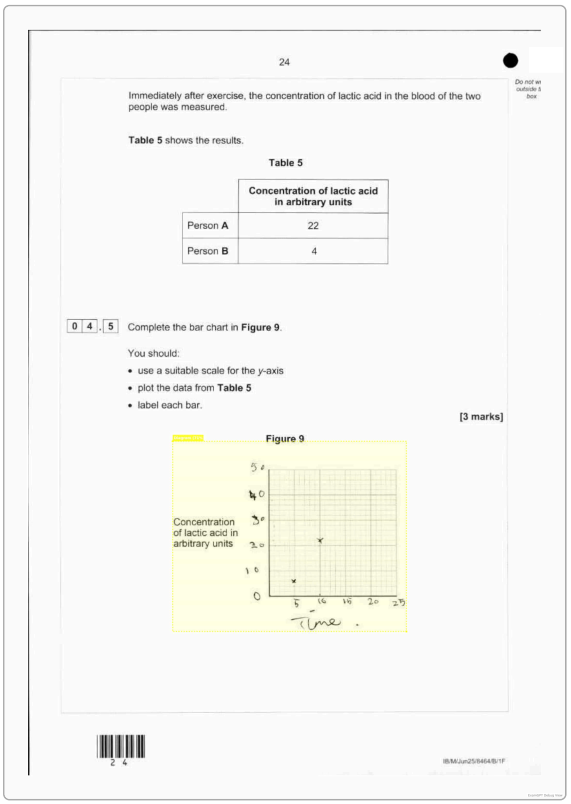
Total Marks: 2/2

Question 4.5

Bioenergetics > Respiration > Response to exercise

4.4.2.2

Q: Immediately after exercise, the concentration of lactic acid in the blood of the two people was measured. Table 5 shows: Person A - 22 arbitrary units; Person B - 4 arbitrary units. Complete the bar chart in Figure 9. You should: use a suitable scale for the y-axis (Concentration of lactic acid in arbitrary units); plot the data from Table 5; label each bar.



24

Immediately after exercise, the concentration of lactic acid in the blood of the two people was measured.

Do not write outside the box

Table 5 shows the results.

Table 5

	Concentration of lactic acid in arbitrary units
Person A	22
Person B	4

0 4 . 5 Complete the bar chart in **Figure 9**.

You should:

- use a suitable scale for the *y*-axis
- plot the data from **Table 5**
- label each bar.

[3 marks]

Figure 9

2 4

IB/M/Jun25/8464/B/1F

Student Response (OCR) ⚡:

```
Based on the image provided, here is the description of the
student's handwritten response for Question 4.5:

The student has not drawn a bar chart as requested, but has
instead created a line graph format and plotted two points
on the provided grid for Figure 9:

* **Y-axis:** The student has added a numerical scale of 0,
10, 20, 30, 40, 50. The increments of 10 are placed every
two major grid squares (10 small squares).
* **X-axis:** The student has added a numerical scale of 5,
10, 15, 20, 25. The increments of 5 are placed every two
major grid squares. Below the axis, the student has
handwritten the label "**Time**".
* **Plotted points:** The student has plotted two points
marked with an 'x':
* One 'x' is plotted at a vertical position corresponding to
4 on their y-axis (4 small squares up) and a horizontal
position just before the 5 mark on their x-axis (at
approximately x=4).
* The second 'x' is plotted at a vertical position
corresponding to 22 on their y-axis (22 small squares up)
and horizontally aligned with the 10 mark on their x-axis.
* No bars are drawn and there are no labels for "Person A"
or "Person B".
```

Marking Analysis ⚡: Gemini 3.1 Pro

AO2.1: Awarded — The mark required a suitable scale for the y-axis where a bar height must use at least half of graph paper. This response provided a consistent linear scale (1 small square = 1 unit) where the maximum value of 22 spans 22 of the 30 available vertical small squares.

AO2.2: Not Awarded — The mark required bars plotted correctly. This response plotted points marked with an 'x' instead of drawing a bar chart. To earn this mark, draw rectangular bars reaching the correct heights.

AO2.3: Not Awarded — The mark required the bars labelled correctly. This response added a numerical scale and the label 'Time' to the x-axis. To earn this mark, write the category labels 'Person A' and 'Person B' for the respective data on the x-axis or in a key.

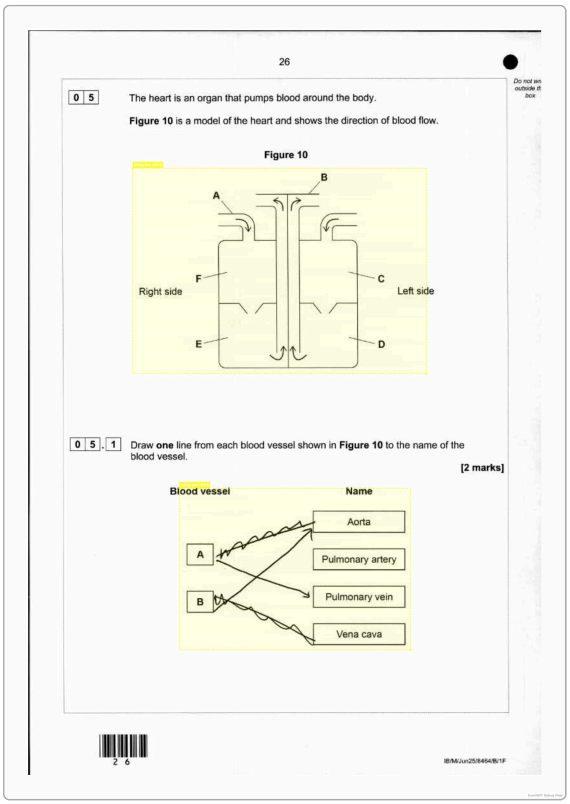
Total Marks: 1/3

Question 5.1

Organisation > Animal tissues, organs and organ systems > The heart and blood vessels

4.2.2.2

Q: The heart is an organ that pumps blood around the body. Figure 10 is a model of the heart showing the direction of blood flow, with blood vessels labelled A and B at the top. Draw one line from each blood vessel shown in Figure 10 (A, B) to the name of the blood vessel. Names: Aorta, Pulmonary artery, Pulmonary vein, Vena cava.



26

0 5 The heart is an organ that pumps blood around the body.

Figure 10 is a model of the heart and shows the direction of blood flow.

Figure 10

0 5 . 1 Draw **one** line from each blood vessel shown in **Figure 10** to the name of the blood vessel.

[2 marks]

Blood vessel	Name
A	Aorta
	Pulmonary artery
B	Pulmonary vein
	Vena cava

2 6

IB/M/Jun25/8464/B/1F

Student Response (OCR) ⚡:

```
Based on the image, the student has provided the following
handwritten response for Question 5.1:

The student has drawn lines connecting the 'Blood vessel'
boxes to the 'Name' boxes:
- A solid line with an arrowhead connects box **A** to
**Pulmonary vein**.
- There is a [scribbled out line] connecting box **A** to
**Aorta**.
- A solid line with an arrowhead connects box **B** to
**Aorta**.
- There is a [scribbled out line] connecting box **B** to
**Vena cava**.
```

Marking Analysis ⚡: Gemini 3.1 Pro

AO1.1: Not Awarded — The mark required connecting A to the Vena cava. You connected A to the Pulmonary vein. To earn this mark, you need to identify that the vessel bringing blood into the right side of the heart is the vena cava.

AO1.2: Awarded — The mark required connecting B to the Aorta. You correctly drew a single valid line from B to the Aorta, as your other line was crossed out.

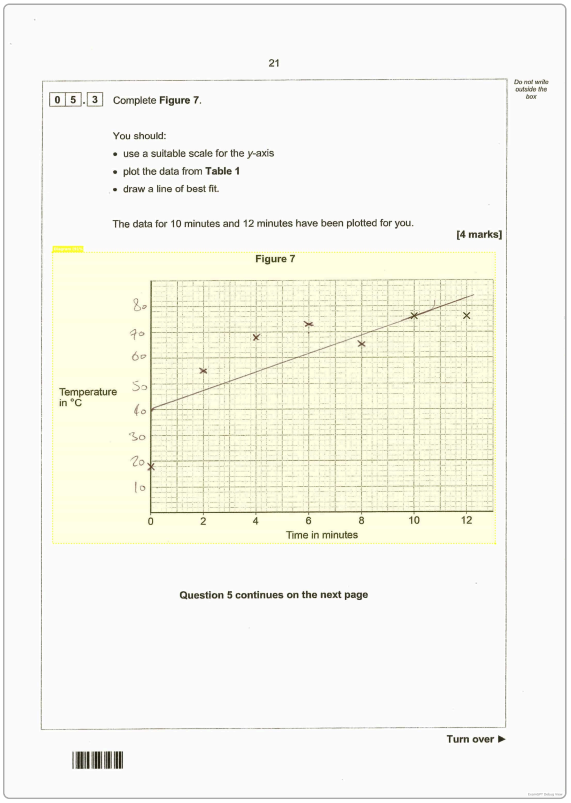
Total Marks: 1/2

Question 5.3

Waves > Black body radiation (physics only) > Emission and absorption of infrared radiation

6.6.3.1

Q: The student investigated how the colour of an object affects the rate of change of temperature. Method: make two identical clay cubes, paint one black and one white, push a temperature probe into the centre of each, place 10 cm from an infrared heater, record temperature every two minutes. Table 1 (white cube): Time (min): 0, 2, 4, 6, 8, 10, 12; Temperature (°C): 18, 55, 68, 73, 65, 76, 76. Complete Figure 7. You should: use a suitable scale for the y-axis; plot the data from Table 1; draw a line of best fit. The data for 10 and 12 minutes have been plotted for you.



21

0 5 . 3 Complete **Figure 7**.

Do not write outside the box

You should:

- use a suitable scale for the *y*-axis
- plot the data from **Table 1**
- draw a line of best fit.

The data for 10 minutes and 12 minutes have been plotted for you.

[4 marks]

Figure 7

Question 5 continues on the next page

Turn over ▶

Student Response (OCR) ⚡:

Based on the student's handwritten response on the graph for Figure 7, here is the transcription of their work:

* **Y-axis scale:** The student has labelled the major grid lines on the y-axis from bottom to top with the numbers: **10, 20, 30, 40, 50, 60, 70, 80**.
* **Plotted points:** The student has plotted five points with an 'x' mark at the following approximate coordinates:
* $(0, 18)$
* $(2, 55)$
* $(4, 68)$
* $(6, 73)$
* $(8, 65)$
(Note: The points at $(10, 76)$ and $(12, 76)$ were pre-plotted as stated in the question instructions).
* **Line of best fit:** A straight line has been drawn that does not follow the overall trend of the plotted data. It starts on the y-axis at $(0, 40)$, passes through the pre-plotted point at $(10, 76)$, and ends at approximately $(12.2, 82)$.

Marking Analysis ⚡: Gemini 3.1 Pro

AO2.1: Awarded — The mark required a y-axis scale of 10 °C per cm. You correctly provided a suitable scale by labelling the major grid lines from 10 to 80 in increments of 10.

AO2.2: Awarded — The mark required all points to be plotted correctly within a tolerance of ± ½ small square. You accurately plotted all five required points at (0, 18), (2, 55), (4, 68), (6, 73) and (8, 65).

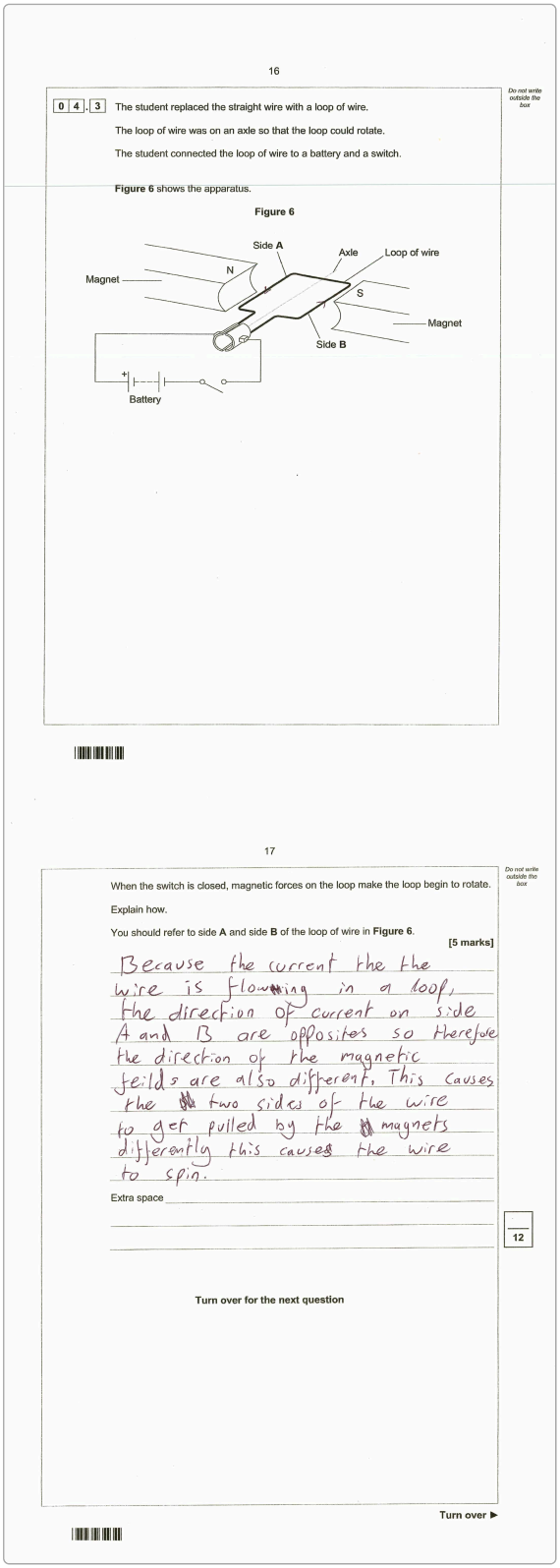
AO3: Not Awarded — The mark required a curved line of best fit ignoring the anomalous point at 8 minutes. You drew a straight line that does not follow the overall trend of the plotted data (which shows a rapid initial increase that then levels off). To earn this mark, you need to draw a smooth curve that tracks the pattern of the points, deliberately leaving the anomalous point at (8, 65) off the line.

Total Marks: 3/4

Question 4.3

Magnetism and electromagnetism > The motor effect > Electric motors (HT only) 6.7.2.3

Q: The student replaced the straight wire with a loop of wire on an axle so the loop could rotate, connected to a battery and a switch. Figure 6 shows the apparatus: a loop of wire between a N pole magnet (left, near side A) and a S pole magnet (right, near side B), on an axle, connected to a battery via a switch. When the switch is closed, magnetic forces on the loop make the loop begin to rotate. Explain how. You should refer to side A and side B of the loop of wire in Figure 6.



16

0 4 . 3 The student replaced the straight wire with a loop of wire.

The loop of wire was on an axle so that the loop could rotate.

The student connected the loop of wire to a battery and a switch.

Figure 6 shows the apparatus.

Figure 6

Do not write outside the box

17

When the switch is closed, magnetic forces on the loop make the loop begin to rotate.

Explain how.

You should refer to side **A** and side **B** of the loop of wire in **Figure 6**.

[5 marks]

Because the current the the wire is flowing in a loop, the direction of current on side A and B are opposites so therefore the direction of the magnetic feilds are also different. This causes the two sides of the wire to get pulled by the magnets differently this causes the wire to spin.

Extra space

12

Turn over for the next question

Turn over ▶

Student Response (OCR):

```
No response detected

Because the current the the
wire is flow[scribbled out (n)]ing in a loop,
the direction of current on side
A and B are opposites so therefore
the direction of the magnetic
feilds are also different. This causes
the [scribbled out (w)] two sides of the wire
to get pulled by the [scribbled out (m)] magnets
differently this causes the wire
to spin.
```

Marking Analysis:

AO1.1: Not Awarded — You did not state that "there is a magnetic field between the poles of the magnets". Your response mentions that the wire is pulled by the "magnets" but does not identify the magnetic field between their poles. To get this mark, state that there is a magnetic field between the North and South poles of the permanent magnets.

AO1.2: Awarded — You successfully explained that "a current in a loop of wire causes a magnetic field". You linked these ideas by writing that the "direction of current... therefore the direction of the magnetic feilds are also different".

AO1.3: Awarded — You correctly stated that "the current is in opposite directions in side A and side B". You wrote "the direction of current on side A and B are opposites".

AO1.4: Not Awarded — You did not state that "the forces on side A and side B are in opposite directions". You wrote that the two sides "get pulled... differently", which is too vague because "differently" does not specify that the forces act in opposite directions. To earn this mark, state that the forces on side A and side B are in opposite directions.

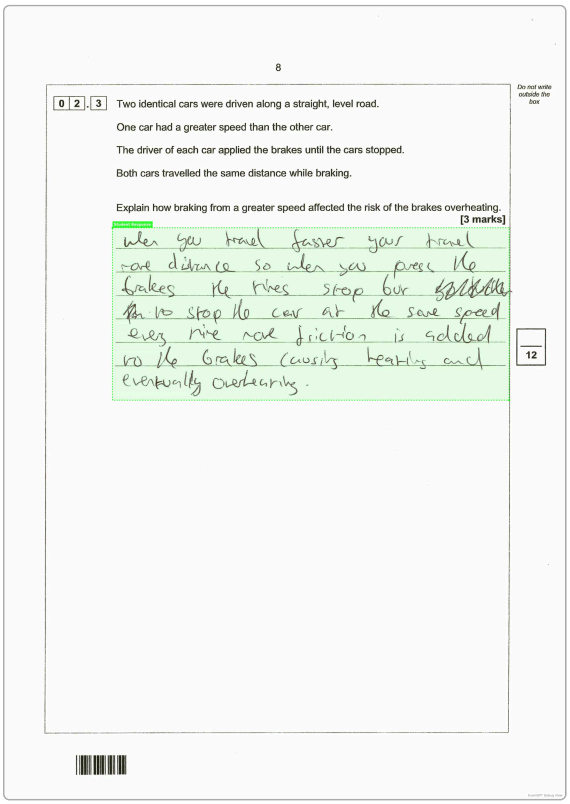
AO1.5: Not Awarded — You did not state that the "force on side A is downwards" or the "force on side B is upwards". You wrote that the force "causes the wire to spin", which does not name the specific direction of the force or identify that the rotation is anticlockwise. To earn this mark, specify that the force on side A is downwards (or side B is upwards).

Total Marks: 2/5

Question 2.3

Forces > Forces and motion > Factors affecting braking distance 2 | 6.5.6.3.4

Q: Two identical cars were driven along a straight, level road. One car had a greater speed than the other car. The driver of each car applied the brakes until the cars stopped. Both cars travelled the same distance while braking. Explain how braking from a greater speed affected the risk of the brakes overheating.



8

0 2 . 3 Two identical cars were driven along a straight, level road.

One car had a greater speed than the other car.

The driver of each car applied the brakes until the cars stopped.

Both cars travelled the same distance while braking.

Explain how braking from a greater speed affected the risk of the brakes overheating. [3 marks]

Do not write outside the box

when you travel faster your travel more distance so when you press the brakes the tires stop but [illegible] to stop the car at the same speed every time more friction is added to the brakes causing heating and eventually overheating.

12

Student Response (OCR):

```
when you travel faster you travel
more distance so when you press the
brakes the tires stop but [scribbled out text]
[scribbled out text] to stop the car at the same speed
every time more friction is added
to the brakes causing heating and
eventually overheating.
```

Marking Analysis:

AO1: Awarded — The mark scheme requires stating that the 'frictional / braking force is greater' or that the faster car has 'more kinetic energy'. Your response stated that 'more friction is added to the brakes', which correctly identifies a greater frictional force. For future questions, use the exact term 'frictional force is greater'.

AO3.1: Not Awarded — The mark scheme requires explaining that 'more work done' or 'more energy is transferred' by the brakes to stop the faster car. Your response described how 'more friction is added' causing heating but did not mention work or energy. To earn this mark, state that more work is done by the brakes to stop the faster car.

AO3.2: Awarded — The mark scheme requires identifying that 'the risk of the brakes overheating is greater' or that there is a 'risk of overheating' for the faster car. Your response concluded that traveling faster leads to 'eventually overheating', linking the higher speed to the risk. To improve, explicitly compare the two cars by stating that the risk of overheating is 'greater' for the faster car.

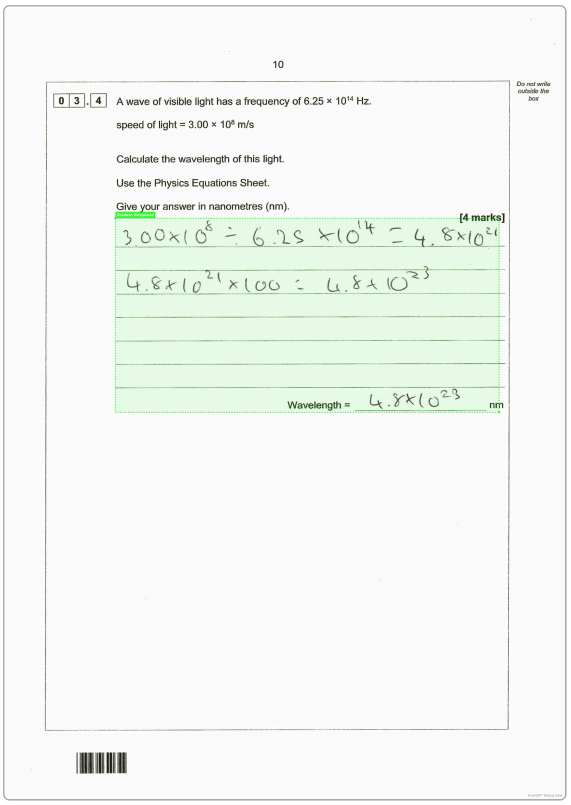
Total Marks: 2/3

Question 3.4

Waves > Waves in air, fluids and solids > Properties of waves

6.6.1.2

Q: A wave of visible light has a frequency of 6.25 × 10^{14} Hz. speed of light = 3.00 × 10^{8} m/s. Calculate the wavelength of this light. Use the Physics Equations Sheet. Give your answer in nanometres (nm).



Student Response (OCR):

$3.00 \times 10^{8} \div 6.25 \times 10^{14} = 4.8 \times 10^{21}$

$4.8 \times 10^{21} \times 100 = 4.8 \times 10^{23}$

Wavelength = 4.8×10^{23} nm

Marking Analysis:

AO2.1: Awarded — The mark scheme requires substituting the values into the wave equation to get "$3.00 \times 10^{8} = 6.25 \times 10^{14} \times \lambda$". You correctly substituted the speed and frequency into your division expression "$3.00 \times 10^{8} \div 6.25 \times 10^{14}$".

AO2.2: Awarded — The mark scheme requires rearranging the equation to "$\lambda = 3.00 \times 10^{8} / 6.25 \times 10^{14}$". You correctly showed this rearrangement by dividing the speed of light by the frequency in your working "$3.00 \times 10^{8} \div 6.25 \times 10^{14}$".

AO2.3: Not Awarded — The mark scheme requires calculating the wavelength as "$\lambda = 4.80 \times 10^{-7}$ (m)". You wrote "4.8×10^{21}" due to a calculator order-of-operations error because you did not put brackets around the denominator. To get the correct value of 4.80×10^{-7} m, use brackets around the divisor as `(6.25 * 10^14)` when entering it into your calculator.

AO2.4: Not Awarded — The mark scheme requires converting the wavelength to nanometres, allowing a correct conversion of your calculated value. You multiplied your value by 100 to get "4.8×10^{23}", which converts metres to centimetres. To convert metres to nanometres, you must multiply your wavelength in metres by 10^{9} instead.

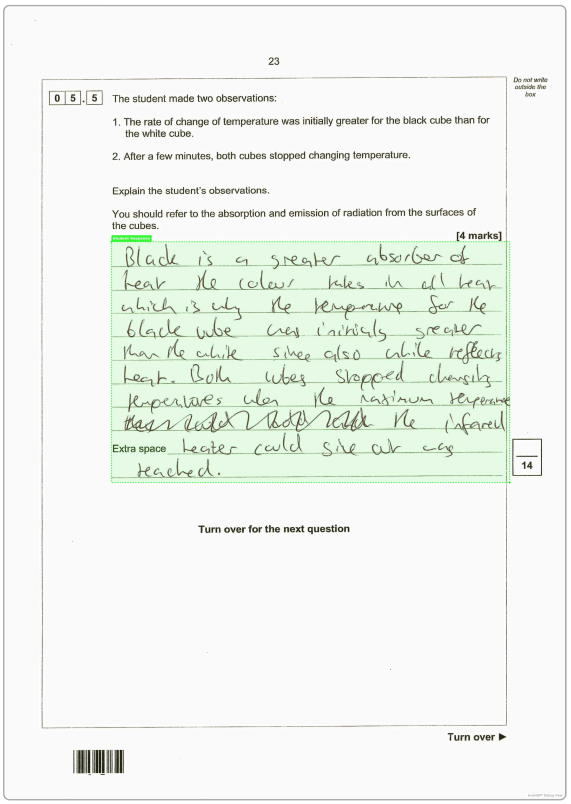
Total Marks: 2/4

Question 5.5

Waves > Black body radiation (physics only) > Emission and absorption of infrared radiation

6.6.3.1

Q: The student made two observations: 1. The rate of change of temperature was initially greater for the black cube than for the white cube. 2. After a few minutes, both cubes stopped changing temperature. Explain the student's observations. You should refer to the absorption and emission of radiation from the surfaces of the cubes.



23

0 5 . 5 The student made two observations:

1. The rate of change of temperature was initially greater for the black cube than for the white cube.

2. After a few minutes, both cubes stopped changing temperature.

Explain the student's observations.

You should refer to the absorption and emission of radiation from the surfaces of the cubes.

[4 marks]

Do not write outside the box

Black is a greater absorber of heat the colour takes in all heat which is why the temperature for the black cube was initially greater than the white since also white reflects heat. Both cubes stopped changing temperatures when the maximum temperature [scribbled out (was reached Both reached)] the infrared heater could give out was reached.

Extra space

14

Turn over for the next question

Turn over ▶

Student Response (OCR):

```
Black is a greater absorber of
heat the colour takes in all heat
which is why the temperature for the
black cube was initially greater
than the white since also white reflects
heat. Both cubes stopped changing
temperatures when the maximum temperature
[scribbled out (was reached Both reached)] the infrared
heater could give out was
reached.
```

Marking Analysis:

AO1.1: Awarded — **Black surfaces are good absorbers** of radiation is the requirement for this mark, which you met by writing 'Black is a greater absorber'. To improve, refer specifically to absorbing 'radiation' or 'infrared' instead of 'heat'.

AO1.2: Awarded — **White surfaces are poor absorbers** of radiation is the requirement for this mark, which you met by writing 'white reflects'. To improve, state explicitly that white surfaces are 'poor absorbers' of 'radiation' or 'infrared' rather than 'heat'.

AO1.3: Not Awarded — **As the temperature of the cubes increases the cubes emit infrared / radiation at a greater rate** was not shown in your response. You did not mention how emission changes with temperature. To earn this mark, explain that as the cubes get hotter, they emit radiation at a faster rate.

AO1.4: Not Awarded — **At maximum / constant temperature, each cube emits infrared / radiation at the same rate that it absorbs** radiation, but you wrote they stopped changing temperature because the 'maximum temperature [of the] heater... was reached'. This is a misconception because constant temperature is actually reached when emission rate equals absorption rate. To improve, explain that the cubes stop changing temperature when their rate of emission matches their rate of absorption.

Total Marks: 2/4