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June 2012

GCE Physics 6PH08 01

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June 2012

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Intodaction

The paper for the International Alternative to Internal Assessment is written to assess the skills associated with practical work in physics and addresses skills associated with planning, data analysis and evaluation. Set in a wide variety of contexts the questions will be more accessible to those candidates who have carried out a range of practicals in the laboratory. There are questions concerning choice of apparatus and the use of that apparatus that will be immediately familiar to those with the practice behind them.

The title of the paper, Experimental Physics, is the same as that for unit 6 for home centres and the mark scheme for each paper is designed to reflect the demands made on home candidates in their coursework for unit 6. In this way all candidates face the same test at A2.

The style of the paper is that there are four questions that combine to test the range of practical skills from the beginning of the experiment to the end. So the first question will usually address the selection and use of measuring instruments, the middle two questions will ask the candidate to plan an experiment, this is usually one mentioned in the specification and analyse some data from an unfamiliar context; a plan at this level will consist of a number of stages. The final question asks the candidate to consider a practical situation that they might have seen in the laboratory and to answer questions on how such a practical might be carried out; there will normally be some data to analyse by drawing a graph.

Uncertainty in measurement and its effect on a conclusion are ideas that run through the paper and can occur in a variety of ways; numerical work is expected to show an awareness of the role of significant figures and physical units. Candidates are expected to be familiar with standard practice in an A level physics laboratory.

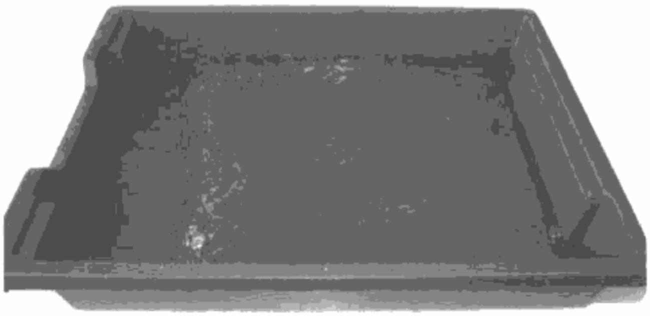
Question 1 (a)

This question is straightforward but requires candidates to answer in a way appropriate to an A level physics student. Specifically, a junior student would use a ruler and here we expect candidates to realise the appropriate item is a rule - the length is not important. Similarly they are expected to include a technique, as is implied by the question.

The percentage uncertainty calculation was done correctly by nearly all candidates but surprisingly few candidates scored the first mark.

Answer ALL questions.

1 A shallow tray holds water. The depth *d* of the water is about 2 cm.



(a) (i) Describe how you would measure *d* to a precision of 1 mm.

(1)

Measure d using a metre rule which an a precission of 1 mm.

(ii) Estimate the percentage uncertainty in this measurement.

(1)

$\% \Delta d = \frac{0.1}{2.0} \times 100\% = 5\%$

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Examiner Comments

This candidate suggests using a rule but does not get the mark because they give no indication how they will use the rule.
The percentage uncertainty calculation is very clear - and correct.

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Examiner Tip

Always show your numerical working - even when the calculations are easy.

(a) (i) Describe how you would measure *d* to a precision of 1 mm.

(1)

Using a meter ruler

(ii) Estimate the percentage uncertainty in this measurement.

(1)

$\frac{1}{1000} \times 100 = 0.1\%$

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Examiner Comments

The first answer is not at an appropriate level, either in calling it a ruler or in use of technique. The uncertainty is correct in that it is a millimetre but in the context of the measurement in the question the percentage uncertainty should use the actual measurement as the denominator. Thus 100 times (1mm/20mm).

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Examiner Tip

A rule will have the zero mark right at the end, a ruler will have an uncalibrated portion at the end.

(a) (i) Describe how you would measure *d* to a precision of 1 mm.

(1)

'd' is measured using a metre rule (has precision of 1mm) The metre rule is dipped in the tray (kept vertical using a set square) to measure d. Take repeat measurements at different positions and obtain mean d.

(ii) Estimate the percentage uncertainty in this measurement.

(1)

% uncertainty $= \frac{1\text{mm}}{20\text{mm}} \times 100 = 5\%$

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Examiner Comments

Here the instrument is correctly called a rule - the length is not important, provided it is long enough.
The candidate also gives both the techniques associated with this measurement.
The percentage uncertainty calculation is exemplary.

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Examiner Tip

The tray is made of moulded plastic and the depth will be uneven, so taking the mean value of repeat readings is vital for an accurate estimate of the depth.

Question 1 (b)

It is not necessary to repeat the wording of the question. Some candidates chose to send the waves up and down the length of the tray, presumably because this was a larger distance and time and so percentage uncertainties would be smaller. This was unimportant as the question asks about measuring technique.

Nearly all candidates scored one mark here but quite a number missed the second.

(b) One side of the tray is lifted up 2 cm and dropped. This causes a wave to cross the surface of the water. The wave is reflected from side to side across the surface.

The wave takes a time t to cross the surface once.

Describe how you would determine an accurate value for t.

(2)

Lift the tray up 2cm and drop it. ~~Count how many~~ Using a stop watch, record the time it takes to complete 10 waves. Repeat this 5 times and record results in a table. Divide each different time by 10 and find the mean of all 5 times.

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Examiner Comments

Here the candidate gives an excellent answer that might only be improved by omitting the first sentence.

This candidate is only awarded the second mark.

(b) One side of the tray is lifted up 2 cm and dropped. This causes a wave to cross the surface of the water. The wave is reflected from side to side across the surface.

The wave takes a time t to cross the surface once.

Describe how you would determine an accurate value for t.

(2)

Using a stopwatch record the time taken for ~~at least 10 waves to~~ the wave to cross the surface at least 10 times and find the mean value for t.

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Examiner Comments

This answer is misleading. The important aspect of repeating your measurement is that you take the measurement several different times - and then find the mean.
Here, it looks as though the candidate will be measuring one cross on 10 different occasions which is a good technique but the actual time measured will be very short, so they should measure several crosses so that they take the mean of a set of larger numbers with a lower percentage uncertainty.

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Examiner Tip

Measurements of a larger value of the variable will have a lower percentage uncertainty.

Question 1 (c)

The majority of candidates scored the first, relatively easy, mark for a velocity calculation - by using an appropriate number of significant figures. Here 2 or 3 SF are expected in the answer since that is the number used in the data in the question.

The second part requires the correct calculation of percentage uncertainties and then their correct combination - by adding, thus finding the uncertainty in a derived quantity.

(c) A student measures the distance across the tray as 33.4 cm with an uncertainty of 0.2 cm.

She then determines $t = 0.92$ s with an uncertainty of 0.03 s.

(i) Use these measurements to calculate v, the velocity of the wave. **(1)**

$v = \frac{d}{t} = \frac{0.334}{0.92} = 0.36\,ms^{-1}$

(ii) Estimate the percentage uncertainty in your value for v. **(2)**

% uncertainty of t $= \frac{0.03}{0.92} \times 100\% = 3.26\%$

% uncertainty of d $= \frac{2\times10^{-3}}{0.334} \times 100\% = 0.59\%$

% v $= \frac{0.59}{3.26} = 0.181\%$

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Examiner Comments

This candidate scores the mark for the calculation and the first mark for the uncertainties since they calculate at least one correctly. They lose the second mark in (ii) because the percentage uncertainties should be added when the two quantities are multiplied or divided.

(ii) Estimate the percentage uncertainty in your value for v.

(2)

percentage uncertainty

$= \frac{0.2}{33.4} \times 100\% + \frac{0.03}{0.92} \times 100\%$

$= 1\% + 3\%$

$= 4\%$

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Examiner Comments

This candidate combines the percentage uncertainties correctly. Since it is only estimates of the uncertainty that are required it is not appropriate to quote 3 SF, here 1 SF gives us exactly the information we need. This was awarded 2 marks.

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Examiner Tip

Uncertainties are only estimates at best and precision is not appropriate.

Question 1 (d-e)

These sections require candidates to do a simple calculation and then consider uncertainties in drawing a conclusion.

Most candidates scored the first mark but many made a mistake with the uncertainty, using the value for the distance in c (i) and not the depth in a (ii). They usually performed the right calculation but using the wrong values. Part (e) was done particularly well with very many candidates scoring both marks. The comparison of %Diff and %Unc was the more usual route but using the range of values based on the uncertainty was equally valid

(d) The student is told that

$$v^2 = kd$$

where k is a constant.

(i) She measures the depth d as 2.1 cm. Calculate a value for k.

(1)

$k = \frac{v^2}{d}$ $\quad$ $k = \frac{0.363^2}{2.1 \div 100} \Rightarrow$

$K = 6.27\ ms^{-2}$

(ii) Use your previous answers to estimate the percentage uncertainty in k.

(1)

Percentage uncertainty in V = 3.86 %. Percentage uncertainty in d = 5 %.

Percentage uncertainty in K = (3.86 x 2) + 5 = 12.72 %.

(e) It is suggested that the value for k is equal to the strength of the Earth's gravitational field 9.81 N kg^{-1}.

Use your calculations to discuss whether these results support the suggestion.

(2)

Percentage difference = $\frac{9.81 - 6.27}{9.81} \times 100$ = 36.1 %.

Percentage uncertainty in k is less than percentage difference, therefore results do not support suggestion.

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Examiner Comments

These answers are clearly laid out and correct. The units and powers of ten in (d)(i) are handled well too.

Question 2

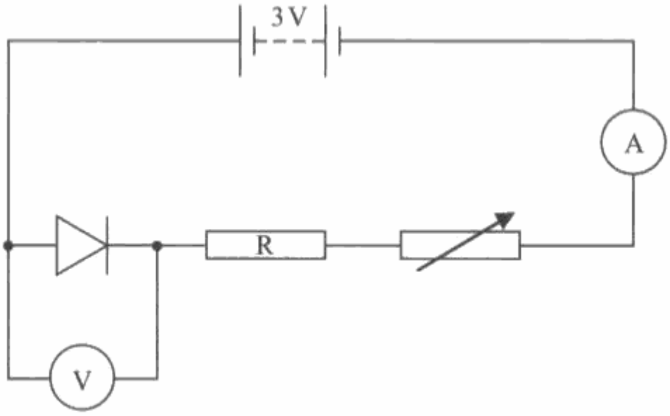
Question 2 concerns measuring the current through a diode as its temperature is changed. The potential difference across it must be kept constant so familiarity with ordinary laboratory details is particularly helpful here.

Scores varied quite considerably in this question and it seemed that many candidates were unfamiliar with heating items and recording temperature.

This is a good answer.

2 A student is asked to investigate how the current through a semiconductor diode varies with temperature. The potential difference across the diode is kept constant.

The student is given the circuit shown.



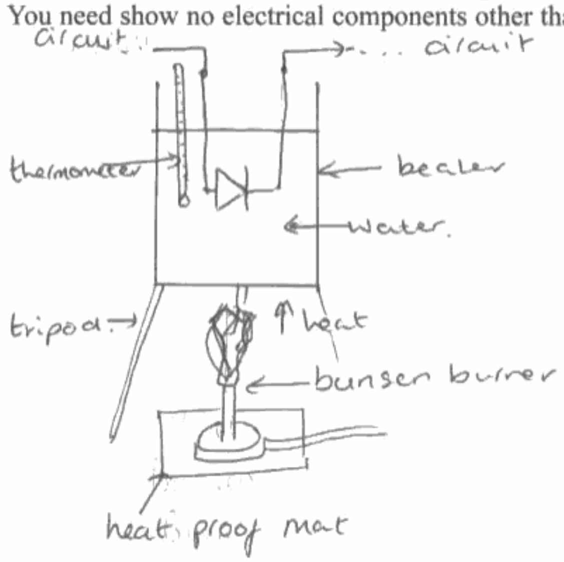
(a) Explain why it is necessary to have a fixed resistor R in the circuit.

(2)

~~If the fixed resisto~~ Without it, as you reduced the resistance of the variable resistor (to keep V constant), because the resistance would ~~decrease~~ have to decrease from a large current caused the diode would get hot, disrupting our experiment.

(b) The student heats the diode using a small beaker of water.

Draw a diagram to show how you could set up this experiment safely in the laboratory. You need show no electrical components other than the diode in your diagram.



(2)

• use a clamp stand to suspend the diode

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Examiner Comments

The fixed resistor protects the diode by limiting the current since the variable resistor can be reduced to zero. Few candidates appreciated this.
The diagram shows all the necessary information including support for the diode.

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Examiner Tip

Heat sources should be named, here bunsen burner is the right thing. Arrows labelled 'heat' does not get the mark.
Use a ruler to draw your diagrams.

(a) Explain why it is necessary to have a fixed resistor R in the circuit.

(2)

To prevent too much current to flow through the circuit and the circuit has significantly low resistance without the fixed resistor R.

ResultsPlus
Examiner Comments

This candidate is on the right track but needs to include more detail either about the hazard of too much current through the diode or why the resistance might be too low.

The answers here are not of A level standard. They do show the candidate has some idea about the practical work but only in a rather general way.

(c) The temperature is varied and the variable resistor is adjusted to keep the reading on the voltmeter constant. Readings are then taken of the current and the temperature.

(i) The student removes the heat source before taking each reading.

Explain why this will improve the accuracy of the experiment.

(1)

~~To allow thermal equilibrium~~ Thermal equilibrium can be reached. Maximum temperature reached can be determined.

(ii) Give **two** more precautions the student should take to ensure his data are accurate and reliable.

(2)

Keep eye level with the thermometer reading. Repeat readings on thermometer and ammeter to get mean values.

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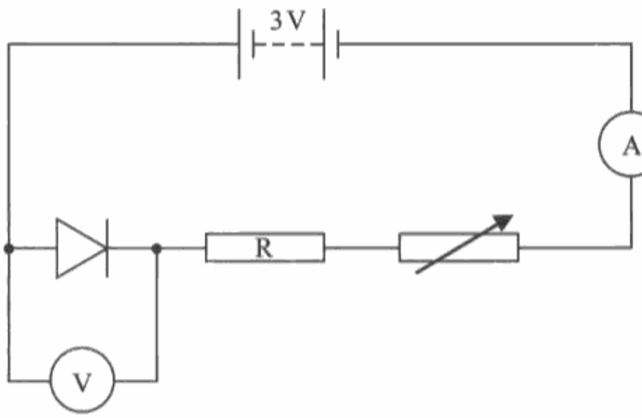
Examiner Comments

The diode, with its plastic case will take longer to get to the temperature of the water than the thermometer.
'Eye level with thermometer' is a popular response, often accompanying 'parallax'. This will usually only get a mark if it is accompanied by a diagram showing exactly what is meant since parallax is often inappropriate.
In this experiement it is not useful to repeat readings since the situation does not change between readings. It is better to ensure a higher than usual number of readings so that anomalies stand out.

2 A student is asked to investigate how the current through a semiconductor diode varies with temperature. The potential difference across the diode is kept constant.

The student is given the circuit shown.



(a) Explain why it is necessary to have a fixed resistor R in the circuit.

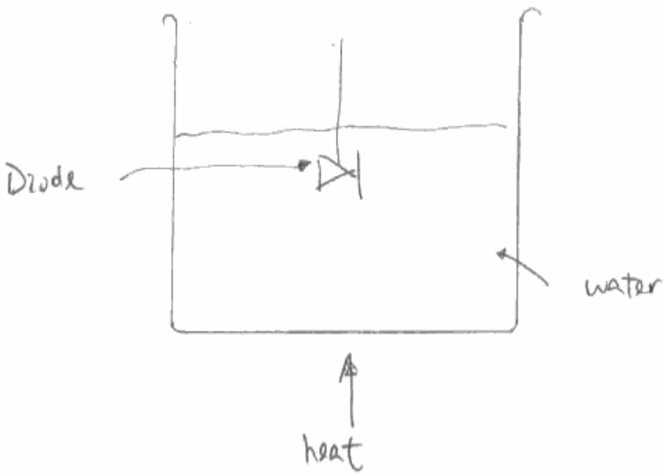
(2)

A fixed resistor R is installed in order to prevent a large current flowing through the circuit thus damaging the equipment.

(b) The student heats the diode using a small beaker of water.

Draw a diagram to show how you could set up this experiment safely in the laboratory. You need show no electrical components other than the diode in your diagram.

(2)



(c) The temperature is varied and the variable resistor is adjusted to keep the reading on the voltmeter constant. Readings are then taken of the current and the temperature.

(i) The student removes the heat source before taking each reading.

Explain why this will improve the accuracy of the experiment.

(1)

This is to ensure the measured temperature is the highest and no more heat energy is transferred for heating the diode.

(ii) Give **two** more precautions the student should take to ensure his data are accurate and reliable.

(2)

The student should be aware of the diode touching the bottom of the flask and must ensure the diode is completely immersed in the water

(d) State why you would expect the current to increase as the temperature increases.

(1)

As temperature increases, the resistance of diode decreases. As the voltage is kept constant, the current increases.

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Examiner Comments

In part (c)(ii) the precautions should be those taken to help obtain accurate results. If you are not keeping the diode under the water you are not really doing the experiment, but touching the sides will make temperature measurement inaccurate.
For part (d) some knowledge of the theoryis required. This is a good answer since it recalls the fact that the voltage is constant. Answers considering an increase in drift velocity were not awarded marks.

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Examiner Tip

There are usually 4 marks on each paper that require candidates to recall some knowledge from the specification.
Answers talking about the increase in carrier density were equally valid.

Question 3 (a-b)

Question 3 is about some data in an unfamiliar context, many candidates scored well showing a familiarity with graphical display of data. The commonest error was that of drawing a straight line - or even two - somewhere near the data points.

Most candidates were able to calculate the temperature correctly using Wien's law.

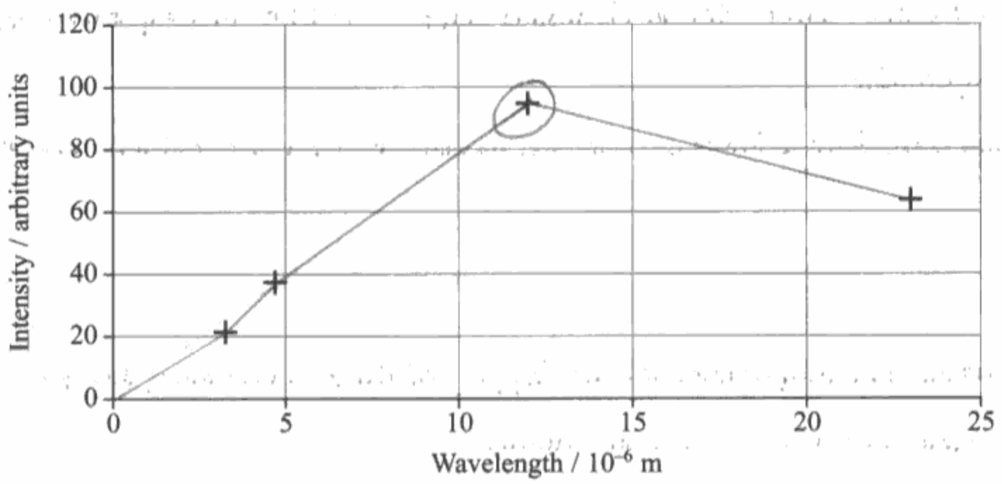
3 Wien's Law states that $\lambda_{max} T = 2.898 \times 10^{-3}$ m K

This can be used to estimate the temperature T of distant objects by determining λ_{max}.

A very distant asteroid is observed for the first time and an astronomer measures the intensity of the radiation, in arbitrary units, at four wavelengths.

Wavelength / 10^{-6} m	Intensity / arbitrary units
3.3	21
4.7	38
12.0	95
23.0	64

The data is plotted as shown.



(a) (i) On the graph draw a best fit line to show where the intensity is a maximum.
(2)

(ii) Hence estimate the wavelength, λ_{max}, at which the intensity is a maximum.
(1)

λ_{max} = 12 × 10⁻⁶ m

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Examiner Comments

Physical laws will never produce data that joins like this. If a candidate makes this mistake they can still access the remaining marks by identifying their maximum correctly, like this candidate has done, and then calculating the temperature correctly.

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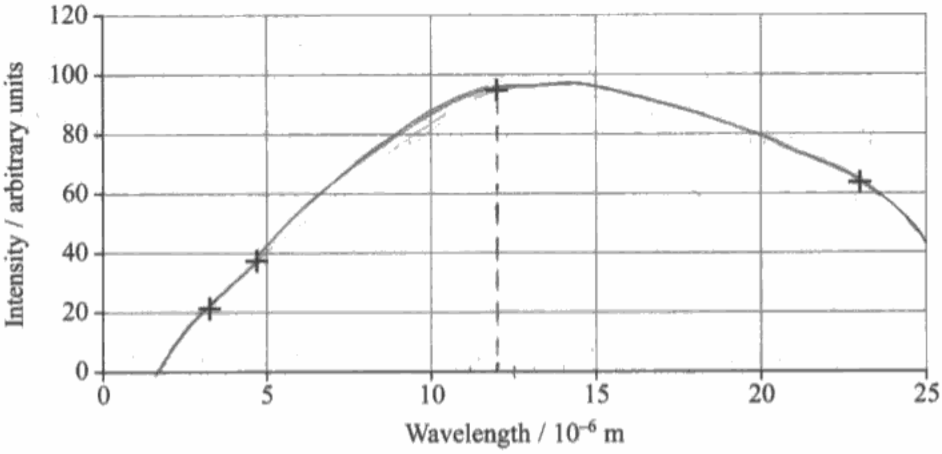
Examiner Tip

Drawing smooth curves through data points is a skill that requires practice.

The data is plotted as shown.



(a) (i) On the graph draw a best fit line to show where the intensity is a maximum. **(2)**

(ii) Hence estimate the wavelength, λ_{max}, at which the intensity is a maximum. **(1)**

λ_{max} = 12×10^{-6} m

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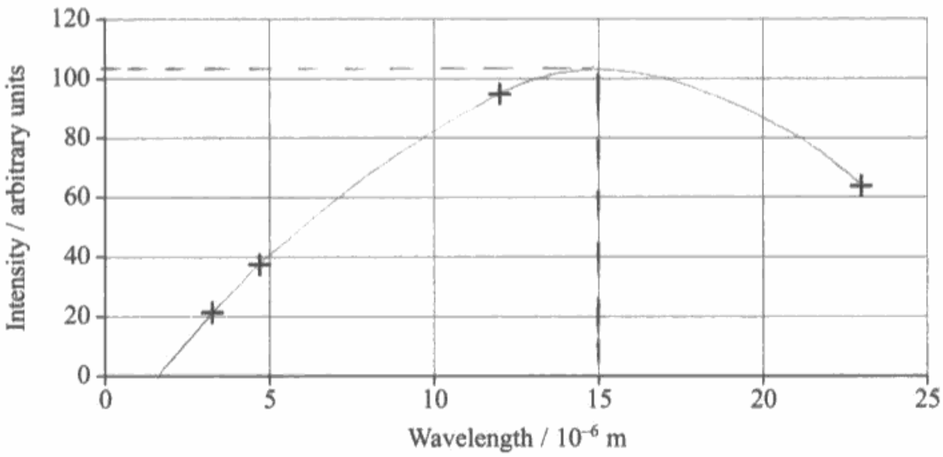
Examiner Comments

A fairly good curve, but the candidate lacks the confidence to mark the maximum at an unrecorded value.

This candidate scores full marks.

The data is plotted as shown.



(a) (i) On the graph draw a best fit line to show where the intensity is a maximum. **(2)**

(ii) Hence estimate the wavelength, λ_{max}, at which the intensity is a maximum. **(1)**

λ_{max} = 15×10^{-6} m

(b) Use Wien's Law to calculate a value for the temperature of the asteroid.

$$\lambda_{max} T = 2.898 \times 10^{-3} \text{ m K}$$

(2)

$T = \dfrac{2.898 \times 10^{-3}}{15 \times 10^{-6}}$

$= 193$ K

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Examiner Comments

The line is thin but clear and shows a definite maximum which is marked and the value read correctly from the axis. This value is then used correctly to find the temperature using Wien's law.

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Examiner Tip

Don't assume the Best Fit Line will be straight.

Question 3 (c)

This question required candidates to appreciate the nature of a first set of observations and apply what they knew about handling data to this situation.

Many candidates were very able to do that and for 2 marks it is a good idea to write 2 bullet points starting on different lines, this helps to clarify things in the candidate's mind and makes their answer clearer on paper. Some candidates thought the range of readings uneven but this was not important for a simple maximum and to be more specific about the units for the intensity raises more problems for the candidate than it solves and seemed unimportant in the answers given.

(c) New data like this must be reliable before it is accepted.

Give **two** reasons why any conclusion drawn from this data might not be very reliable.

(2)

The sample size is too small ; only four data. to get a trend to predict λ_{max}.
More measurements of intensity should be taken between 10 × 10^{-6} and 20 × 10^{-6} m wavelength. ~~There is an anomalous reading at 23.0 × 10^{-3} m~~ wavelength. There is an anomalous reading at 23.0 × 10^{-3} m wavelength.

Examiner Comments

This candidate recognises that the sample size is too small but suggestions about further readings are not helpful. It seems they drew a straight line and identified the last point (incorrectly) as an anomaly.

(c) New data like this must be reliable before it is accepted.

Give **two** reasons why any conclusion drawn from this data might not be very reliable.

(2)

- Readings must be repeated for an average.
- Readings at more wavelengths should be taken to ensure a reliable line of best fit.

There are not enough points on the graph to draw conclusions.

Examiner Comments

A good answer in every way.

Question 4 (a)

This question was answered well by a high proportion of candidates but a number spoke about the conducting properties of wood or metal or said that the metal would be attracted or repelled.Neither of these was awarded the mark.

4 A bar magnet is suspended by a thread attached to a wooden support. The bar magnet hangs horizontally as shown and lines up with the Earth's magnetic field.

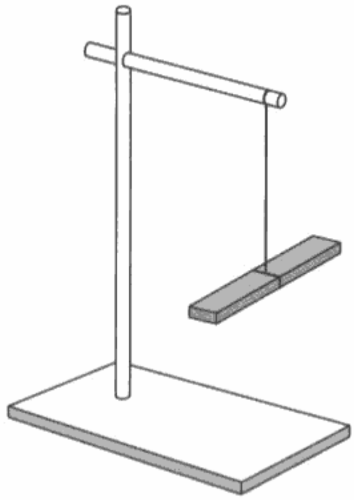

Figure 1

(a) State why the support should be made of wood and not steel.

(1)

This is because the steel will be ~~magnet~~ ~~magnised~~ magnetized and will attract or repel the magnet, making the result non-reliable.

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Examiner Comments

Induced magnetism will always produce attraction, this spoiled an otherwise good answer which mentioned the effect on the experiment.

(a) State why the support should be made of wood and not steel.

(1)

Steel is a hard magnetic material, and would interfere with the magnetic field lines of the magnet.

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Examiner Comments

This answer gets the mark as a benefit of the doubt since it is not clear why the candidate thinks the hardness of the magnetic property is significant but they make the link between this and the outcome of the experiment.

Question 4 (b)

This question discriminated between the candidates who knew a little about measuring technique and those who could apply correctly what they knew. Many candidates scored a mark for measuring more than one period and some for repeating for a mean. The third mark was seldom awarded since some candidates put a mark on the moving magnet or failed to use a timing marker at all. The choice of marker is not important but it should be placed at the centre where there will be the smallest uncertainty in the timing of the magnet since it is moving quickest.

The choice of a stopwatch to measure the period is not deemed demanding enough at this level to warrant a mark on its own.

Many answers to this question were too long and contained too much irrelevant information.

Describe how you would measure the period of these oscillations as accurately as possible.

(3)

Use stop watch to record the time taken for at least 20 oscillations of the bar magnet.

Then, period $T = \frac{\text{Time taken}}{\text{number of oscillations}}$

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Examiner Comments

This candidate only gives one response and is awarded one of the three marks available.

Describe how you would measure the period of these oscillations as accurately as possible.

(3)

Use a stopwatch and start from zero once the bar magnet starts spinning.
Set a centre point of oscillation for better reference.
Time at least 20 oscillations and find period using $T = \frac{t_{20}}{20}$.
Repeat the above steps a few times and obtain an average value.
Eye level should be in line with magnet.

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Examiner Comments

The third mark is given, benefit of doubt, for the centre point of oscillations even though the candidates doesn't say how they will set the centre point. The eye being in line with the magnet means very little without a diagram.

Question 4 (c)

Candidates confused time and speed here. The oscillations decay in amplitude but at a constant frequency and it is the change in amplitude that is important here. Heavily damped oscillations that died away almost immediately were allowed.

(c) You are told that these oscillations are lightly damped.

State what you would observe if the oscillations were heavily damped.

(1)

Amplitude would decrease at a faster rate, there will be less oscillations since there will be less tranfer of energy.

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Examiner Comments

The fact that the oscillations decreased faster was the crucial aspect of correct answers. Here the spurious transfer of energy was ignored.

(c) You are told that these oscillations are lightly damped.

State what you would observe if the oscillations were heavily damped.

(1)

A sudden decrease in the speed of oscillation of the magnet

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Examiner Comments

Discussing speed by itself was not awarded the mark.

(c) You are told that these oscillations are lightly damped.

State what you would observe if the oscillations were heavily damped.

(1)

If the oscillations were heavily damped it would reach equilibrium and stop.

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Examiner Comments

Very heavy damping, but acceptable as an answer to a question that was not specific.

Question 4 (d) (i)

This is a variation on the usual question about plotting the data as a straight line. It is not enough, for 2 marks, just to say that the variables as listed are proportional, rather candidates must also identify the gradient as one of the quantities in the equation.

Having no intercept is not the same as having a zero intercept. A graph of pressure against volume for an ideal gas has no intercept, this equation suggests that the intercept will be zero.

(d) A large coil of wire is now placed vertically around the centre of the magnet.

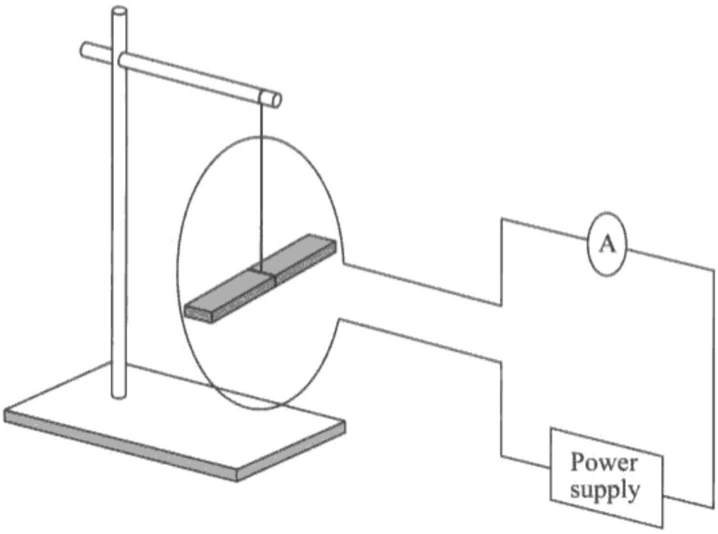

Figure 3

When current is passed through the coil it produces a magnetic field **in the same direction** as the Earth's magnetic field. When the magnet is again rotated horizontally, it oscillates at an increased frequency.

(i) A student thinks that the period T of the oscillations is related to the current in the coil I by

$$\frac{1}{T^2} = kI$$

where k is a constant.

Explain why this suggests a graph of $1/T^2$ against I will produce a straight line through the origin.

(2)

Because k is a constant. compare $y = mx + c$ with $\frac{1}{T^2} = kI$ the c is zero so it ~~passes~~ touches ~~to~~ the origin, and the slope m is k, which is a constant, so it is a straight line.

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Examiner Comments

Here the candidate correctly identifies the intercept as zero and the gradient as k, which is given as a constant in the question meaning that the line is straight.

Explain why this suggests a graph of $1/T^2$ against I will produce a straight line through the origin.

(2)

$\frac{1}{T^2} = kI$

$y = mx + c$

The equation is in the form of $y = mx + c$. Therefore it will produce a straight line passing through the origin.

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Examiner Comments

The gradient is identified with k again here but the candidate does not make clear why they think the graph will pass through the origin. To write that c = 0 is the safest option.

Question 4 (d) (ii-iii)

For the graph plotting there was a variety of ways that the best fit line could be drawn. Candidates who joined the top and bottom plots lost the best fit mark and generally it is expected that plots will lie on either side of the best fit line. The table was completed correctly by most of the candidates who found little difficulty getting the units correct. The majority of the candidates attempted the right graph.

Many candidates lost the marks in part (iii) because they did not refer to the graph they had just plotted but wrote only about the equation. Those that did refer to the graph often failed to mention why it was expected to be straight.

(ii) The student carries out an experiment to measure T as I is varied. He obtains the following data.

I / A	Mean T / s	$\frac{1}{T^2}$ /s
0	1.230	0.7
1.00	0.827	1.5
2.00	0.673	2.2
3.00	0.581	3.0
4.02	0.520	3.7
5.01	0.475	4.4

ResultsPlus
Examiner Comments

Here the candidate makes two mistakes by putting the wrong unit at the top and only using 2 significant figures for the data. This will cause the graph to look very odd.

ResultsPlus
Examiner Tip

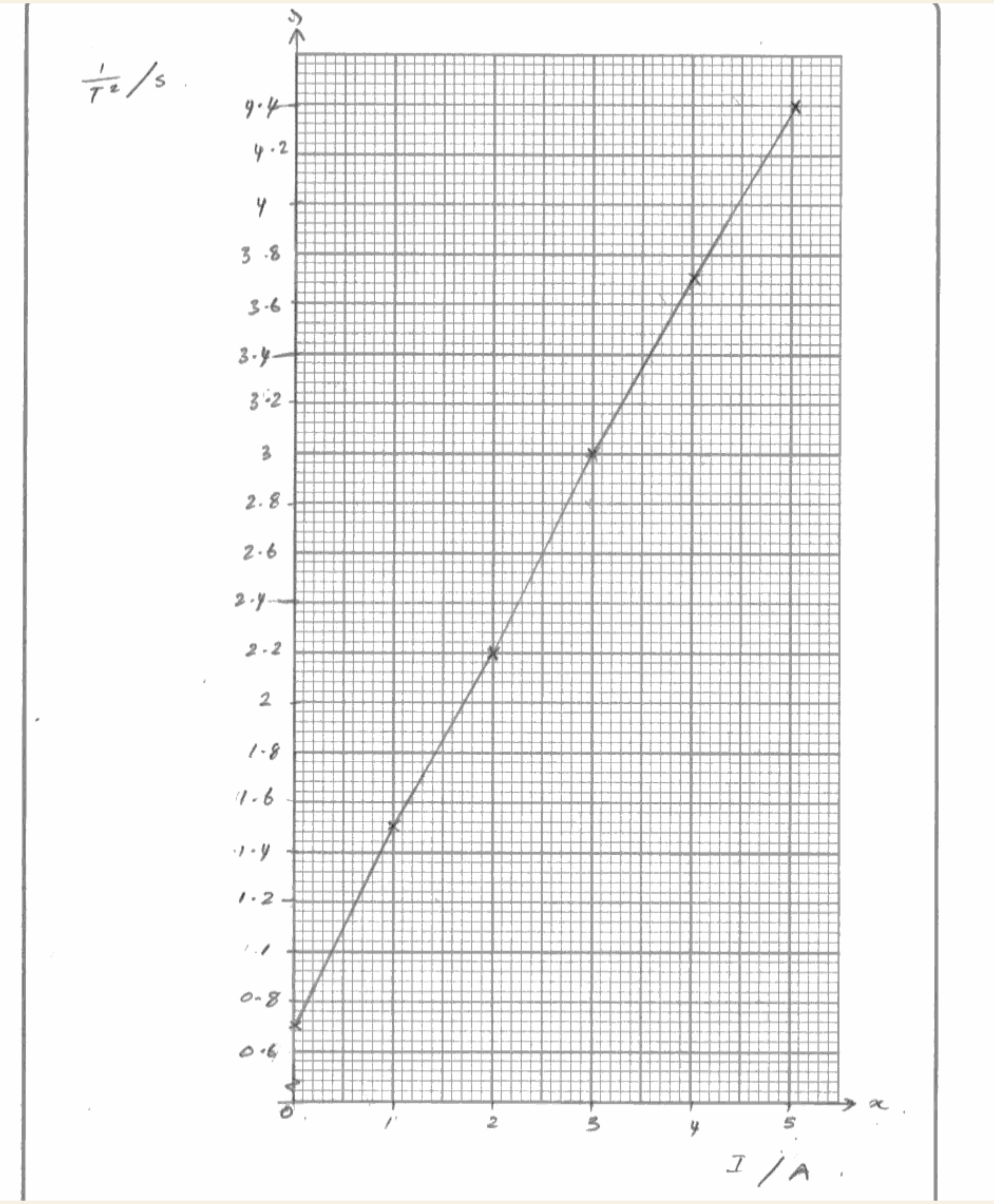
Use 3 SF for all graph work. For plotting data and for the value of the gradient.

(ii) The student carries out an experiment to measure T as I is varied. He obtains the following data.

I / A	Mean T / s	$\frac{1}{T^2}$ (s^{-2})
0	1.230	0.661
1.00	0.827	1.462
2.00	0.673	2.208
3.00	0.581	2.962
4.02	0.520	3.698
5.01	0.475	4.432

ResultsPlus
Examiner Comments

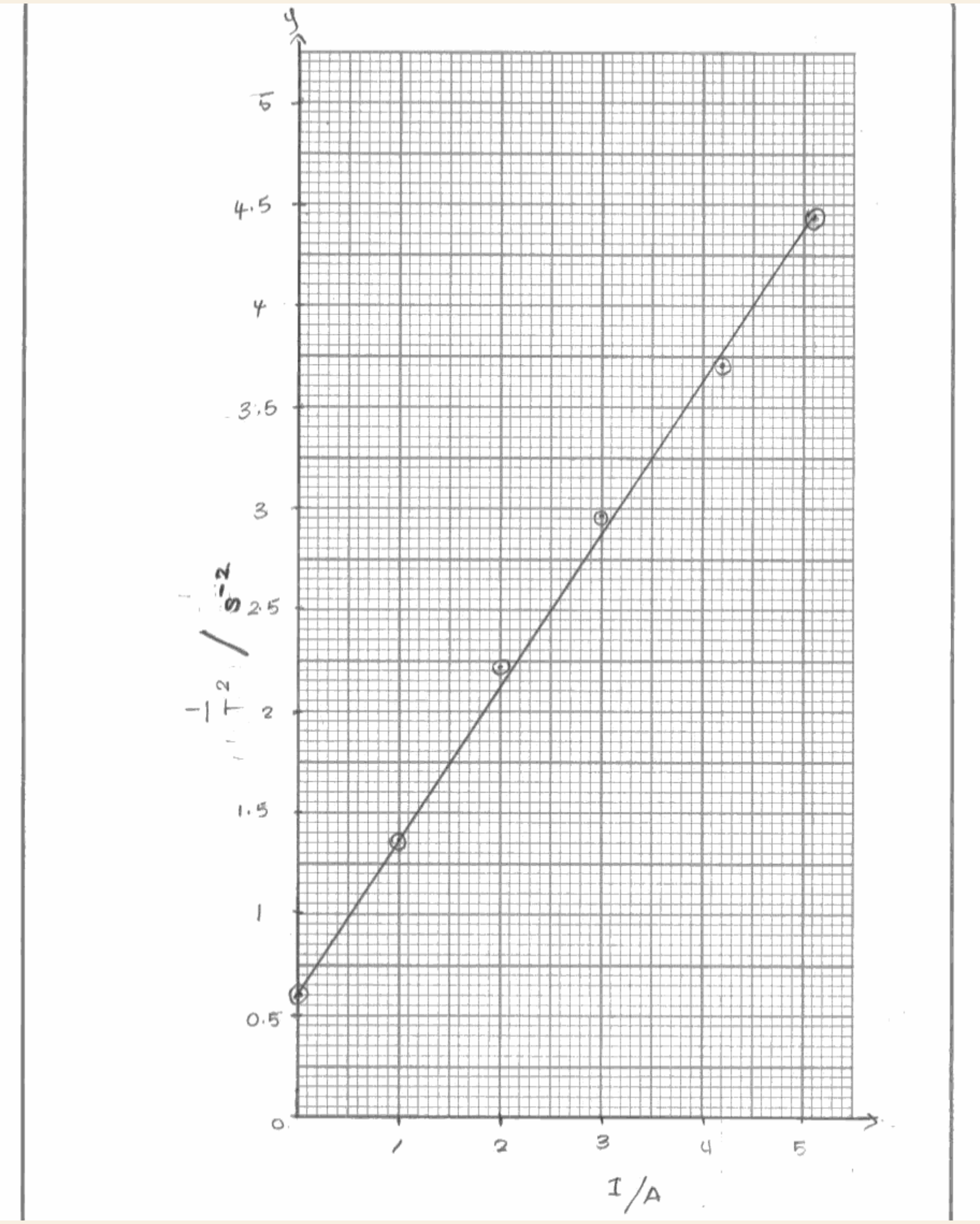
This candidate quotes 4 SF, although the last SF will not be very useful in plotting data this is not penalised. Although it is preferable to have the quantity divided by the unit in the header this way of showing the units is acceptable.



ResultsPlus

Examiner Comments

The candidate with 2 SF in the table produces this graph. They now lose the unit mark and have joined the plots in dot-to-dot fashion. They still score marks for the scales and the plots which are correct to 2 SF.



ResultsPlus

Examiner Comments

This candidate makes the common mistake of plotting 4.02 at 4.2 and loses the plotting mark but still gets the best fit line on benefit of doubt - it really should pass just above the bottom plot.

(iii) His teacher suggests that the equation

$$\frac{1}{T^2} = kI + b$$

is a better mathematical model for the data.

Explain why his teacher is right.

(2)

$(1/T^2 = kI)$

Because the graph is not passing through the origin as it has got a y intercept.

So it is better to include the y intercept in the model

b (y intercept) is 0.661 (s^{-2})

ResultsPlus

Examiner Comments

This candidate writes that the graph does not pass through the origin to score the first mark but also states that there is a y-intercept. This candidate then goes on to say that this is not zero. No mention of the straight line so only one mark.

(iii) His teacher suggests that the equation

$$\frac{1}{T^2} = kI + b$$

is a better mathematical model for the data.

Explain why his teacher is right.

$y = mx + c$

(2)

The line is not passing through the origin

so $y = mx + c$ is $\frac{1}{T^2} = kI + b$.

Where m is the gradient 'k' value.

$m = k$, $b = c$ (constant).

ResultsPlus

Examiner Comments

This candidate writes about their graph saying that does not pass through the origin and makes it clear that the line has a constant gradient and so is straight.

Paper Summary

- It is recommended that teachers familiarise themselves with the demand at this level by looking at the coursework support material available on the Edexcel website GCE Physics pages.
- It will be helpful for candidates to look at past papers and their mark schemes as part of their exam preparation. These are also available on the website.
- There can be no substitute for carrying out practical work in the laboratory and discovering how enjoyable it can be to successfully record and analyse some real physics.

Grade Boundaries

Grade boundaries for this, and all other papers, can be found on the website on this link:

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