

IB PHYSICS

Name: _____

Period: _____ Date: _____

Marks: **42** Raw Score: _____ IB Curve: _____**DEVIL**  **PHYSICS****BADDEST CLASS ON CAMPUS****CHAPTER 1 TEST REVIEW**

1. The best estimate for the time it takes light to cross the nucleus of the hydrogen atom is

- A. 10^{-23} s.
 B. 10^{-20} s.
 C. 10^{-15} s.
 D. 10^{-7} s.

(Total 1 mark)

2. Which of the following contains one fundamental and one derived unit?

A.	ampere	kilogram
B.	ampere	coulomb
C.	joule	newton
D.	joule	coulomb

(Total 1 mark)3. The length of each side of a sugar cube is measured as 10 mm with an uncertainty of ± 2 mm. Which of the following is the absolute uncertainty in the volume of the sugar cube?

- A. $\pm 6 \text{ mm}^3$
 B. $\pm 8 \text{ mm}^3$
 C. $\pm 400 \text{ mm}^3$
 D. $\pm 600 \text{ mm}^3$

(Total 1 mark)

4. Which of the following will reduce random errors in an experiment?

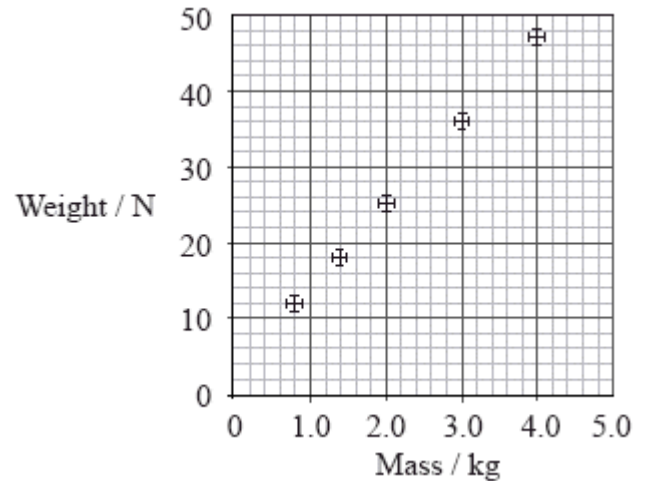
- A. Using an instrument having a greater precision
 B. Checking the calibration of the instrument used
 C. Checking for zero error on the instrument used
 D. Repeating readings

(Total 1 mark)5. Two lengths, a and b , are measured to be 51 ± 1 cm and 49 ± 1 cm respectively. In which of the following quantities is the percentage uncertainty the largest?

- A. $a + b$
 B. $a - b$
 C. $a \times b$
 D. $\frac{a}{b}$

(Total 1 mark)

6. The masses and weights of different objects are independently measured. The graph is a plot of weight versus mass that includes error bars.



These experimental results suggest that the

- A. measurements show a significant systematic error but small random error.
- B. measurements show a significant random error but small systematic error.
- C. measurements are precise but not accurate.
- D. weight of an object is proportional to its mass.

(Total 1 mark)

7. In an experiment to measure the acceleration of free fall at the surface of the Earth the following results were obtained.

Acceleration of free fall / m s^{-2}
7.69
7.70
7.69
7.68
7.70

The results are

- A. accurate and precise.
- B. inaccurate but precise.
- C. accurate but imprecise.
- D. inaccurate and imprecise.

(Total 1 mark)

8. The volume V of a cylinder of height h and radius r is given by the expression

$$V = \pi r^2 h.$$

In a particular experiment, r is to be determined from measurements of V and h . The uncertainties in V and in h are as shown below.

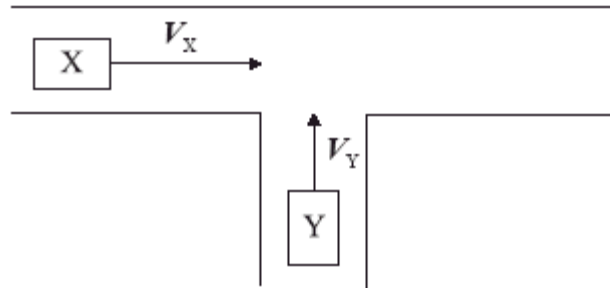
V	$\pm 7\%$
h	$\pm 3\%$

The approximate uncertainty in r is

- A. 10 %.
- B. 5 %.
- C. 4 %.
- D. 2 %.

(Total 1 mark)

9. Two cars, X and Y, are travelling towards a junction. The velocity of car X is V_X and car Y is V_Y .



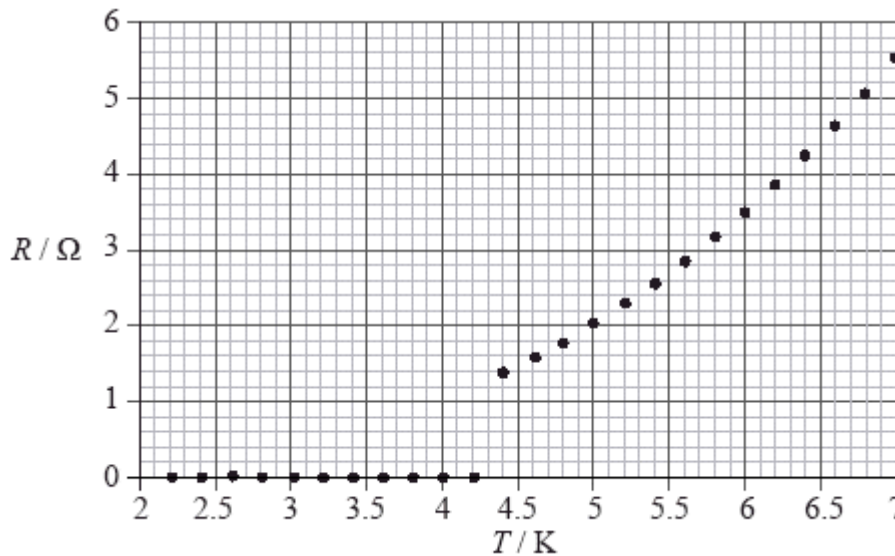
Which of the following vectors represent the velocity of Y relative to X?

- A.  B. 
- C.  D. 

(Total 1 mark)

10. This question is about electrical resistance of the metal mercury.

The resistance R of a sample of mercury was measured as a function of the temperature T of the sample. The sample was cooled and data points were taken at temperature intervals of 0.2 K. The uncertainties in R and T are too small to be shown on the graph.



The hypothesis is that resistance is proportional to absolute temperature for temperatures greater than 4.5 K.

- (a) (i) Suggest whether the data supports the hypothesis.

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(1)

- (ii) Draw a line of best fit through the data.

(2)

(b) State the value of R for which the rate of change of resistance of the sample with temperature is least.

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(1)

(c) At a temperature T_C the resistance suddenly becomes zero.

(i) Use the graph to determine the possible range of the temperature T_C .

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(1)

(ii) State, to the correct number of significant figures, the value of T_C and its uncertainty.

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(2)

(iii) Outline how the temperature T_C could be measured more precisely.

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(1)

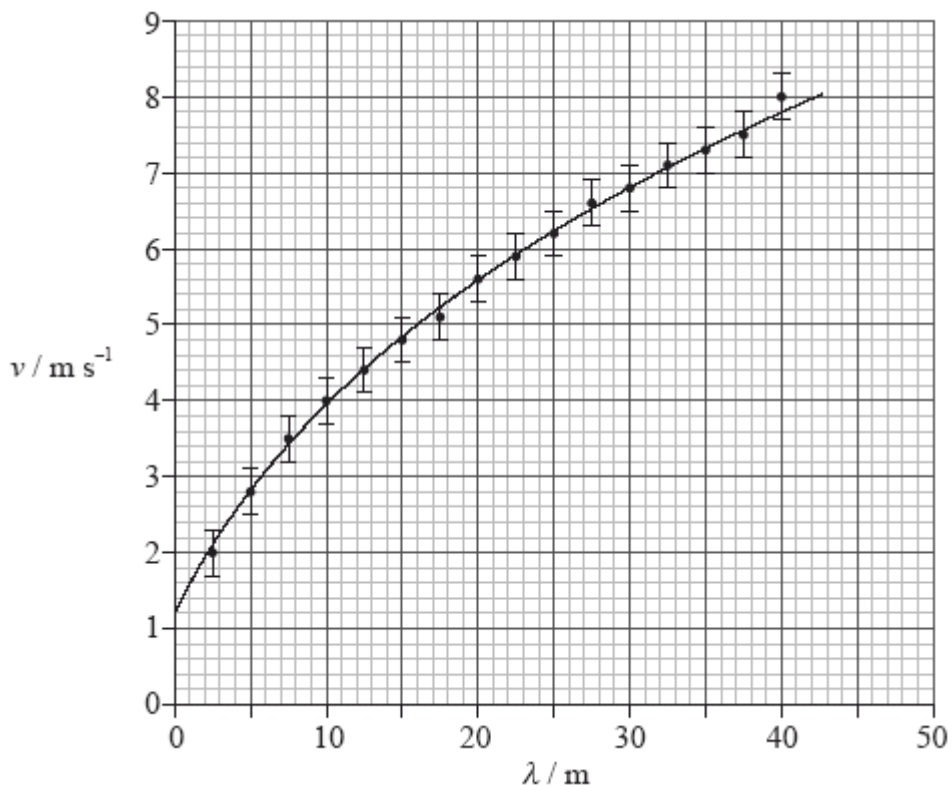
(d) Outline **two** reasons why you could not use the data to determine an accurate value for R at room temperature.

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(2)

11. Data analysis question.

The speed v of waves on the surface of deep water depends only on the wavelength λ of the waves. The data gathered from a particular region of the Atlantic Ocean are plotted below.



The uncertainty in the speed v is $\pm 0.30 \text{ m s}^{-1}$ and the uncertainty in λ is too small to be shown on the diagram.

(a) Draw a best-fit line for the data.

(1)

(b) State, with reference to the line you have drawn in (a),

(i) why v is not directly proportional to λ .

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(1)

(ii) the value of v for $\lambda = 39 \text{ m}$.

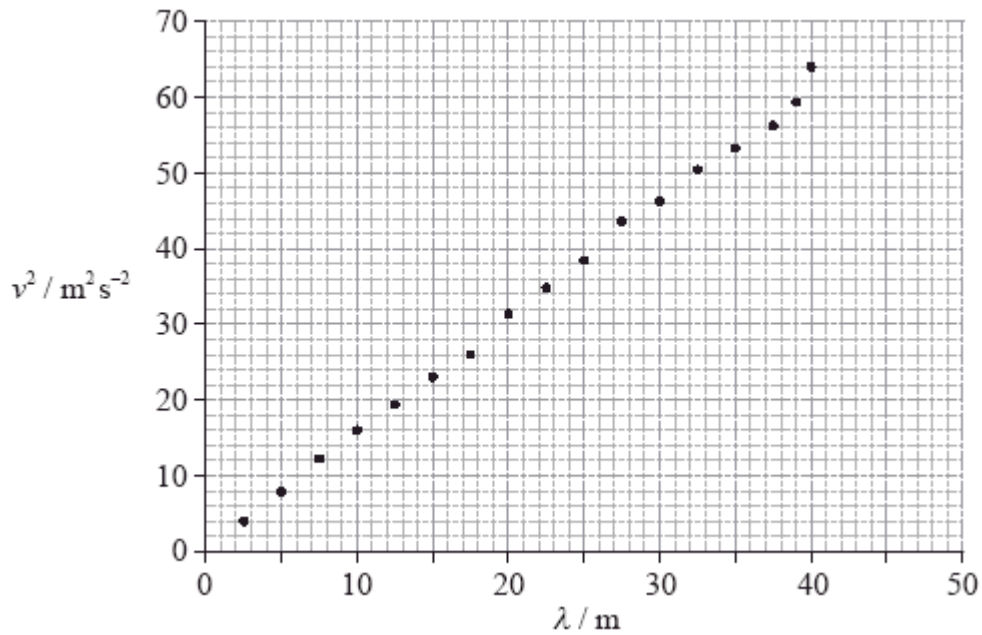
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(1)

(c) It is suggested that the relationship between v and λ is of the form

$$v = a\sqrt{\lambda}$$

where a is a constant. To test the validity of this hypothesis, values of v^2 against λ are plotted below.



- (i) Use your answer to (b)(ii) to show that the absolute uncertainty in v^2 for a wavelength of 39 m is $\pm 5 \text{ m}^2 \text{ s}^{-2}$.

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(3)

- (ii) The absolute uncertainty in v^2 for a wavelength of 2.5 m is $\pm 1 \text{ m}^2 \text{ s}^{-2}$. Using this value and the value in (c)(i), construct error bars for v^2 at the data points for $\lambda = 2.5 \text{ m}$ and 39 m.

(1)

- (iii) State why the plotted data in (c)(ii) suggest that it is likely that v is proportional to $\sqrt{\lambda}$.

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(1)

- (iv) Use the graph above to determine the constant a .

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(3)

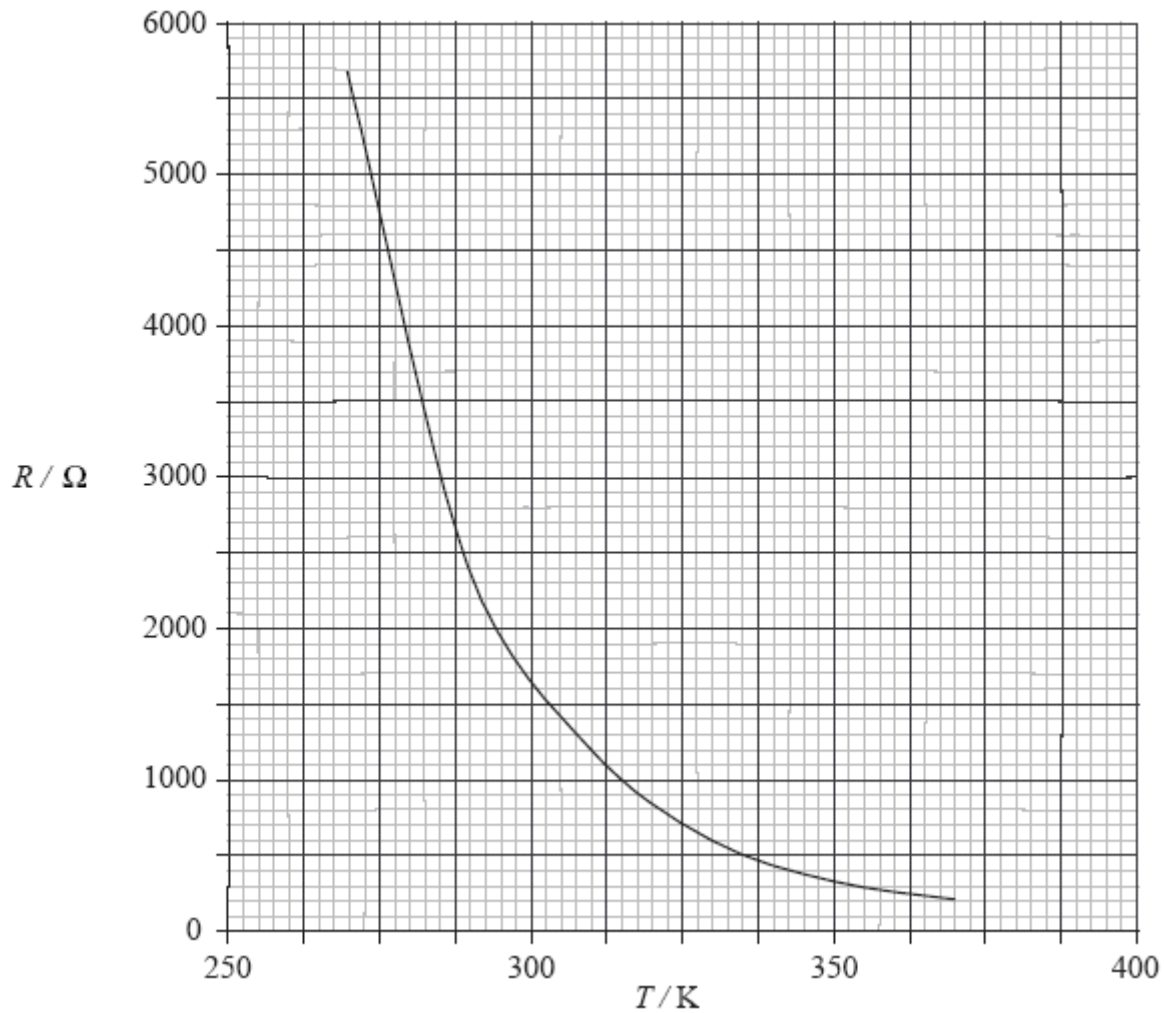
(v) Theory shows that $a = \sqrt{\frac{k}{2\pi}}$. Determine a value for k .

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(1)

12. This question is about electrical resistance.

The graph shows the variation with temperature T of the resistance R of an electrical component.



(a) A student hypothesizes that the resistance is inversely proportional to the temperature. Use data from the graph to show whether the hypothesis is supported.

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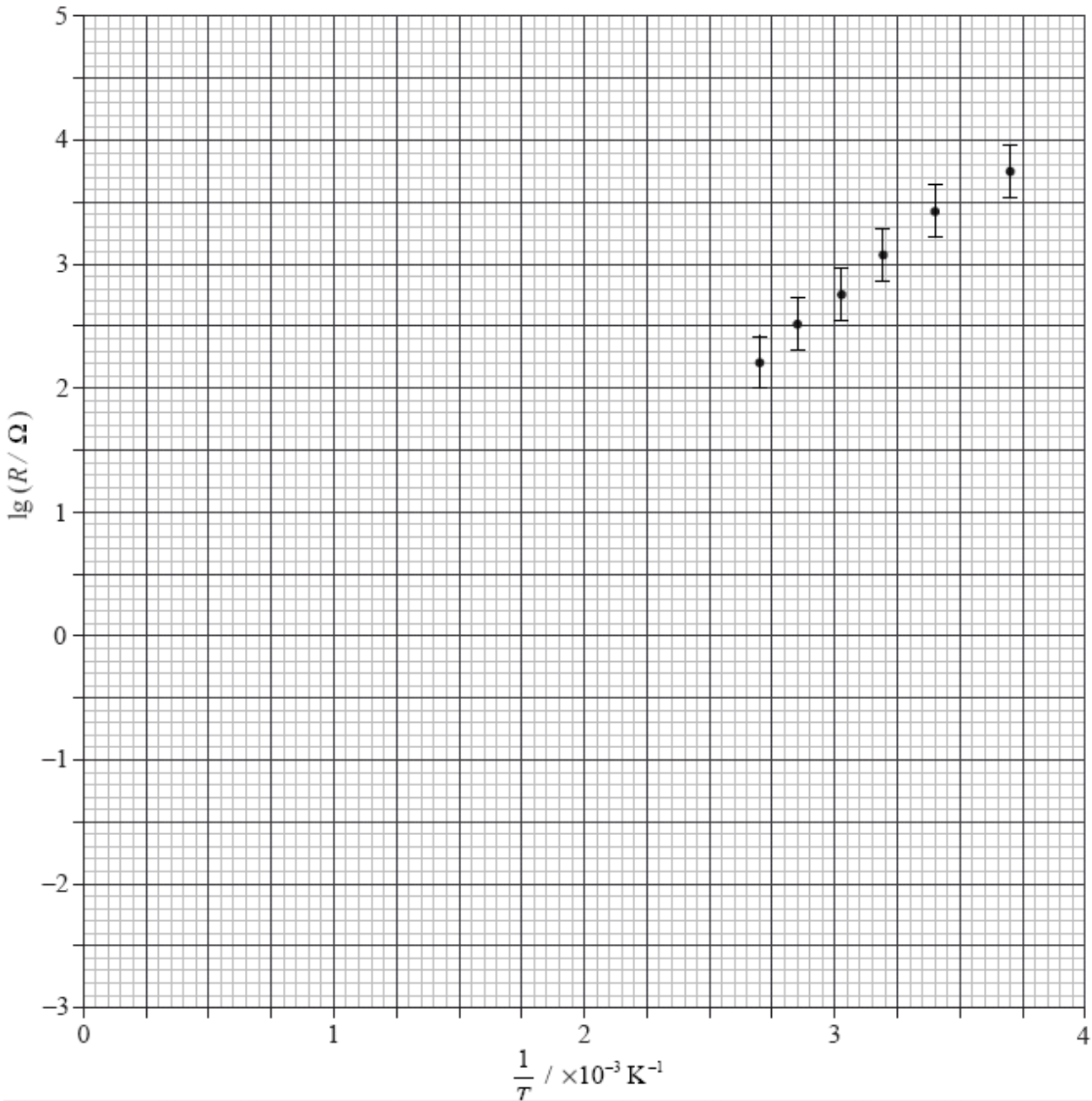
(3)

(b) A second student suggests that the relationship is of the form

$$\lg R = a + \frac{b}{T}$$

where a and b are constants.

The student plots the graph below. Error bars have been included for the sake of clarity.



(i) Explain how the graph drawn could be used as evidence to support the student's suggestion.

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(2)

(ii) Use the graph to determine the constants a and b .

b :
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a :
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(4)

(iii) Using your answers to (b)(ii), determine a value for the resistance of the component at a temperature of 260 K.

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(2)