IB Physics SL Y2 – Paper 1 and Paper 2 Review – Topic 1 Assignment (17 Marks)

Name: _____ Date: _____ Period: _____

Objectives:
1.1 The realm of physics
1.2 Measurement and uncertainties
1.3 Vectors and scalars

Which of the following is equivalent to the joule?

A. $\mathrm{N\,m^2}$

B. $\mathrm{N\,m^{-2}}$

C. $\mathrm{kg\,m\,s^{-2}}$

D. $\mathrm{kg\,m^2\,s^{-2}}$

An object falls for a time of $0.25\,\mathrm{s}$. The acceleration of free fall is $9.81\,\mathrm{m\,s^{-2}}$. The displacement is calculated. Which of the following gives the correct number of significant digits for the calculated value of the displacement of the object?

A. 1

B. 2

C. 3

D. 4

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

A. $10^{-23}\,\mathrm{s}$.

B. $10^{-20}\,\mathrm{s}$.

C. $10^{-15}\,\mathrm{s}$.

D. $10^{-7}\,\mathrm{s}$.

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. $\pm 600\,\text{mm}^3$

The current in a resistor is measured as 2.00 A ± 0.02 A. Which of the following correctly identifies the absolute uncertainty and the percentage uncertainty in the current?

	Absolute uncertainty	Percentage uncertainty
A.	±0.02 A	±1 %
B.	±0.01 A	±0.5 %
C.	±0.02 A	±0.01 %
D.	±0.01 A	±0.005 %

Which of the following lists **only** two vector quantities?

A. mass, energy, work

B. momentum, work, speed

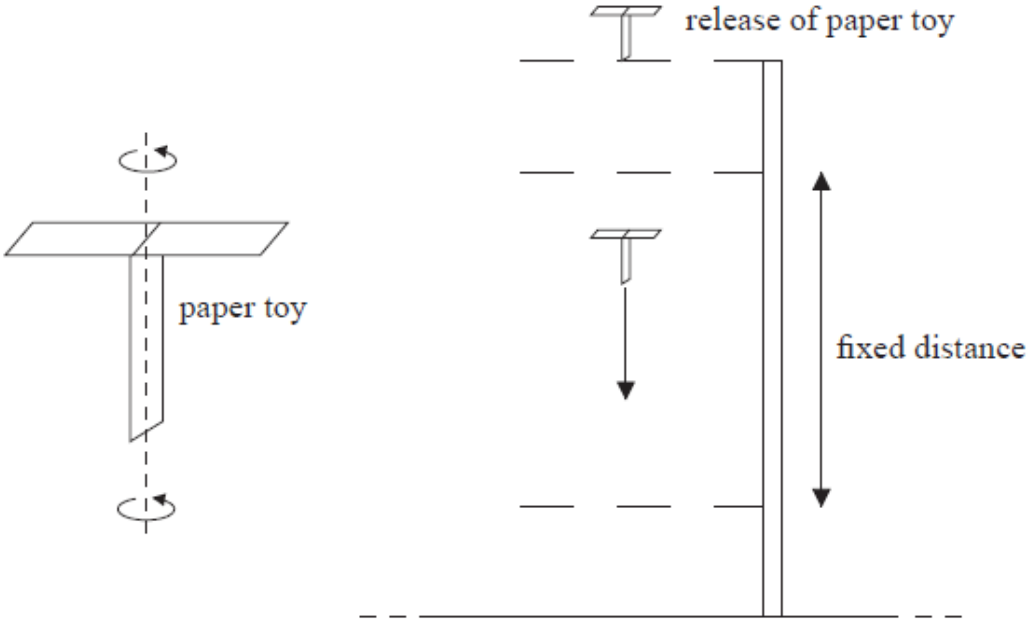
C. weight, force, acceleration

D. momentum, energy, displacement

Answer all the questions in the spaces provided.

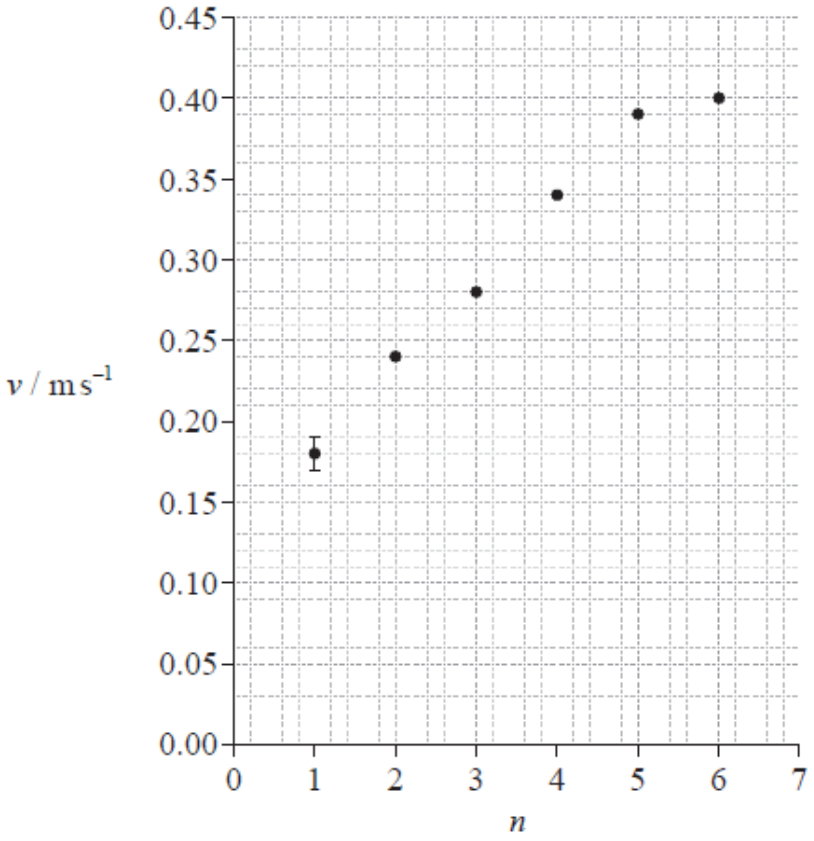
A1. Data analysis question.

A student performs an experiment with a paper toy that rotates as it falls slowly through the air. After release, the paper toy quickly attains a constant vertical speed as measured over a fixed vertical distance.



The aim of the experiment was to find how the terminal speed of the paper toy varies with its weight. The weight of the paper toy was changed by using different numbers of paper sheets in its construction.

The graph shows a plot of the terminal speed v of the paper toy (calculated from the raw data) and the number of paper sheets n used to construct the toy. The uncertainty in v for $n=1$ is shown by the error bar.



(a) The fixed distance is 0.75 m and has an absolute uncertainty of 0.01 m. The percentage uncertainty in the time taken to fall through the fixed distance is 5 %.

(i) Calculate the absolute uncertainty in the terminal speed of the paper toy for $n=6$. *[3]*

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(ii) On the graph, draw an error bar on the point corresponding to $n=6$. *[1]*

(b) On the graph, draw a line of best-fit for the data points. *[1]*

(c) The student hypothesizes that v is proportional to n. Use the data points for $n = 2$ and $n = 4$ from the graph opposite to show that this hypothesis is incorrect. *[3]*

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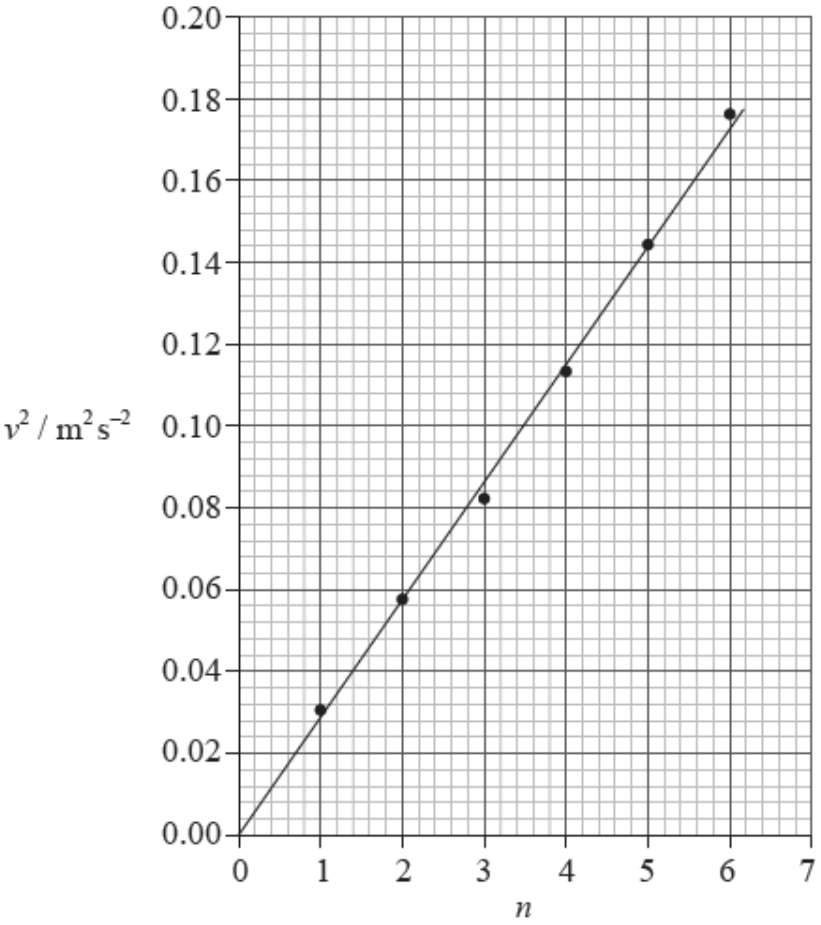
(d) Another student hypothesized that v might be proportional to $\sqrt{n}$. To verify this hypothesis he plotted a graph of v^2 against n as shown below.



Explain how the graph verifies the hypothesis that v is proportional to $\sqrt{n}$. *[3]*

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