Question 1

Given:

Mass = 2.25 ± 0.021kg

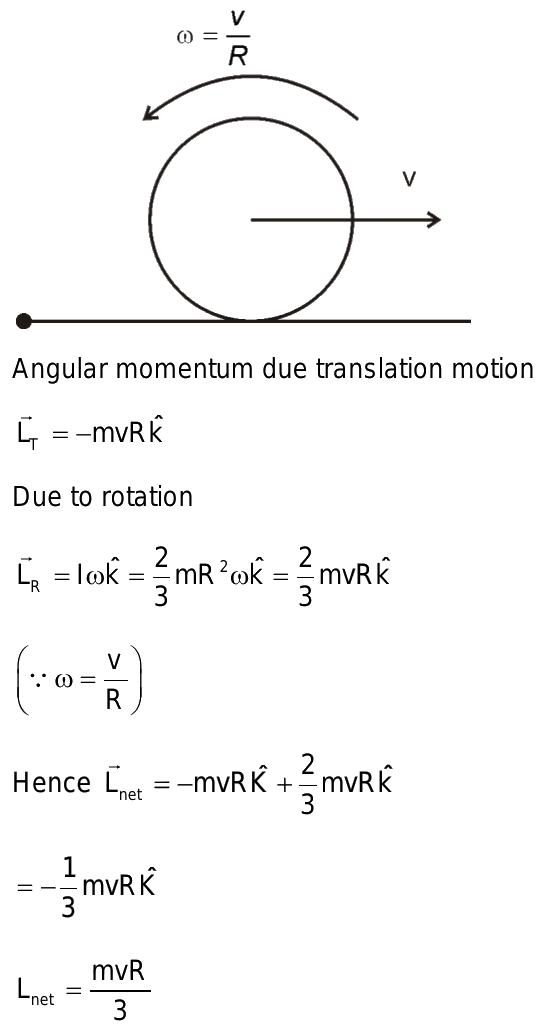
Radius = 0.180 ± 0.0030m   
𝜔 = 17.5 ± 0.250 rad/s

L = 1/2MR2 𝜔

Find:

The angular momentum 𝐿 and its uncertainty.

Diagram:



Theory: Propagation of error formula

A square with a square in it

Description automatically generated with medium confidence

Assumptions: Uncertainties in mass, radius, and angular velocity are independent.

Solution:

L = 0.64 ± 0.02 kgm^2/s

Question 2

Given:

Find:

1. What is the predicted value of T?
2. Is a measured value of is consistent with the theoretical prediction from part a.

Diagram:

A graph paper with a graph and a diagram

Description automatically generated

Theory:

* the period T of a simple pendulum is

Assumptions:

We can assume we will need to get the and values to compare to the theoretical prediction.

Solution:

Compute max and min values of the lengths

; ;

-> Max = 1.76, Min = 1.74

Since , only the minimum value would fit here and the max value is not consistent.

Question 3

Given:

v1 = 3.54 ± 0.10m/s

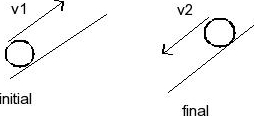
v2 = 8.16 ± 0.10m/s   
t = 2.79 ± 0.10 s

a = (v2-v1)/t

Find:

1. Acceleration and its uncertainty.
2. Compare the measured acceleration with the predicted.

Diagram:



Theory: Propagation of error formula

A square with a square in it

Description automatically generated with medium confidence

Assumptions:

The uncertainties in v1, v2 and t are independent and random.

Solution:

L = 1.656 ± 0.08 m/s^2

Question 4

Given:

* 𝑚1 = 102 ± 1.0 grams
* 𝑚2 = 86 ± 0.90 grams

Find:

* Equation for the uncertainty in the expected acceleration (𝛿𝑎)
* Calculate 𝑎 ± 𝛿𝑎 using the given values

Theory:

* Formula for acceleration is:
* Formula for propagation of uncertainties:

Where:

- 𝛿𝑎 is uncertainty in the acceleration.

- 𝛿𝑚1 is uncertainty in mass 𝑚1.

- 𝛿𝑚2 is uncertainty in mass 𝑚2.

Assumptions: Masses m1 and m2 are independent measurements, there is no correlation between them.

Solution:

Solve for acceleration:

🡪 = 0.835 m/s²

Rearrange the propagation of uncertainties:

𝑎 ± 𝛿𝑎 is approximately 0.835 ± 0.012 m/s².

Question 5

Given:

H = 3.20 ± 0.15

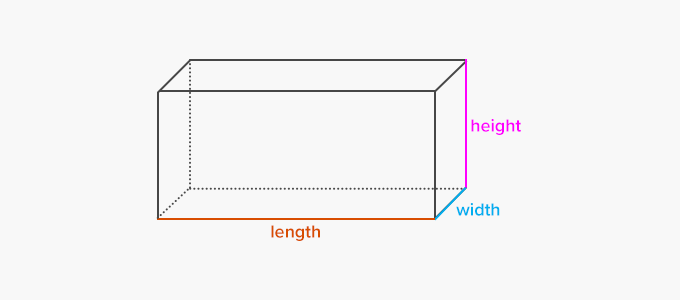
W = 5.00 ± 0.05

L = 4.25 ± 0.13

Find:

1. The volume of the rectangular prism and its associated uncertainty.

Diagram:



Theory: Propagation of error formula

A square with a square in it

Description automatically generated with medium confidence

Volume = Base x Height

Base = Length x Width

Assumptions:

Uncertainties in height, length, width are independent and random

Solution: 