Determining the mass of the rotating object experimentally

(Q-1) Measure the angular speed of the rotor.

<table>
<thead>
<tr>
<th>Trial</th>
<th>Counter readings (rev)</th>
<th>Number of revolutions (rev)</th>
<th>Elapsed time (s)</th>
<th>Angular speed (rev/s)</th>
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Use Rule 8 in “Measurement and Calculation” to calculate the best value for the angular speed and its uncertainty.

\[ N/t = (\text{_______} \pm \text{_______}) \text{rev/s} \]
(Q-2) Find the centripetal force.

Mass needed to stretch spring by the same amount as in (Q-1).

\[ M_{\text{low}} = \underline{\quad} \text{kg} \quad M_{\text{high}} = \underline{\quad} \text{kg} \]

How large is the range of possible values of \( M \)? Why do you suppose it is as high as it is?

Based on your data above, calculate the centripetal force with its uncertainty (use Rule 8 again).

\[ F_c = (\underline{\quad} \pm \underline{\quad}) \text{ N} \]

(Q-3) With the spring still stretched by the hanging weight in (Q-2), measure the radius of the circular path followed by the rotating mass.

\[ r = (\underline{\quad} \pm \underline{\quad}) \text{ cm} \]

(Q-4) Calculate \( m_{\text{exp}} \), including its uncertainty.

\[ m_{\text{exp}} = (\underline{\quad} \pm \underline{\quad}) \text{ kg} \]
Comparing to the known value of the mass

(Q-5) Determine $m_{\text{known}}$ and compare to $m_{\text{exp}}$.
Which mass are you using?

A B C D E F G H I J K L M

$m_{\text{known}} = \underline{\hspace{2cm}}$ kg

Compare $m_{\text{exp}}$ and $m_{\text{known}}$ using the discrepancy test.

Do they agree? Explain.

Exercises

Upon what body does the centripetal force act in this experiment?

(A) The motor.
(B) The pointer.
(C) The spring.
(D) The mass connected to the spring.
(E) The rotor head.

What part of the apparatus exerts the centripetal force?

(A) The motor.
(B) The pointer.
(C) The spring.
(D) The mass connected to the spring.
(E) The rotor head.

How is the centripetal force determined?

(A) It is calculated from the spring constant and the radius $r$.
(B) It is calculated from the spinning mass $m$, the radius of its orbit $r$, and its velocity $v$.
(C) It is measured by hanging a suspended weight which will stretch the spring by the proper amount.
(D) The instructor has the value.
(E) The centripetal force is not needed for this lab.