

OPEN INQUIRY HANGING MASS LAB

Instructions

- Design and carry out an experiment to investigate how the net force on a cart affects its acceleration.
- Collect and record your data, analyze patterns between force and acceleration, and create a graph to support your findings.
- Complete a lab report on a separate paper or in your lab notebook with all required sections:
 - Title
 - Goal
 - Hypothesis
 - Procedure
 - Data Tables
 - Graph
 - Analysis
 - Conclusion

Consider these guiding questions:

- How does the mass of the hanging weight influence the cart's acceleration?
- How does the mass of the cart affect acceleration for a given force?
- What is the relationship between force, mass, and acceleration?

Planning Your Investigation

1. Decide how you will measure acceleration. Will you use time over a fixed distance, or another method?
2. Determine which variables you will test and which you will keep constant (e.g., cart mass, track length).
3. Choose how many trials you will perform for each condition to ensure reliable data.
4. Record your plan in your lab notebook, including diagrams of your setup if helpful.

Conducting the Experiment

- Collect data systematically according to your plan.
- Measure and record the mass of the cart and the hanging weights.
- Repeat trials to reduce random errors.

- Keep detailed notes of observations and any unexpected occurrences.

Data Recording

Create your own data tables. At minimum, record:

- Hanging mass (kg)
- Cart mass (kg)
- Distance traveled (m)
- Time or other measurements used to calculate acceleration
- Calculated acceleration (m/s^2)
- Force applied ($F = m_{\text{hang}} \times g$)

Analysis and Graphing

- Graph your results to explore the relationship between force and acceleration.
- Look for patterns and trends in your data.
- Compare your findings to theoretical predictions using $F = ma$.

Reflection Questions

1. What patterns did you observe between force and acceleration?
2. How did changing the cart mass or hanging mass affect acceleration?
3. How do your results compare with Newton's Second Law?
4. What were the main sources of uncertainty in your experiment, and how could you reduce them?
5. How would you improve your investigation if you repeated it?

