POPPY SCHOLARS · PHYSICS OF THE UNIVERSE

Home lab 1 · Unit 1 · about 45 minutes

Does a car rolling down a ramp speed up at a constant rate, and what is that rate?

Name _____ Date _____

MATERIALS

You supply everything. Tick each item as you gather it.

- ☐ A smooth board or ramp about 2 m long (a plank, a shelf board or a folding table leaf)
- ☐ A stack of books to raise one end exactly 8 cm
- ☐ A toy car or a similar rolling object
- ☐ A tape measure, masking tape, and a phone stopwatch
- ☐ Graph paper or a spreadsheet and a calculator

SAFETY

Stop the car at the bottom with a book, so that it does not hit your feet or roll off a table. Keep the ramp stable. Keep fingers clear of the car at the bottom.

PROCEDURE

1. Prop one end of the board on a stack of books so that the end is 8 cm higher than the other. Measure the length of the board along its slope (it should be about 2.00 m).
2. Mark the starting line at the top, and mark distances of 0.50, 1.00, 1.50 and 2.00 m down the slope from the starting line.
3. Release the car from rest at the starting line, without pushing it. Time how long it takes to reach the 0.50 m mark.
4. Repeat 3 times for each of the four distances, always releasing from the same starting line.
5. Compute the mean time for each distance and the square of the mean time.
6. Graph distance (vertical) against time squared (horizontal). If the car has constant acceleration, the points lie on a straight line through the origin, and $d = \frac{1}{2} a t^2$ means the slope is $a \div 2$.

RECORD YOUR DATA

Distance (m)	Trial 1 (s)	Trial 2 (s)	Trial 3 (s)	Mean time (s)	Mean time squared (s²)
0.50					
1.00					
1.50					
2.00					

Also write the ramp's length and height, the slope of your graph, the acceleration, and the speed at the bottom.

LAB REPORT

Write a report that gives your table and graph, shows how you found the acceleration from the slope, compares it with the value g × height ÷ length that you would expect with no friction, and explains your graph's shape.

Include the speed of the car at the bottom of the ramp, found with $v = a \times t$.

Report the numbers you actually got, even when they disagree with the lesson. Write on the lines, or type your report on the website and send it to a teacher there.

Question and hypothesis *State the question in your own words, what you expect to happen, and why you expect it.*

Method *What you changed, what you measured, what you kept the same, and how many trials you ran.*

Observations *Describe what you saw, including anything unexpected. Your data tables are added to the report automatically.*

Calculations *Show each calculation step by step, with units.*

Claim and reasoning *Answer the question using your numbers, then explain why, using the science from the unit.*

Limits and next step *What could have affected your results, and one change you would make next time.*