

Acceleration due to Gravity Lab

Objective Determine the acceleration due to gravity g using video analysis

Introduction In this lab, a mass will be dropped from a height of 2.0 m. A dot-by-dot analysis of the mass in free fall will be used to determine the position of the object at set times.

Pre-Lab

1. Assuming no air resistance, describe the motion of an object in free fall.
2. Determine the number of dots the ticker timer creates every second (dps).
3. Determine how many seconds 1 dot would correspond to.
4. Determine how many dots would correspond to 0.08 s.
5. Explain how the acceleration of an object can be determined using a velocity vs time graph.

Acceleration due to Gravity

A ticker timer ticks 50 times per second (every 0.02 seconds).

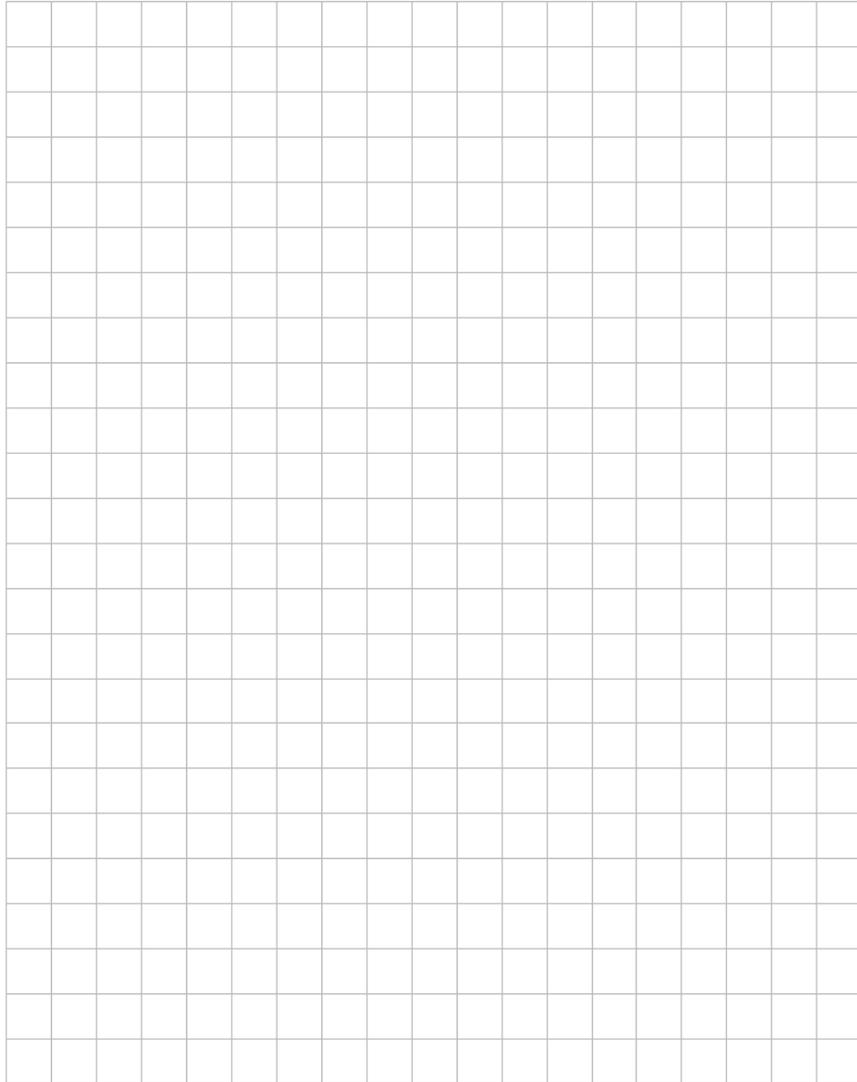
Experimental Method

1. Cut a 3-metre section of tape.
2. Tape a 50 gram mass onto the end of the tape.
3. Thread the tape all the way through the first slot in the ticker timer.
4. Slip the tape between the black carbon paper of the ticker.
5. Thread the tape all the way through the second slot in the ticker timer
6. Pull the tape all the way through until the mass reaches the ticker.
7. Straighten the ticker tape so that there are no bends, folds, or rolls.
8. Hold the ticker tape loosely at the end of the tape without the mass.
9. Turn on the power.
10. Carefully drop the weight so that it pulls the ticker tape through the machine.
11. Mark the first clear dot with a 0. Look carefully and identify when the mass started to fall.
12. Mark **every fourth dot** with a number counting up from that first dot.
13. Record your measurements in the table below.

Continue until the mass hits the floor. Do not include any measurements after the mass hits the floor.

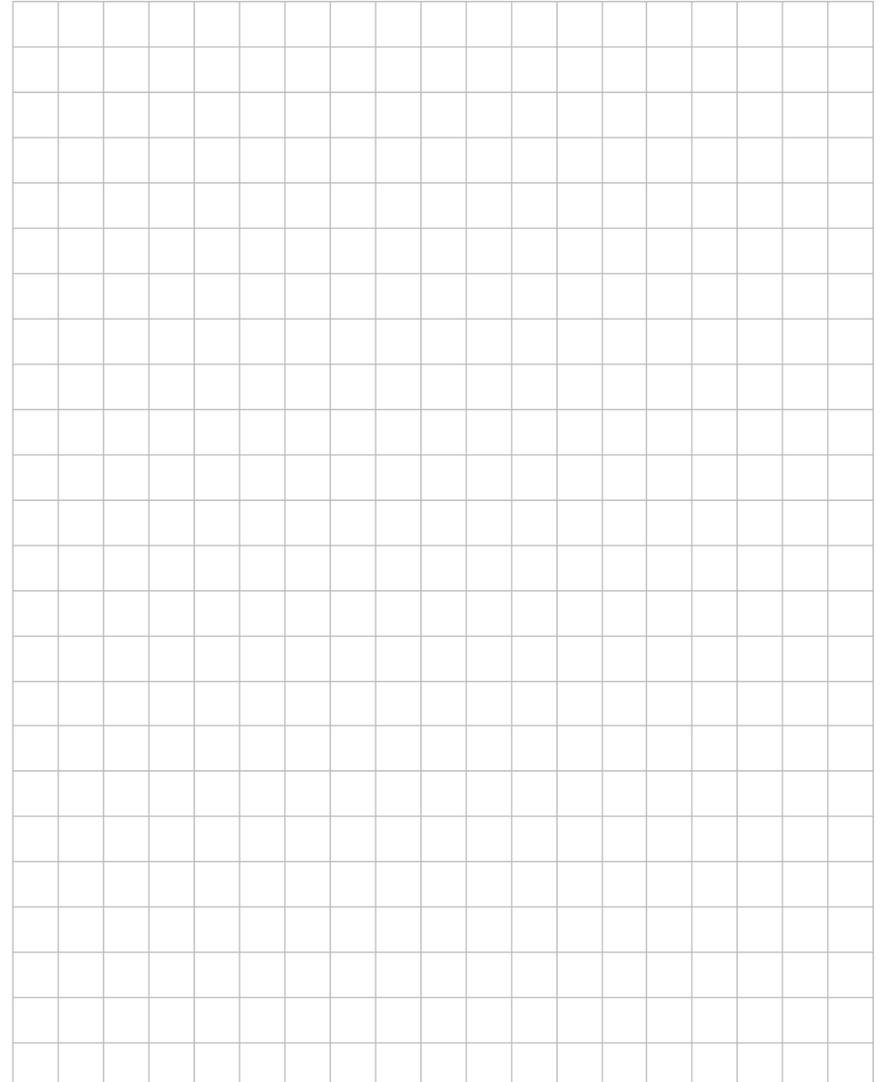
Position vs. Time Graph

Draw a graph of position vs. time. Include a best fit curve.



Velocity vs. Time Graph

Draw a graph of velocity vs. time. Include a best fit line.
Note: Because we are finding an average, use the mid-point of each time interval to plot the velocity values. (e.g. the velocity for 0.04 s - 0.08 s should be plotted at 0.06 s)



Analysis & Discussion

1. Determine the slope of the best fit line of the velocity vs. time graph. Clearly mark the triangle on the line that you use to calculate the slope. Be sure to include units.
2. Describe the quantity that the slope represents.
3. Compare your experimental result for the acceleration due to gravity to the accepted value of 9.8 m/s^2 .
4. Determine your percent error using $\frac{\text{experimental result} - \text{accepted value}}{\text{accepted value}} \cdot 100\%$.
5. Discuss at least two sources of error that could have contributed to the percent error that you measured.
6. Conclusion: Briefly summarize what you achieved in the lab and how you achieved that result.

Apparatus Diagram

Draw an apparatus diagram

- Diagrams should be labelled. The labels should be placed appropriately on the diagram.
- Following each label must be a descriptive caption which explains the diagram.
- The reader should be able to understand the diagram without referring to the text.
- The diagram shows equipment essential to the lab.
- The diagram need not show measurement equipment not part of the apparatus.