

UNIVERSITY OF TORONTO
Faculty of Arts and Science

FIRST YEAR PHYSICS LAB
PRACTICAL LABORATORY TEST

Duration - 50 minutes
Calculators without stored data are permitted
No other aids are allowed.

All experimental observations must be recorded in PEN in the exam booklet and data must be plotted (using pen *or* pencil) on the graph paper provided. You are expected to record and analyze your data in the same manner as is normally expected in the lab.

FREE FALL

Simple analysis of the kinematics of a freely falling body, neglecting air resistance, gives

$$\mathbf{s} = \mathbf{v}_0 \mathbf{t} + \frac{1}{2} \mathbf{g} \mathbf{t}^2 \quad (1)$$

and thus

$$\frac{\mathbf{s}}{\mathbf{t}} = \mathbf{v}_0 + \frac{1}{2} \mathbf{g} \mathbf{t} \quad (2)$$

where \mathbf{s} is the vertical displacement between time = 0 and time = \mathbf{t} , \mathbf{v}_0 is the velocity at time = 0 and \mathbf{g} is the acceleration due to gravity.

Using the apparatus provided, obtain, for \mathbf{v}_0 fixed, five values of \mathbf{s} and \mathbf{t} covering a wide range of values. Graphically confirm equation (2) and derive a value for \mathbf{g} . Comment briefly on whether your data indicate that neglecting the air resistance is justified.

N.B. The accuracy of the metal measuring tape is of the order of 1 part in 4000.

TEST STRATEGY ADVICE: Remember to quote units throughout, and use SI (MKS) units in your final result. You will be given credit for your estimate of errors; however it is more important that you have taken adequate data and produced a graph of the results, so leave your error calculations to the last. It is more important to have your results suitably plotted than to achieve the full set of five points. If one of the points doesn't fit your line or curve, it is advisable to repeat that measurement.