CP1c.1 Acceleration due to gravity

Your teacher may watch to see if you can:

- follow instructions carefully.

Aim

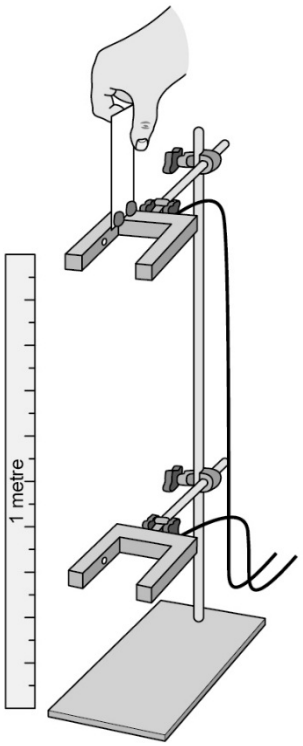
To measure the acceleration in free fall.

Introduction

Falling objects accelerate because the force of gravity is pulling them downwards. We can measure the acceleration caused by gravity (g) by measuring the velocity of a falling object at two points during its fall.

Apparatus

- two light gates
- datalogger
- card weighted at one end with modelling clay
- metre rule
- clamps and stand



Method

A Measure the length of the piece of card.

B Set up the apparatus as shown in the diagram. Enter the length of the card into the computer or datalogger (this is necessary to measure the speed of the card).

C Hold the card above the top light gate and drop it so that it passes through both light gates.

D Read the values for the two velocities from the datalogger, and also the time it took for the card to pass between the two gates. Record the results in your table.

E Repeat steps C and D for different starting heights.

Recording your results

1 Draw a table like this for your results.

Starting height (cm)	Velocity at top light gate (u, in m/s)	Velocity at bottom light gate (v, in m/s)	Time between light gates (t, in s)	Acceleration (m/s^2)

Calculate the acceleration for each drop, using the formula in the box.

$$a = \frac{v - u}{t}$$

Considering your results

2 **a** Are the acceleration values for the different drops similar or do they vary?

b If they vary, is there a pattern? You may need to draw a graph to see if a pattern exists.

c If the results are similar, calculate the mean acceleration.

I can…

- use the formula relating acceleration, velocity and time
- estimate the magnitudes of some everyday accelerations.