

Investigation of the terminal speed of a falling object

Introduction

When objects fall through the air, they accelerate until they reach a maximum speed - known as the terminal speed. You are going to investigate how the terminal speed of a falling object depends upon its mass. You are going to use paper cake cases. These are quite light and have a relatively large area. They reach their terminal speed after falling a very short distance.

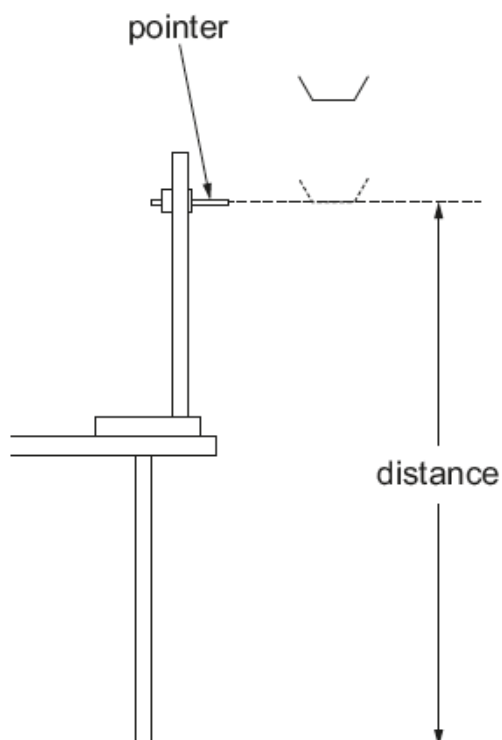
Apparatus

6 × paper cake cases
stopwatch
2 × metre rulers ± 1 mm
clamp stand, boss and clamp
pointer (e.g. pencil)

Access to:

electronic balance ± 0.1 g

Diagram of Apparatus



Method

1. Set up a pointer in the clamp stand and adjust its height to a convenient level above the floor, e.g. 150 cm. Record this height accurately.
2. Take a single cake case and record its mass.
3. Drop the cake case from a height well above (e.g. about 20 cm) the pointer and record the time it takes to fall from the level of the pointer to the floor.
4. Repeat step 3 another four times.
5. Repeat steps 2 to 4 with 2, 3, 4, 5 and 6 cake cases in a stack.

Analysis

1. Calculate the terminal speed of each stack of cake cases using:

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

2. Plot the number of cake cases against the terminal speed.