Dept. of Education and Science – Revised Sample Paper

Question 12(a).

An object starts from rest and accelerates at 2m s^{-2}. By calculating the distance travelled after each second, sketch the distance-time graph for the first three seconds of its motion.

Outline how you would measure acceleration in the laboratory.

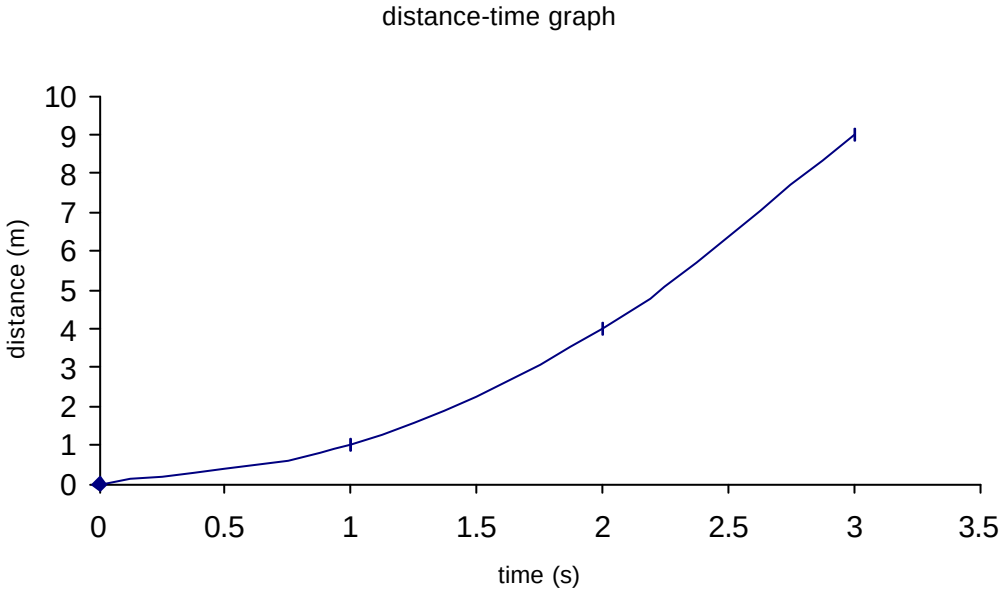
A snake is capable of very high acceleration in a short period of time.
A snake can accelerate its head at 8 m s^{-2}. What is the shortest length of time it will take the snake, starting from rest, to strike a mouse, which is one metre from its head?

By calculating the distance travelled after each second, sketch the distance-time graph for the first three seconds of its motion.

$S = ut + \frac{1}{2}at^2$

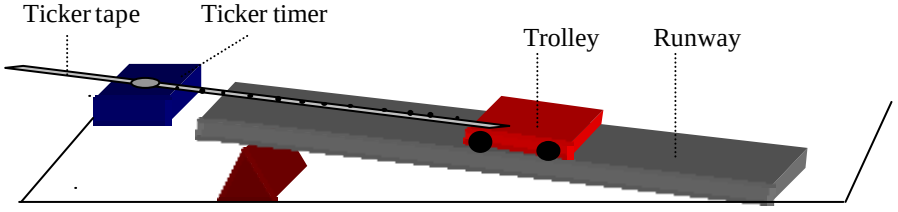
$S = \frac{1}{2}at^2$ .... $u = 0$

When t = 0, $S = \frac{1}{2}(2)(0)^2 = 0$ m
t = 1, $S = \frac{1}{2}(2)(1)^2 = 1$ m
t = 2, $S = \frac{1}{2}(2)(2)^2 = 4$ m
t = 3, $S = \frac{1}{2}(2)(3)^2 = 9$ m

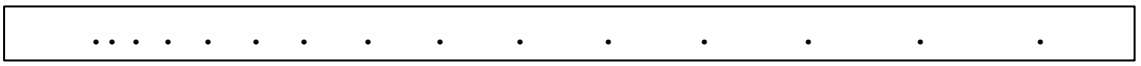


Outline how you would measure acceleration in the laboratory

Set up apparatus as shown



Determine the initial velocity u from, say, 5 dots near the beginning of the tape and the final velocity v from 5 dots near the end of the tape (Measure the distance covered by the five dots, s, in the time 0.1s and use speed = distance/time). Then count the number of dots between mid-intervals to get the time taken, t, for the velocity change to occur.
Substitute into v = u + at to determine the acceleration a.



A snake can accelerate its head at 8 m s^{-2}. What is the shortest length of time it will take the snake, starting from rest, to strike a mouse, which is one metre from its head?

u = 0 m
a = 8 m s^{-2}
s = 1 m

$s = ut + \frac{1}{2}at^2$
$1 = 0 + \frac{1}{2}(8)t^2$
$1 = 4t^2$
$t^2 = \frac{1}{4}$
$t = \frac{1}{2}$ s