

- 3 A ball falls from rest onto a flat horizontal surface. Fig. 3.1 shows the variation with time t of the velocity v of the ball as it approaches and rebounds from the surface.

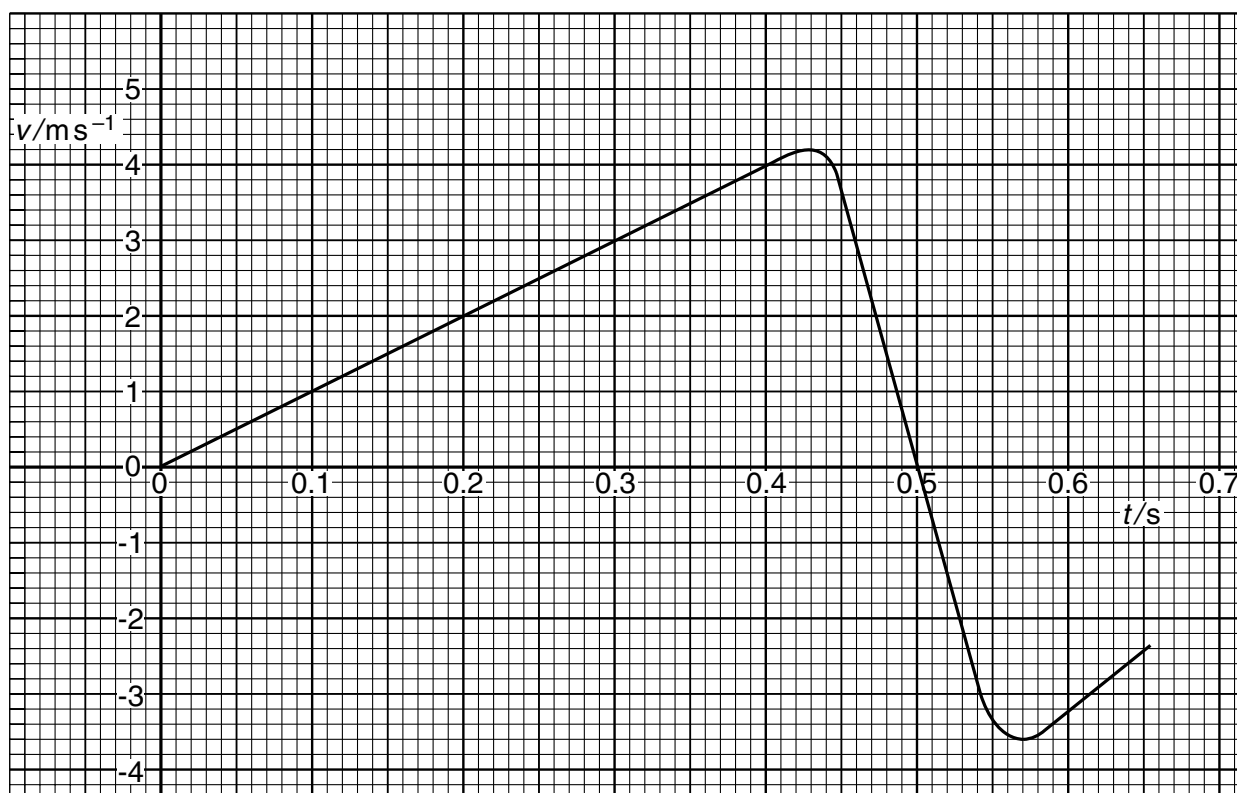


Fig. 3.1

Use data from Fig. 3.1 to determine

- (a) the distance travelled by the ball during the first 0.40 s,

distance = m [2]

- 4 A steel ball of mass 73 g is held 1.6 m above a horizontal steel plate, as illustrated in Fig. 4.1.

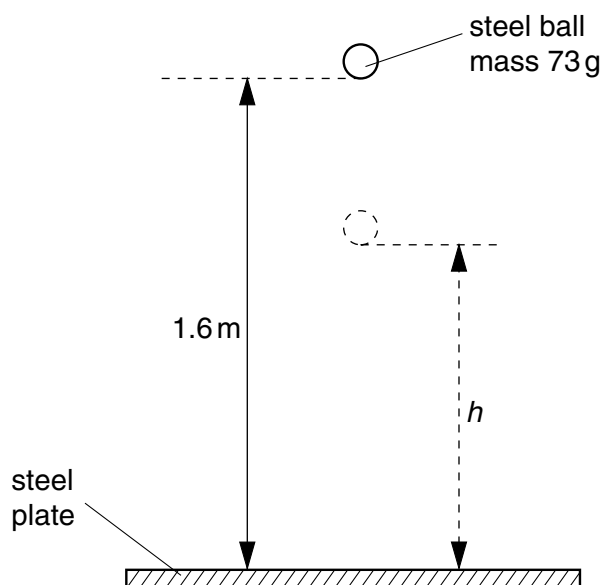


Fig. 4.1

The ball is dropped from rest and it bounces on the plate, reaching a height h .

- (a) Calculate the speed of the ball as it reaches the plate.

speed = m s^{-1} [2]

- (b) As the ball loses contact with the plate after bouncing, the kinetic energy of the ball is 90% of that just before bouncing. Calculate

- (i) the height h to which the ball bounces,

h = m

- (ii) the speed of the ball as it leaves the plate after bouncing.

speed = m s^{-1} [4]

- (c) Using your answers to (a) and (b), determine the change in momentum of the ball during the bounce.

change = Ns [3]

- (d) With reference to the law of conservation of momentum, comment on your answer to (c).

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.....
.....[3]

Answer **all** the questions in the spaces provided.

1 Distinguish between the *mass* of a body and its *weight*.

mass

.....

weight

.....[4]

2 A student determines the acceleration of free fall using the apparatus illustrated in Fig. 2.1.

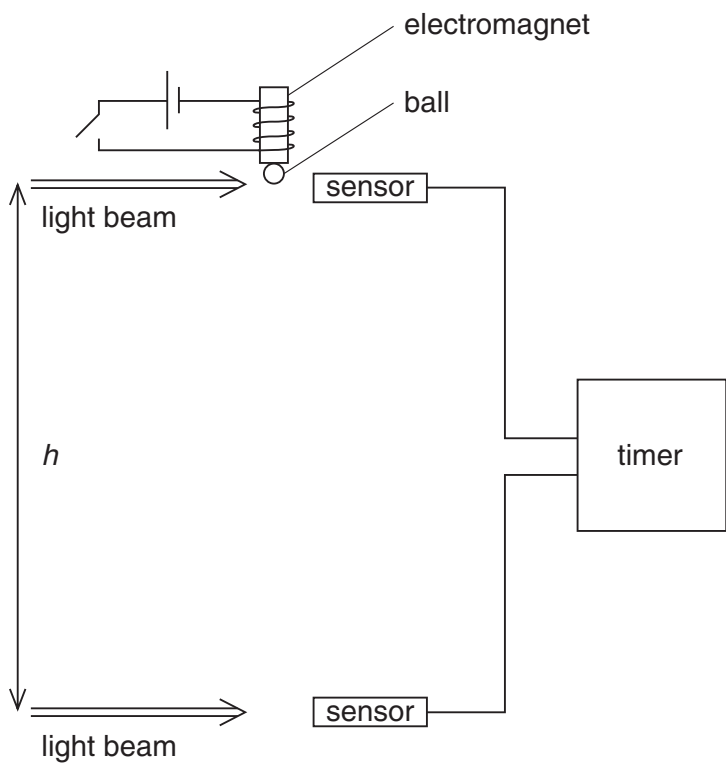


Fig. 2.1

A steel ball is held on an electromagnet. When the electromagnet is switched off, the ball immediately interrupts a beam of light and a timer is started. As the ball falls, it interrupts a second beam of light and the timer is stopped. The vertical distance h between the light beams and the time t recorded on the timer are noted. The procedure is repeated for different values of h . The student calculates values of t^2 and then plots the graph of Fig. 2.2.

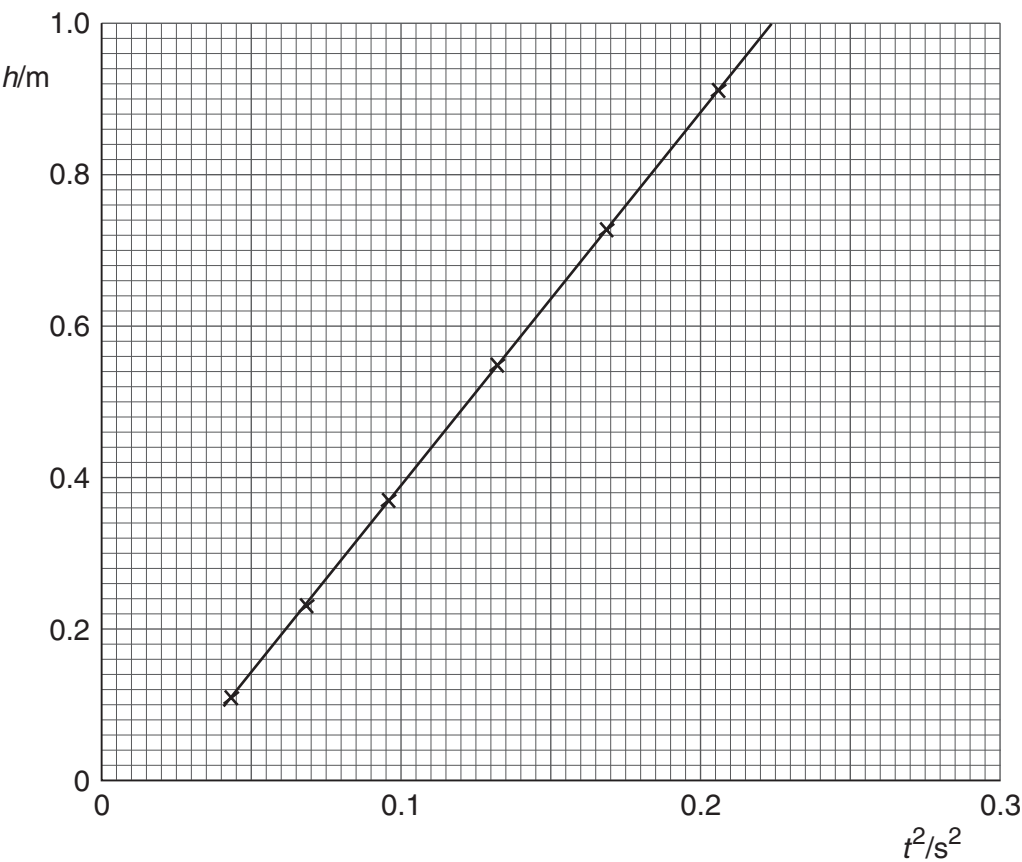


Fig. 2.2

(a) Use Fig. 2.2 to calculate a value for g , the acceleration of free fall of the ball. Explain your working.

$g = \dots\dots\dots \text{ms}^{-2}$ [4]

(b) Identify one possible source of random error in the determination of g and suggest how this error may be reduced.

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.....[2]