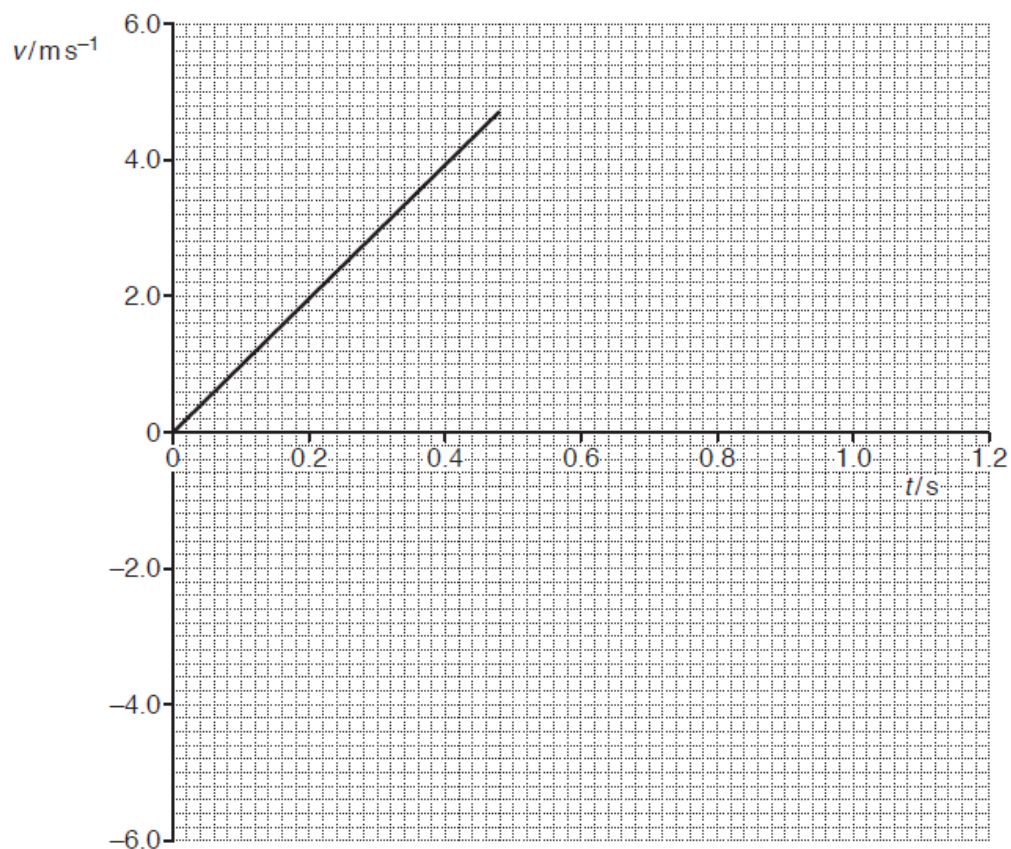


**AS Level Physics A**  
**H156/02** Depth in physics

**Question Set 16**

1

A student investigates the motion of a tennis ball of mass 57 g which falls vertically from rest, then bounces once on a soft horizontal surface. Fig. 1 shows the variation with time  $t$  of the velocity  $v$  of the tennis ball falling from rest until it hits the soft surface.



**Fig. 1**

Air resistance had a negligible effect on the motion of the tennis ball.

**(a)**

Use Fig. 1 to show that

**(i)** the acceleration of the falling ball is about  $10 \text{ ms}^{-2}$

[1]

**(ii)** the kinetic energy of the ball just before impact with the surface is 0.63 J.

[2]

- (b) The ball leaves the surface with 80% of the kinetic energy just before impact.
- (i) Calculate the magnitude of the velocity  $v$  of the ball as it leaves the surface.

$$v = \dots\dots\dots \text{ms}^{-1}$$

[3]

- (ii) Complete Fig. 1 to show the variation of the velocity of the ball after it leaves the surface until it is at rest again.

[2]

Determine the maximum height  $h$  reached by the ball after it bounces.

$$h = \dots\dots\dots \text{m}$$

[2]

- (c) The student repeats the experiment with a different ball that is affected by air resistance.

Explain how the graph in Fig. 1 now appears from the time the ball is released to the time it hits the surface.

[2]

**Total Marks for Question Set 16: 12**

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