

Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

2 Kinematics in one dimension

Exercise C, Question 3

Question:

A ball is thrown upwards with an initial speed of 14.7 m s^{-1} from a height of 1 m above ground level.

(a) Find the time that it takes the ball to reach its maximum height.

(b) Find the maximum height of the ball above ground level.

(c) Find the speed of the ball when it hits the ground.

Solution:

$$v = u + at$$

$$0 = 14.7 + (-9.8)(t_1)$$

$$(a) \therefore 9.8t_1 = 14.7$$

$$t_1 = \frac{14.7}{9.8} = 1.5 \text{ seconds}$$

$$v^2 = u^2 + 2as$$

$$0^2 = 14.7^2 + 2(-9.8)(h_1)$$

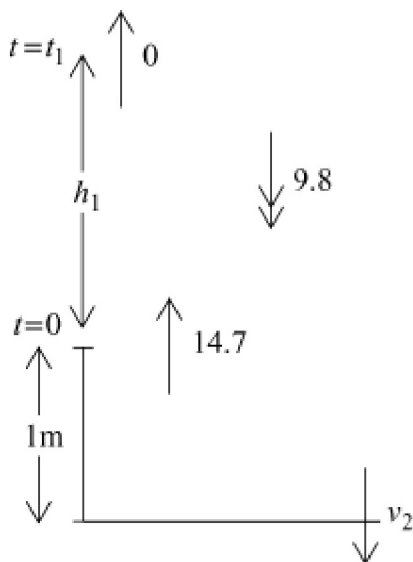
$$(b) \therefore 19.6h_1 = 14.7^2$$

$$h_1 = \frac{14.7^2}{19.6} = 11.025$$

\therefore maximum height above ground

$$= h_1 + 1 = 11.025 + 1$$

$$= 12.025 \text{ metres} = 12.0 \text{ metres (3 s.f.)}$$



$$\begin{aligned}v^2 &= u^2 + 2as \\(c) \quad (-v_2)^2 &= (14.7)^2 + 2(-9.8)(-1) \\v_2^2 &= 235.69 \\\therefore v_2 &= \sqrt{235.69} = 15.352\dots = 15.4 \text{ m s}^{-1} \text{ (3 s.f.)}\end{aligned}$$

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