

# Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

## 2 Kinematics in one dimension

### Exercise C, Question 7

#### Question:

A stone is released from rest and falls vertically through a distance of 22.5 metres before hitting the ground.

- Calculate the velocity of the stone as it hits the ground.
- Calculate the time between the stone being released and hitting the ground.
- Sketch a velocity-time graph to show the motion of the stone while it is falling.
- State one modelling assumption that you have made in order to answer the question. [A]

#### Solution:

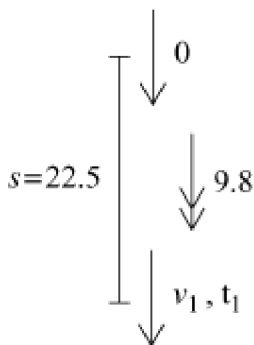
$$v^2 = u^2 + 2as$$

$$v_1^2 = 0^2 + 2(9.8)(22.5)$$

$$(a) v_1^2 = 441$$

$$\therefore v_1 = \sqrt{441} = 21$$

$$\text{i.e. } v_1 = 21.0 \text{ m s}^{-1} \text{ (3 s.f.)}$$



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

$$22.5 = 0 \times t_1 + \frac{1}{2}(9.8)t_1^2$$

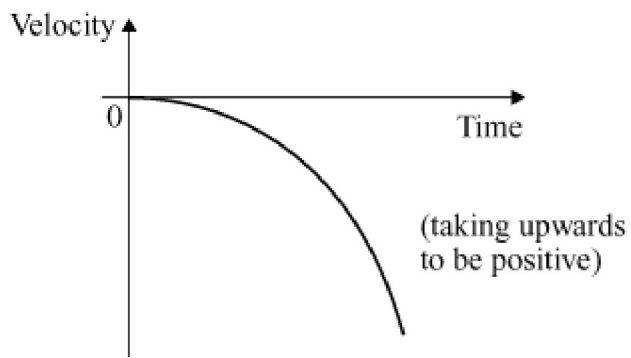
$$(b) \therefore \frac{22.5}{4.9} = t_1^2,$$

$$\text{i.e. } t_1^2 = 4.5918\dots$$

$$\therefore t_1 = \sqrt{4.5918} = 2.1428\dots$$

$$\text{i.e. } t_1 = 2.14 \text{ s (3 s.f.)}$$

(c)



(d) no air resistance.

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