

Vertical SUVAT

Question Number	Scheme	Marks
2. (a)	$-6.45 = u - 9.8 \times 0.75$ $0.9 = u$ **	M1 A1 A1 (3)
(b)	$0 = 0.81 - 2 \times 9.8 \times s$ $s = 0.041$ or 0.0413	M1 A1 (2)
(c)	$h = -0.9 \times 0.75 + 4.9 \times 0.75^2$ $h = 2.1$ or 2.08	M1 A1 A1 (3) [8]

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Mark Scheme

Question Number	Scheme	Marks
1. (a)	$0^2 = u^2 - 2 \times 9.8 \times 40$ $u = 28 \text{ m s}^{-1} \quad ** \text{ GIVEN ANSWER}$	M1 A1 A1 (3)
(b)	$33.6 = 28t - \frac{1}{2}9.8t^2$ $4.9t^2 - 28t + 33.6 = 0$ $t = \frac{28 \pm \sqrt{28^2 - 4 \times 4.9 \times 33.6}}{9.8}$ $= 4 \text{ s or } (1.7 \text{ s or } 1.71 \text{ s})$	M1 A1 M1 A1 A1 (5) 8

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Question Number	Scheme	Marks
5 (a)	$v = u + at(\uparrow) \Rightarrow 0 = u - g\left(\frac{25}{14}\right)$ $u = 17 \frac{1}{2} \quad *$	M1 M(A)1 A1 (3)
(b)	$v^2 = u^2 + 2as(\uparrow) \Rightarrow 0^2 = 17.5^2 - 2gs$ $s = 15.6 \quad (\text{m}) \quad \text{or } 16 \text{ (m)}$	M1 A1 (2)
(c)	$s = ut + \frac{1}{2}at^2(\uparrow) \Rightarrow 6.6 = 17.5t - \frac{1}{2}gt^2$ $4.9t^2 - 17.5t + 6.6 = 0$ $t = \frac{17.5 \pm \sqrt{(17.5^2 - 129.36)}}{9.8} = \frac{17.5 \pm 13.3}{9.8}$ $t = 3.142.. (22/7) \quad \text{or } 0.428...(3/7)$ $T = t_2 - t_1 = 2.71 \quad (2.7)$ OR $v^2 = u^2 + 2as(\uparrow) \Rightarrow v^2 = 17.5^2 - 2gx6.6$ $v = \pm 13.3$ $v = u + at(\uparrow) \Rightarrow \pm 13.3 = 17.5 - gt$ $t = \frac{17.5 \pm 13.3}{9.8}$ $= 3.14.. (22/7) \quad \text{or } 0.428..(3/7)$ $T = 3.14.. - 0.428.. = 2.71 \quad \text{or } 2.7$ OR $v^2 = u^2 + 2as(\uparrow) \Rightarrow v^2 = 17.5^2 - 2gx6.6 \quad \text{or } 0^2 = u^2 - 2gx(15.625 - 6.6)$ $v = 13.3 \qquad \qquad \qquad u = 13.3$ $v = u + at(\uparrow) \Rightarrow 0 = 13.3 - gt$ $t = \frac{13.3}{g}$ $T = 2 \times \frac{13.3}{g} = 2.7 \quad \text{or } 2.71$	M1 A1 DM1 A1 (6)
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Question Number	Scheme	Marks
5.	<p>(a) $v^2 = u^2 + 2as \Rightarrow 28^2 = u^2 + 2 \times 9.8 \times 17.5$ Leading to $u = 21$ *</p> <p>(b) $s = ut + \frac{1}{2}at^2 \Rightarrow 19 = 21t - 4.9t^2$ $4.9t^2 - 21t + 19 = 0$ $t = \frac{21 \pm \sqrt{21^2 - 4 \times 4.9 \times 19}}{9.8}$ $t = 2.99$ or 3.0 $t = 1.30$ or 1.3</p> <p>(c) N2L $4g - 5000 = 4a$ $(a = -1240.2)$ $v^2 = u^2 + 2as \Rightarrow 0^2 = 28^2 - 2 \times 1240.2 \times s$ Leading to $s = 0.316$ (m)</p> <p>OR</p> $\frac{1}{2} \times 4 \times 28^2 + 4gs = 5000s$ Work-Energy: $s = 0.316$ or 0.32	<p>M1 A1 A1 (3)</p> <p>cs0</p> <p>M1 A1</p> <p>DM1 A1 A1 (5)</p> <p>M1 A1</p> <p>or 0.32 M1 A1 (4)</p> <p>[12]</p> <p>M1 A1 M1 A1</p>

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Question 5(a)

First M1 for a complete method for finding u e.g.

$$28^2 = u^2 + 2gx17.5$$

or $28^2 = u^2 + 2(-g)x(-17.5)$

or $28^2 = 2gs \Rightarrow s = 40$ then $0^2 = u^2 + 2(-g)x(22.5)$

condone sign errors

First A1 for a correct equation(s) with $g = 9.8$

Second A1 for “ $u = 21$ ” PRINTED ANSWER

N.B. Allow a verification method, but they must state, as a conclusion, that “ $u = 21$ ”, to score the final A1.

Question 5(b)

First M1 for a complete method for finding at least one t value i.e. for producing an equation in t only.
(condone sign errors but not missing terms)

First A1 for a correct quadratic equation in t only or TWO correct linear equations in t only.

Second DM1, dependent on first M1, for attempt to solve the quadratic or one of the linear equations.

Second A1 for 3.0 or 3 or 2.99

Third A1 for 1.3 or 1.30

Question 5(c)

First M1 for resolving vertically with usual rules.

First A1 for a correct equation

Second M1 for use of $v^2 = u^2 + 2as$, with $v = 0$, $u = 28$ or $u = 0$ and $v = 28$ and their a , (or any other complete method which produces an equation in s , which could be negative)

M0 if they haven't *calculated* a value of a .

Second A1 for 0.32 or 0.316. (must be positive since it's a distance)

