Question	Scheme	Marks	AOs
5 (a)	Vertical speed:	M1	3.4
	$-u\sin\theta = u\sin\theta - gt \qquad \left(t = \dfrac{2u\sin\theta}{g}\right)$	A1	1.1b
	Horizontal distance $= u\cos\theta t$	B1	3.4
	$= u\cos\theta \times \dfrac{2u\sin\theta}{g}$	M1	2.1
	$= \dfrac{u^2}{g} \times 2\sin\theta\cos\theta = \dfrac{u^2\sin 2\theta}{g}$ *	A1*	2.2a
		(5)	
(b)	$\dfrac{25^2\sin 2\theta}{g} \geqslant 40 \quad \Rightarrow \quad \sin 2\theta \geqslant \dfrac{40g}{625} \quad (= 0.627.....)$	M1	3.4
	$\Rightarrow (38.8° \leqslant) 2\theta \leqslant 141.2° \qquad \theta_{MAX} = 70.6°(71°)$	A1	1.1b
		(2)	
(c)	Vertical height : $3 = u\sin\theta t - \dfrac{1}{2}gt^2$	M1	3.1b
	$3 = \dfrac{25}{2}t - \dfrac{1}{2}gt^2$	A1	1.1b
	$4.9t^2 - 12.5t + 3 = 0$	M1	3.1a
	$\Rightarrow T = 2.28282.. - 0.26819.. = 2.01 \quad (2.0)$	A1	1.1b
		(4)	
			(11 marks)

Notes:

(a)	
M1	Complete method using *suvat* to find t Condone sign errors and sin/cos confusion
A1	Correct unsimplified equation in t
B1	Correct expression in u, θ and t for the horizontal distance travelled. Seen or implied.
M1	Obtain expression for distance in terms of u and θ
A1*	Correct justification of given answer from correct working.
(b)	
M1	Use given formula or complete *suvat* method to find inequality in θ
A1	71° or 70.6°

(c)	
M1	Use *suvat* to form an equation in t. Condone sign errors and sin/cos confusion
A1	Correct unsimplified equation
M1	Solve to find T
A1	2.0 or 2.01 only