

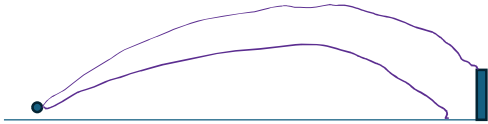
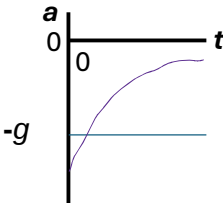


JURONG PIONEER JUNIOR COLLEGE

9478 H2 PHYSICS

PROJECTILE MOTION SOLUTIONS

1(a)	time taken = $50/10 = 5.0$ s Height of cliff = $\frac{1}{2}gt^2 = \frac{1}{2}(9.81)(5)^2$ $= 123$ m	[1] for time [1] for correct substitution and correct answer
	Vertical velocity = $9.81 \times 5 = 49.05 \text{ ms}^{-1}$ Magnitude of velocity = $\sqrt{10^2 + 49.05^2}$ $= 50.1 \text{ ms}^{-1}$ $\tan \theta = \frac{49.05}{10}$ $\theta = 78.5^\circ$ below the horizontal	[1] vertical velocity [1] for correct calculation of v [1] for correct calculation of angle
2(a)	$s = ut + \frac{1}{2}at^2$ $2.44 - 0.200 = 20.0(\sin 37^\circ)t - \frac{1}{2}(9.81)t^2$ $4.905t^2 - 12.04t + 2.24 = 0$ $t = \frac{12.04 \pm \sqrt{12.04^2 - 4(4.905)(2.24)}}{2(4.905)}$ $t = \frac{12.04 \pm 10.05}{9.81}$ $t = 2.25$ s or 0.203 s Possible distance = $2.25(20.0)\cos(37^\circ)$ and $0.203(20.0)\cos(37^\circ)$ $= 35.9$ m or 3.24 m $= 35.9$ m (nearer the centre of field)	[1] for correct substitution of s using vertical component [1] for correct t, using larger t [1] for correct substitution [1] for correct distance.
(b)	$v^2 = u^2 + 2as$ $0 = [20.0\sin(37^\circ)]^2 - 2(9.81)s$ $s = 7.38$ m Height = $7.38 + 0.2 = 7.58$ m	[1] for correct substitution [1] for correct answer

(c)	$v_y^2 = (20.0 \sin 37^\circ)^2 - 2(9.81)(2.44 - 0.20)$ $v_y = 10.046$ $v = \sqrt{(20.0 \cos 37^\circ)^2 + 10.046^2}$ $= 18.9 \text{ m s}^{-1}$ $\tan \theta = \frac{10.046}{20.0 \cos 37^\circ}$ $\theta = 32.2^\circ \text{ below the horizontal.}$	[1] for correct substitution of values [1] for correct magnitude of v [1] for correct angle.
(d)		[1] correct shape [1] lower height and range, steeper on the fall.
(e)		[1] Constant $a = -g$ [1] Larger than g and less than g