

Assessment Schedule – 2016

Physics: Demonstrate understanding of mechanics (91171)

Evidence Statement

Q	Evidence	Achievement	Merit	Excellence
ONE (a)	$v_f^2 = v_i^2 + 2ad$ $1.5^2 = 2 \times a \times 0.50$ $a = 2.3 \text{ m s}^{-2}$	Correct answer.		
(b)	$m_r v_r + m_b v_b$ before = $m_r v_r + m_b v_b$ after $(0.050 \times 1.5) + 0 = (0.040 \times 1.2) + (0.05 \times v)$ $v = 0.54 \text{ m s}^{-1}$	Correct equation and correct substitution.	Correct answer.	
(c)	$\Delta p = 0.04 \times 1.2 = 0.048$ OR $\Delta p = 0.05 \times (1.5 - 0.54) = 0.048$ $\Delta p = F \times t$ $0.048 = F \times 0.08$ $F = 0.60 \text{ N}$	Change in momentum calculated for either car. OR Acceleration calculated for either car if $F = ma$ used.	Correct answer.	
(d)(i) (ii)	<ul style="list-style-type: none"> Centripetal or friction force, acting towards the centre. as this force is acting towards the centre of the circle, it changes the direction of the car's velocity (makes the car go around the circle). as this force is acting at 90° to the direction of travel of the car, it does not change the size of the velocity. 	Correct name and correct direction of the force. OR One correct effect of the force.	Correct name and correct direction of the force. AND ONE correct effect of the force with reason.	Correct name and correct direction of the force. AND BOTH correct effects of the force.

Not Achieved			Achievement		Achievement with Merit		Achievement with Excellence	
NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Very little Achievement evidence.	Some evidence at the Achievement level, but most is at the Not Achieved level.	A majority of the evidence is at the Achievement level.	Most evidence is at the Achievement level.	Some evidence is at the Merit level.	A majority of the evidence is at the Merit level.	Evidence is provided for most tasks. The evidence at the Excellence level may have minor errors, or the evidence is weak.	Evidence is provided for most tasks and the evidence at the Excellence level is accurate.

Q	Evidence	Achievement	Merit	Excellence
TWO (a)	$v_v = 20 \times \sin 40^\circ = 12.856$ $= 12.9 \text{ m s}^{-1}$	Correct working.		
(b)	$v_f = v_i + at$ $0 = 12.9 + -9.8 \times t$ $t = 1.32 \text{ s}$ (or 1.31 if unrounded v_v used)	Correct equation and correct substitution.	Correct answer.	
(c)	time of flight $= 2t = 2 \times 1.32 = 2.64 \text{ s}$ (or 2.62 if unrounded) $v_H = 20 \times \cos 40^\circ = 15.32 = 15.3 \text{ m s}^{-1}$ $d_H = v_H \times \text{time of flight}$ $= 15.3 \times 2.64$ $= 40.4 \text{ m}$ (or 40.2 if unrounded)	Correct total time. OR Correct horizontal velocity.	Correct answer.	
(d)	<ul style="list-style-type: none"> Horizontal velocity remains constant, as there are no external forces in the horizontal direction, air resistance is negligible. Going up, vertical velocity decreases/ball decelerates as the weight force/gravity acts downwards/in an opposite direction to the motion Coming downwards, the vertical velocity increases/ball accelerates as the weight force/gravity is acting downwards/in the same direction as the motion. 	ONE correct statement with correct reason. OR Correct description of both velocities.	TWO correct statements with correct reasons.	Comprehensive explanation.

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N0	N1	N2	A3	A4	M5	M6	E7	E8
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Q	Evidence	Achievement	Merit	Excellence
THREE (a)	$\tau = F \times d$ $= 50 \times 9.8 \times 3.0 = 1470 \text{ N m} = 1500 \text{ N m}$	Correct answer with correct units.		
(b)	Force at support A must be downwards. So the torque by the Force at A is in an opposite direction (anticlockwise) to the total clockwise torque created by Sarah and the weight force of the board.	Correct direction (with an attempt to give some correct explanation).	Correct answer with correct reasoning.	
(c)	$F = kx$ $k = \frac{F}{x} = \frac{50 \times 9.8}{0.05} = 9800 \text{ N m}^{-1}$	Incorrect answer due to mass used as opposed to correctly using (weight) force.	Correct answer.	
(d)	<ul style="list-style-type: none"> • $E_p = \frac{1}{2} kx^2 = \frac{1}{2} \times 9800 \times 0.25^2 = 306 \text{ J}$ • $E_k = E_p$ • $\frac{1}{2} mv^2 = 306 \text{ J}$ so $v = 3.5 \text{ m s}^{-1}$	Elastic potential energy is correctly calculated. OR Idea that the kinetic energy changes into elastic potential energy.	Elastic potential energy is correctly calculated. AND Idea that the kinetic energy changes into elastic potential energy.	Correct answer.

Not Achieved			Achievement		Achievement with Merit		Achievement with Excellence	
NØ	N1	N2	A3	A4	M5	M6	E7	E8
No response; no relevant evidence.	Very little Achievement evidence.	Some evidence at the Achievement level, but most is at the Not Achieved level.	A majority of the evidence is at the Achievement level.	Most evidence is at the Achievement level.	Some evidence is at the Merit level.	A majority of the evidence is at the Merit level.	Evidence is provided for most tasks. The evidence at the Excellence level may have minor errors, or the evidence is weak	Evidence is provided for most tasks and the evidence at the Excellence level is accurate.

Cut Scores

Not Achieved	Achievement	Achievement with Merit	Achievement with Excellence
0 – 6	7 – 13	14 – 18	19 – 24