



Mark Scheme (Results)

January 2026

Pearson Edexcel International Advanced
Subsidiary level In Physics
WPH11/01

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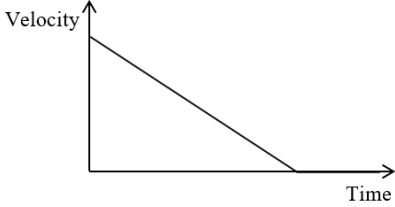
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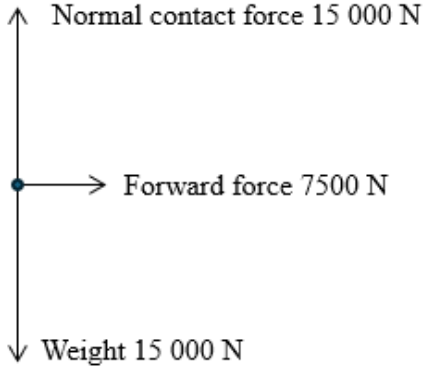
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General Marking Guidance

- All candidates must receive the same treatment. Examiners must mark the first candidate in exactly the same way as they mark the last.
- Mark schemes should be applied positively. Candidates must be rewarded for what they have shown they can do rather than penalised for omissions.
- Examiners should mark according to the mark scheme not according to their perception of where the grade boundaries may lie.
- There is no ceiling on achievement. All marks on the mark scheme should be used appropriately.
- All the marks on the mark scheme are designed to be awarded. Examiners should always award full marks if deserved, i.e. if the answer matches the mark scheme. Examiners should also be prepared to award zero marks if the candidate's response is not worthy of credit according to the mark scheme.
- Where some judgement is required, mark schemes will provide the principles by which marks will be awarded and exemplification may be limited.
- When examiners are in doubt regarding the application of the mark scheme to a candidate's response, the team leader must be consulted.
- Crossed out work should be marked UNLESS the candidate has replaced it with an alternative response.

Question Number	Answer	Mark
1	<p>The only correct answer is C (N)</p> <p>A is not correct because energy is a scalar B is not correct because mass is a scalar D is not correct because power is a scalar</p>	1
2	<p>The only correct answer is D ($s \propto t^2$)</p> <p>A is not correct because $s = ut + \frac{1}{2}at^2$ and $u = 0$ B is not correct because $s = ut + \frac{1}{2}at^2$ and $u = 0$ C is not correct because $s = ut + \frac{1}{2}at^2$ and $u = 0$</p>	1
3	<p>The only correct answer is D (total kinetic energy stays the same and total momentum stays the same)</p> <p>A is not correct because total kinetic energy and total momentum stays the same B is not correct because total kinetic energy stays the same C is not correct because total momentum stays the same</p>	1
4	<p>The only correct answer is B ($\frac{Fx}{\cos \theta}$)</p> <p>A is not correct because x is not the distance moved in the direction of the force C is not correct because y is not the distance moved in the direction of the force D is not correct because the distance moved along the slope is $\frac{y}{\sin \theta}$</p>	1
5	<p>The only correct answer is D ($\sqrt{(20^2 + 35^2)}$)</p> <p>A is not correct because the forces are not in the same direction B is not correct because the forces should each be squared before square rooting the sum of the squares C is not correct because the sum has not been square rooted</p>	1
6	<p>The only correct answer is B</p> <div style="text-align: center;">  <p>The graph shows Velocity on the vertical axis and Time on the horizontal axis. A straight line starts at a point on the vertical axis and slopes downwards to meet the horizontal axis, representing constant deceleration.</p> </div> <p>A is not correct because this shows constant velocity not constant deceleration C is not correct because this shows varying deceleration D is not correct because this shows varying deceleration</p>	1

7	<p>The only correct answer is C (The force of the parachute on the cords)</p> <p>A is not correct because the Newton's third law pair must be between the cords and the parachute B is not correct because the Newton's third law pair must be between the cords and the parachute D is not correct because the Newton's third law pair must be between the cords and the parachute</p>	1
8	<p>The only correct answer is B (Length = x; Cross-sectional area = $2A$)</p> <p>A is not correct because this would give an extension of $2\Delta x$ B is not correct because this would give an extension of $4\Delta x$ D is not correct because this would give an extension of Δx</p>	1
9	<p>The only correct answer is C $\left(\frac{(300 + 50 + 50) \times 6 \times 10^{-3}}{2}\right)$</p> <p>A is not correct because this would be the change in elastic energy if the initial force applied was 0 N B is not correct because the final force on the spring is $(300 + 50)$ N so this does not take account that the initial force on the spring was 50 N D is not correct because this would be the total elastic energy of the spring</p>	1
10	<p>The only correct answer is A $\left(\frac{2g}{3}\right)$</p> <p>B is not correct because the resultant force is not $5g$ as this does not take the weight of the 3 kg mass into account C is not correct because this gives the resultant force on the 3 kg mass in N D is not correct because this gives the upwards force from the spring in N</p>	1

Question Number	Answer	Additional Guidance	Mark
11	<p>Straight arrows representing forward force (F), weight (W or mg) and normal contact force (N), in correct directions with labels, all starting from dot (1)</p> <p>Length of weight arrow and length of normal contact force arrows equal, and twice length of forward force arrow (1)</p>	<p>Do not allow more than three arrows for MP1</p> <p>Allow a tolerance of one small square.</p> <p><u>Example of diagram</u></p> 	2
Total for question 11			2

Question Number	Answer	Additional Guidance	Mark
12	Use of $\Delta W = F\Delta s$ (1) Use of efficiency = $\frac{\text{useful energy output}}{\text{total energy input}}$ Or Use of efficiency = $\frac{\text{useful power output}}{\text{total power input}}$ (1) Use of $P = \frac{W}{t}$ (1) $t = 41 \text{ s}$ (1)	<u>Example of calculation</u> $\Delta W = 3400 \text{ N} \times 26 \text{ m} = 88\,400 \text{ J}$ $\text{total energy input} = \frac{88\,400 \text{ J}}{0.38} = 233\,000 \text{ J}$ $\text{time taken} = \frac{233\,000 \text{ J}}{5700 \text{ W}} = 40.9 \text{ s}$	4
	Total for question 12		4

Question Number	Answer	Additional Guidance	Mark
13(a)	<p>(By Newton's second law), Stone A and stone B accelerate in opposite directions (for the same time) (1)</p> <p>So the momentum of A decreases and the momentum of B increases by the same amount</p> <p>Or So change of momentum for each stone is the same size but in the opposite direction (1)</p>	<p>Allow the velocity of stone A decreases and the velocity of stone B increases</p> <p>Allow change in momentum = force \times time (and force and time are the same for both stones)</p>	2
13(b)	<p>Use of $E_k = \frac{1}{2}mv^2$ (1)</p> <p>Use of $p = mv$ (1)</p> <p>Use of conservation of momentum (1)</p> <p>Final momentum of A = 4.1 kg m s^{-1} (1)</p> <p>$4.1 \text{ (kg m s}^{-1}) < 5.5 \text{ (kg m s}^{-1})$ so stone A will not slide past the target</p> <p>Or Comparison of calculated value of final momentum of A with $5.5 \text{ (kg m s}^{-1})$ and consistent conclusion (1)</p>	<p><u>Example of calculation</u></p> $u_A = \sqrt{\frac{2 \times 3.8 \text{ J}}{18 \text{ kg}}} = 0.650 \text{ m s}^{-1}$ $p_{A(\text{before})} = 18 \text{ kg} \times 0.650 \text{ m s}^{-1} = 11.7 \text{ kg m s}^{-1}$ $p_{B(\text{after})} = 17 \text{ kg} \times 0.45 \text{ m s}^{-1} = 7.65 \text{ kg m s}^{-1}$ $11.7 \text{ kg m s}^{-1} - 7.65 \text{ kg m s}^{-1} = 4.05 \text{ kg m s}^{-1}$ $4.05 \text{ kg m s}^{-1} < 5.5 \text{ kg m s}^{-1}$ so stone A will not slide past the target	5
Total for question 13			7

Question Number	Answer	Additional Guidance	Mark
14(a)	Because there is no (resultant) moment. (1)		1
14(b)	Use of moment of force = Fx to determine clockwise moment (1) Use of appropriate trigonometry to determine vertical distance on wall between horizontal bar and supporting bar (1) Use of principle of moments (1) $F = 85 \text{ N}$ (1)	<u>Example of calculation</u> Moment of weight about bottom of supporting bar = $34 \text{ N} \times 0.28 \text{ m} = 9.52 \text{ N m}$ Vertical distance from P to $F = \frac{0.16 \text{ m}}{\tan(55^\circ)} = 0.112 \text{ m}$ $F \times 0.112 \text{ m} = 9.52 \text{ N m}$ $F = \frac{9.52 \text{ N m}}{0.112 \text{ m}} = 85 \text{ N}$	4
Total for question 14			5

Question Number	Answer	Additional Guidance	Mark
15(a)	Small, spherical object Or Spherical object with low speed (1) Laminar flow (1)	Allow an absence of turbulent flow	2
15(b)	Use of $s = ut + 1/2at^2$ with $a = 0$ (1) Use of $F = 6\pi\eta rv$ (1) $F = 1.1 \times 10^{-4} \text{ N}$ (1)	<u>Example of calculation</u> $u = \frac{0.056 \text{ m}}{1.3 \text{ s}} = 0.043 \text{ m s}^{-1}$ $F = 6 \times \pi \times 0.15 \text{ Pa s} \times 0.90 \times 10^{-3} \text{ m} \times 0.043 \text{ m s}^{-1}$ $F = 1.09 \times 10^{-4} \text{ N}$	3
15(c)	Calculates volume of ball bearing (1) Use of $\rho = \frac{m}{V}$ to determine mass of displaced paint (1) Use of $W = mg$ (1) Use of $\Sigma F = 0$ (so viscous drag = weight – upthrust) (1) Viscous drag = $1.9 \times 10^{-4} \text{ N}$ (1)	<u>Example of calculation</u> $V = \frac{4}{3} \times \pi \times (0.90 \times 10^{-3} \text{ m})^3 = 3.05 \times 10^{-9} \text{ m}^3$ $m = 1.5 \times 10^3 \text{ kg m}^{-3} \times 3.05 \times 10^{-9} \text{ m}^3 = 4.58 \times 10^{-6} \text{ kg}$ Upthrust = weight of displaced paint $= 4.58 \times 10^{-6} \text{ kg} \times 9.81 \text{ N kg}^{-1} = 4.49 \times 10^{-5} \text{ N}$ Weight of ball bearing = $2.4 \times 10^{-5} \text{ N} \times 9.81 \text{ N kg}^{-1}$ $= 2.35 \times 10^{-4} \text{ N}$ Viscous drag = $2.35 \times 10^{-4} \text{ N} - 4.49 \times 10^{-5} \text{ N} = 1.91 \times 10^{-4} \text{ N}$	5
Total for question 15			10

Question Number	Answer	Additional Guidance	Mark
16(a)	Adding the mass causes the string to be straight / taut (1)	Allow so the string is under tension	1
16(b)	Increase x (1) Or Position the marker further from the clamp (1) (absolute) uncertainty will remain the same (1) (and) percentage uncertainty is calculated by dividing uncertainty by x / length (1) OR Position metre rule adjacent to string Or Use a set square between metre rule and string (1) Or View perpendicular to the string / ruler (1) To reduce parallax error (dependent on MP1) (1) Which decreases (absolute) uncertainty (dependent on MP1) (1)	Allow use a longer length of string (between the clamp and the marker) Ignore decreases percentage uncertainty	3
16(c)	Use of $\sigma = \frac{F}{A}$ (1) Use of $\epsilon = \frac{\Delta x}{x}$ (1) Use of $E = \frac{\sigma}{\epsilon}$ (1) $E = 4.8$ (GPa) ≈ 5.0 (GPa) so the string is nylon (1) Or $E = 4.8$ (GPa) which is closest to the value for nylon	<u>Example of calculation</u> $\sigma = \frac{15 \text{ N}}{1.2 \times 10^{-6} \text{ m}^2} = 12.5 \times 10^6 \text{ Pa}$ $\epsilon = \frac{4.2 \times 10^{-3}}{1.6} = 2.63 \times 10^{-3}$ $E = \frac{12.5 \times 10^6 \text{ Pa}}{2.63 \times 10^{-3}} = 4.75 \times 10^9 \text{ Pa}$ $4.75 \times 10^9 \text{ Pa} \approx 5.0 \text{ GPa so the string is nylon}$	4
Total for question 16			8

Example of calculation

$$s = 2.5 \text{ m} \times \sin(22^\circ) = 0.937 \text{ m}$$

$$5.0 \text{ kg} \times 9.81 \text{ N kg}^{-1} \times 0.937 \text{ m} = 45.9 \text{ J}$$

$$45.9 = \frac{1}{2} \times 5.0 \text{ kg} \times v^2$$

$$v = \sqrt{\frac{2 \times 45.9 \text{ J}}{5.0 \text{ kg}}} = 4.29 \text{ m s}^{-1}$$

Example of calculation

$$a = 9.81 \times \sin(22^\circ) = 3.67 \text{ m s}^{-2}$$

$$v^2 = (0 \text{ m s}^{-1})^2 + 2 \times 3.67 \text{ m s}^{-2} \times 2.5 \text{ m} = 18.4 \text{ m}^2 \text{ s}^{-2}$$

$$v = \sqrt{18.4 \text{ m}^2 \text{ s}^{-2}} = 4.29 \text{ m s}^{-1}$$

***17(b)**

This question assesses a student's ability to show a coherent and logically structured answer with linkages and fully-sustained reasoning. Marks are awarded for indicative content and for how the answer is structured and shows lines of reasoning. The following table shows how the marks should be awarded for indicative content.

IC points	IC mark	Max linkage mark	Max final mark
6	4	2	6
5	3	2	5
4	3	1	4
3	2	1	3
2	2	0	2
1	1	0	1
0	0	0	0

The following table shows how the marks should be awarded for structure and lines of reasoning.

	Number of marks awarded for structure of answer and sustained line of reasoning
Answer shows a coherent and logical structure with linkages and fully sustained lines of reasoning demonstrated throughout	2
Answer is partially structured with some linkages and lines of reasoning	1
Answer has no linkages between points and is unstructured	0

Indicative content

- IC1 Gradient of the graph represents velocity
Or Initial gradient (up to 10 s) is constant
- IC2 Initial velocity (up to 10 s) is constant
Or Initial acceleration (up to 10s) is zero
- IC3 From 10 s to 20 s the gradient decreases so velocity decreases
- IC4 From 10 s to 20 s the box decelerates
Or From 10 to 20 s the acceleration is negative
- IC5 At 20 s velocity = 0
- IC6 After 20 s the velocity / motion of the box is in the opposite / backwards direction because gradient is negative

Total for question 17

6

10

Question Number	Answer	Additional Guidance	Mark
18(a)(i)	<p>Use of $s = ut + \frac{1}{2}at^2$ with $a = 0$ (1)</p> <p>Use of appropriate trigonometry to determine θ Or Use of appropriate trigonometry to determine horizontal component of initial velocity (1)</p> <p>$\theta = 80.9$ ($^{\circ}$) (to at least 3 significant figures) (1)</p>	<p><u>Example of calculation</u></p> $u_{\text{horizontal}} = \frac{2930 \text{ m}}{7.50 \text{ s}} = 391 \text{ m s}^{-1}$ $\theta = \cos^{-1}\left(\frac{391 \text{ m s}^{-1}}{2460 \text{ m s}^{-1}}\right) = 80.9^{\circ}$	3

<p>18(a)(ii)</p>	<p>Use of appropriate trigonometry to determine vertical component of velocity (1)</p> <p>Use of $v = u + at$ with $a = 1.63 \text{ m s}^{-2}$ with u and a having the same sign convention (1)</p> <p>Use of Pythagoras equation (1)</p> <p>$v = 2470 \text{ m s}^{-1}$ (ecf from (a)(i)) (1)</p> <p>OR</p> <p>Use of appropriate trigonometry to determine vertical component of velocity (1)</p> <p>Use of $s = ut + \frac{1}{2}at^2$ with $a = 1.63 \text{ m s}^{-2}$ with u and a having the same sign convention (1)</p> <p>Uses principle of conservation of energy (1)</p> <p>$v = 2470 \text{ m s}^{-1}$ (ecf from (a)(i)) (1)</p>	<p><u>Example of calculation</u></p> $u_{\text{vertical}} = 2460 \text{ m s}^{-1} \times \sin(80.9^\circ) = 2429 \text{ m s}^{-1}$ $v_{\text{vertical}} = 2429 \text{ m s}^{-1} + 1.63 \text{ m s}^{-2} \times 7.50 \text{ s} = 2441 \text{ m s}^{-1}$ $v_{\text{final}} = \sqrt{(391 \text{ m s}^{-1})^2 + (2441 \text{ m s}^{-1})^2} = 2472 \text{ m s}^{-1}$ <p><u>Example of calculation</u></p> $u_{\text{vertical}} = 2460 \text{ m s}^{-1} \times \sin(80.9^\circ) = 2429 \text{ m s}^{-1}$ $s = 2429 \text{ m s}^{-1} \times 7.50 \text{ s} + 0.5 \times 1.63 \text{ m s}^{-2} \times (7.50 \text{ s})^2 = 18300 \text{ m}$ $m \times 1.63 \text{ m s}^{-2} \times 18300 \text{ m} + \frac{1}{2} \times m \times (2460 \text{ m s}^{-1})^2 = \frac{1}{2} \times m \times v^2$ $v = \sqrt{2 \times \left(1.63 \text{ m s}^{-2} \times 18300 \text{ m} + \frac{1}{2} \times (2460 \text{ m s}^{-1})^2 \right)}$ $= 2472 \text{ m s}^{-1}$	<p>4</p>
<p>18(b)(i)</p>	<p>The horizontal (component of) velocity is the same (1)</p> <p>And the time taken to reach the surface of Earth is less (than time taken to reach the surface of the Moon) (1)</p> <p>So the (horizontal) distance travelled is less (dependent on MP2) (1)</p>	<p>If no other mark scored allow 1 mark for air resistance decreases the horizontal component of velocity.</p>	<p>3</p>

18(b)(ii)	Max TWO from: Air resistance acts (on the projectile) Or Drag acts (on the projectile) (1) The projectile would decelerate horizontally (1) The (vertical) acceleration would not be constant Or The (vertical) acceleration would not be 9.81 m s^{-2} (1)		2
	Total for question 18		12

Question Number	Answer	Additional Guidance	Mark
19(a)	<p>There is some energy stored in the spring when the bread is in the toaster</p> <p>Or Some work is done by gravity (1)</p> <p>Total work done (to stretch the spring) is work done by gravity plus work done by force of the person (1)</p> <p>So the (total elastic strain) energy stored is greater than the work done (by the person) (1)</p>	(dependent on MP1 or MP2)	3

19(b)(i)	<p>Determines the force on each spring (1)</p> <p>Use of $\Delta F = k\Delta x$ (1)</p> <p>$k = 6.2 \text{ (N m}^{-1}\text{)}$ (to at least 2 significant figures) (1)</p>	<p><u>Example of calculation</u></p> <p>Force on each spring = $\frac{0.52 \text{ N}}{4} = 0.13 \text{ N}$</p> <p>$k = \frac{0.13 \text{ N}}{0.021 \text{ m}} = 6.19 \text{ N m}^{-1}$</p>	3
19(b)(ii)	<p>Use of $\Delta F = k\Delta x$ (1)</p> <p>Use of $\Delta E_{\text{el}} = \frac{1}{2}F\Delta x$ (1)</p> <p>Use of $\Delta E_{\text{grav}} = mg\Delta h$ with $mg = 0.52 \text{ N}$ (1)</p> <p>Applies conservation of energy (1)</p> <p>Use of $E_{\text{k}} = \frac{1}{2}mv^2$ and use of $W = mg$ (1)</p> <p>$v = 0.95 \text{ m s}^{-1}$ (ecf from (b)(i)) (show that value gives $v = 0.96 \text{ m s}^{-1}$) (1)</p>	<p><u>Example of calculation</u></p> <p>$x = \frac{\left(\frac{1.2 \text{ N} + 0.52 \text{ N}}{4}\right)}{6.19 \text{ N m}^{-1}} = 0.0695 \text{ m}$</p> <p>$E_{\text{elastic}} = 0.5 \times (1.2 \text{ N} + 0.52 \text{ N}) \times 0.0695 \text{ m} = 0.0598 \text{ J}$</p> <p>$\Delta E_{\text{grav}} = 0.52 \text{ N} \times 0.0695 \text{ m} = 0.0361 \text{ J}$</p> <p>$\Delta E_{\text{k}} = 0.0598 \text{ J} - 0.0361 \text{ J} = 0.0237 \text{ J}$</p> <p>$m = \frac{0.52 \text{ N}}{9.81 \text{ N kg}^{-1}} = 0.0530 \text{ kg}$</p> <p>$v = \sqrt{\frac{2 \times 0.0237 \text{ J}}{0.0530 \text{ kg}}} = 0.946 \text{ m s}^{-1}$</p>	6
Total for question 19			12