Pearson

Mark Scheme (Results)

October 2025

Pearson Edexcel International Advanced
Subsidiary level In Physics
WPH11/01

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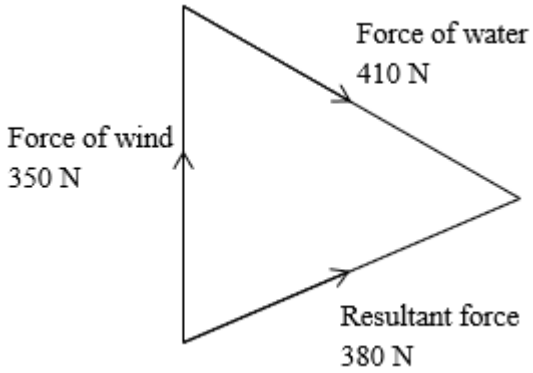
General Marking Guidance

- 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	**The only correct answer is C (N)** A is not correct because energy is a scalar quantity B is not correct because mass is a scalar quantity D is not correct because power is a scalar quantity	1
2	**The only correct answer is B (Useful power output is constant; total energy output increases.)** A is not correct because total energy output would increase with time C is not correct because useful power output is constant D is not correct because useful power output is constant and total energy output would increase with time	1
3	**The only correct answer is D (The forces have the same magnitude.)** A is not correct because the forces act on two different objects B is not correct because the forces act in opposite directions C is not correct because the forces can act between stationary objects	1
4	**The only correct answer is C (Viscosity of oil increases; Terminal velocity of ball bearing decreases)** A is not correct because viscosity increases as temperature decreases B is not correct because viscosity increases as temperature decreases and terminal velocity decreases when viscosity increases D is not correct because terminal velocity decreases when viscosity increases	1
5	**The only correct answer is D ($U > W$)** A is not correct because $U = W + D$ B is not correct because $U = W + D$ C is not correct because $U = W + D$	1
6	**The only correct answer is D ($\overrightarrow{F_A} + \overrightarrow{F_B} + \overrightarrow{W} = 0$)** A is not correct because the correct relationship is $\overrightarrow{F_A} + \overrightarrow{F_B} + \overrightarrow{W} = 0$ B is not correct because the correct relationship is $\overrightarrow{F_A} + \overrightarrow{F_B} + \overrightarrow{W} = 0$ C is not correct because the correct relationship is $\overrightarrow{F_A} + \overrightarrow{F_B} + \overrightarrow{W} = 0$	1
7	**The only correct answer is B ($\frac{(0.5 - 0.4) \times 9.81}{0.5 + 0.4}$)** A is not correct because the total mass being accelerated is 0.4 kg + 0.5 kg C is not correct because the total mass being accelerated is 0.4 kg + 0.5 kg and the resultant force is (0.5 kg − 0.4 kg) × 9.81 N kg^{-1} D is not correct because the resultant force is (0.5 kg − 0.4 kg) × 9.81 N kg^{-1}	1

8	**The only correct answer is C (Δx)** A is not correct because both wires have the same extension B is not correct because both wires have the same extension D is not correct because both wires have the same extension	**1**
9	**The only correct answer is D (Gradient increases so line is parabolic and then gradient is constant)** A is not correct because constant acceleration gives a parabolic shaped variation in displacement with time B is not correct because constant acceleration gives a parabolic shaped variation in displacement with time C is not correct because when the acceleration becomes zero, the object continues to move at the same velocity, so displacement continues to increase at a constant rate	**1**
10	**The only correct answer is B ($3p$)** A is not correct because the change in velocity is the same for both objects so the increase in momentum of S is greater than that of R C is not correct because S does not double its speed D is not correct because S moves 1.5 times faster than at the start and has twice the mass of R	**1**

Question Number	Answer		Additional Guidance	Mark
11	Use of $\sum F = ma$ $a = 1.3 \text{ m s}^{-2}$	**(1)** **(1)**	Example calculation $a = \dfrac{6700 \text{ N} - 900 \text{ N}}{4500 \text{ kg}} = 1.29 \text{ m s}^{-2}$	**2**
	Total for question 11			**2**

Question Number	Answer		Additional Guidance	Mark
12	Triangle of correct shape drawn, with at least two sides labelled Vector triangle drawn with at least two sides labelled and arrows in correct directions Magnitude of resultant force = 380 N (allow 370 N to 390 N) Angle of resultant force from north = 68° (allow 66° – 70°)	**(1)** **(1)** **(1)** **(1)**	Example diagram  	**4**
	Total for question 12			**4**

Question Number	Answer		Additional Guidance	Mark
13(a)	(Starting and stopping stopwatch) involves human reaction time (So) there will be (large) <u>random</u> errors	**(1)** **(1)**	Ignore references to human error	**2**
13(b)(i)	The length of the metal cylinder	**(1)**	Ignore length of the tube	**1**
13(b)(ii)	Use of $v^2 = u^2 + 2as$ $a = 9.62 \text{ m s}^{-2}$	**(1)** **(1)**	Allow any valid suvat method to determine acceleration <u>Example calculation</u> $a = \dfrac{(2.96 \text{ m})^2 - (1.39 \text{ m})^2}{2 \times 0.355 \text{ m}} = 9.619 \text{ m s}^{-2}$	**2**
	Total for question 13			**5**

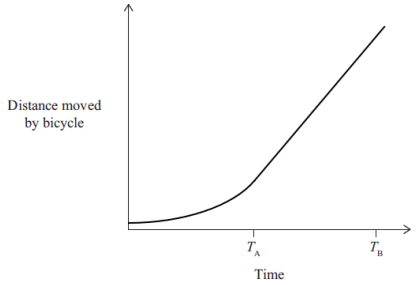
Question Number	Answer	Additional Guidance	Mark
14(a)	The total momentum (of a system) is constant **(1)** When no external forces act (dependent on MP1) **Or** In a closed system (dependent on MP1) **(1)**		**2**
14(b)	Use of $E_k = \frac{1}{2}mv^2$ to determine initial velocity of rock B **(1)** Use of $p = mv$ **(1)** Use of principle of conservation of momentum **(1)** $v = 11\ \text{m s}^{-1}$ **(1)**	<u>Example calculation</u> $v_B = \sqrt{\frac{2 \times 4.1 \times 10^3\ \text{J}}{56\ \text{kg}}} = 12.1\ \text{m s}^{-1}$ $p_B = 56\ \text{kg} \times 12.1\ \text{m s}^{-1} = 678\ \text{kg m s}^{-1}$ $p_A = 43\ \text{kg} \times 7.8\ \text{m s}^{-1} = 335\ \text{kg m s}^{-1}$ $335\ \text{kg m s}^{-1} + 678\ \text{kg m s}^{-1} = 43\ \text{kg} \times v_A + 530\ \text{kg m s}^{-1}$ $v_A = \frac{1013\ \text{kg m s}^{-1} - 530\ \text{kg m s}^{-1}}{43\ \text{kg}} = 11.2\ \text{m s}^{-1}$	**4**
	Total for question 14		**6**

Question Number	Answer		Additional Guidance	Mark
15(a)	Use of $W = mg$	**(1)**	Example calculation	
	Use of $F = k\Delta x$ to determine k	**(1)**	$0.200\ \text{kg} \times 9.81\ \text{N kg}^{-1} = 1.962\ \text{N}$	
	Use of $F = k\Delta x$ to determine weight of ball	**(1)**	$k = \dfrac{1.962\ \text{N}}{0.375\ \text{m} - 0.250\ \text{m}} = 15.70\ \text{N m}^{-1}$	
	$W = 0.71\ \text{N}$	**(1)**	$F = 15.70\ \text{N m}^{-1} \times (0.295\ \text{m} - 0.250\ \text{m}) = 0.707\ \text{N}$	**4**
15(b)	Elastic strain energy is equal to the area under graph **Or** k is constant (because the gradient is constant)	**(1)**		
	Area under graph $= \frac{1}{2}F\Delta x$ **and** $\Delta x = \frac{F}{k}$ **Or** $E_{\text{el}} = \frac{1}{2}F\Delta x$ **and** $\Delta x = \frac{F}{k}$	**(1)**		
	(So) elastic strain energy $= \frac{F^2}{2k}$	**(1)**		**3**
	Total for question 15			**7**

Question Number	Answer		Additional Guidance	Mark
16(a)(i)	Stiffness	**(1)**		**1**
16(a)(ii)	Use of $E = \frac{\sigma}{\varepsilon}$ Use of $\varepsilon = \frac{\Delta x}{x}$ $\Delta x = 3.6 \times 10^{-3}$ m New length = 0.446 m	**(1)** **(1)** **(1)** **(1)**	Example calculation $\varepsilon = \frac{150 \times 10^6 \text{ Pa}}{19 \times 10^9 \text{ Pa}} = 7.89 \times 10^{-3}$ $\Delta x = 7.89 \times 10^{-3} \times 0.45 \text{ m} = 3.55 \times 10^{-3} \text{ m}$ New length $= 0.45 \text{ m} - 3.55 \times 10^{-3} \text{ m} = 0.446 \text{ m}$	**4**
16(b)	Use of $\sigma = \frac{F}{A}$ Breaking stress of running blade = 390 Mpa **Or** Breaking force for glass fibre = 272 kN **Or** Breaking force for carbon fibre = 340 kN **Or** Breaking force for hybrid core = 289 kN Comparison of breaking stress with value from table and consistent conclusion **Or** Comparison of calculated breaking force for carbon fibre with 330 kN and consistent conclusion	**(1)** **(1)** **(1)**	Example calculation $\sigma = \frac{330 \times 10^3 \text{ N}}{8.5 \times 10^{-4} \text{ m}^2} = 3.88 \times 10^8 \text{ Pa}$ 388 MPa ≈ 400 MPa, so the running blade is made from carbon fibre	**3**
	Total for question 16			**8**

Question Number	Answer		Additional Guidance	Mark
17(a)	Calculates volume of one lifting bag	**(1)**	Example calculation $V_{\text{bag}} = \frac{4}{3} \times \pi \times \left(\frac{0.5\text{ m}}{2}\right)^3 = 0.0654\text{ m}^3$ $V_{\text{box}} = 1.1\text{ m} \times 0.5\text{ m} \times 0.25\text{ m} = 0.138\text{ m}^3$ $V_{\text{total}} = 2 \times 0.0654\text{ m}^3 + 0.138\text{ m}^3 = 0.269\text{ m}^3$ $m_{\text{displaced water}} = 1020\text{ kg m}^{-3} \times 0.269\text{ m}^3 = 274\text{ kg}$ $W_{\text{displaced water}} = 274\text{ kg} \times 9.81\text{ N kg}^{-1} = 2690\text{ N}$ 2690 (N) > 2500 N so the box will be lifted	**6**
	Calculates volume of box	**(1)**		
	Use of $\rho = \frac{m}{V}$	**(1)**		
	Use of $W = mg$	**(1)**		
	Total upthrust = 2700 N	**(1)**		
	Comparison of calculated upthrust with 2500 N and consistent conclusion	**(1)**		
17(b)(i)	Calculates resultant of weight and upthrust	**(1)**	Example calculation $F = 4.77 \times 10^{-4}\text{ N} - 1.82 \times 10^{-6}\text{ N} = 4.752 \times 10^{-4}\text{ N}$ $v = \frac{4.752 \times 10^{-4}\text{ N}}{6 \times \pi \times 8.60 \times 10^{-4}\text{ Pa s} \times 2.25 \times 10^{-3}\text{ m}} = 13.03\text{ m s}^{-1}$	**3**
	Use of $F = 6\pi\eta rv$	**(1)**		
	Terminal velocity = 13.0 m s^{-1}	**(1)**		

17(b)(ii)	Any two from • The bubble may not move at a low speed **(1)** • The bubble may not be spherical **(1)** • The bubble may not experience laminar flow **Or** flow may be turbulent **(1)** • The temperature/viscosity may change (as the bubble rises) **(1)** • The volume/radius may change (as the bubble rises)	Ignore the bubble may not be small	**2**
	Total for question 17		**11**

Question Number	Answer		Additional Guidance	Mark
18(a)	Gradient increasing between 0 s and T_A	**(1)**	graph does not have to start from origin	**2**
	Straight line with positive gradient between T_A and T_B	**(1)**	<u>Example diagram</u>  	

***18(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 In stage A, the kinetic energy increases

IC2 (and kinetic energy is proportional to speed squared, so) in stage A, the useful power output increases

IC3 In stage B, the gravitational potential energy increases (and kinetic energy is constant)
Or In stage B, work is done against gravity (and kinetic energy is constant)

IC4 And in stage B the gradient of the slope increases so power output increases

IC5 In stage C gravitational potential energy increases **and** kinetic energy decreases

IC6 So in stage C the useful power output of the person is zero

6

Total for question 18 **8**

Question Number	Answer		Additional Guidance	Mark
19(a)	Acceleration of the shot is constant	**(1)**		**2**
	Because air resistance will be negligible **Or** the only force acting is weight	**(1)**		
19(b)(i)	Use of $s = ut + \frac{1}{2}at^2$ with $a = 0$	**(1)**	Example calculation $14.2\text{ m} = u_{\text{horizontal}} \times 1.61\text{ s}$	**2**
	$u_{\text{horizontal}} = 8.82\text{ (m s}^{-1}\text{)}$ (to at least 3 significant figures)	**(1)**	$u_{\text{horizontal}} = \frac{14.2\text{ m}}{1.61\text{ s}} = 8.8199\text{ m s}^{-1}$	
19(b)(ii)	Use of $s = ut + \frac{1}{2}at^2$ with $a = (-)9.81\text{ m s}^{-1}$ and s=(-)1.85 m	**(1)**	Example calculation $u_{\text{vertical}} = \frac{\frac{1}{2} \times 9.81\text{ m s}^{-2} \times (1.61\text{ s})^2 - 1.85\text{ m}}{1.61\text{ s}} = 6.75\text{ m s}^{-1}$	**5**
	Use of Pythagoras to determine u **Or** Use of appropriate trigonometry to determine u	**(1)**	$u^2 = (8.82\text{ m s}^{-1})^2 + (6.75\text{ m s}^{-1})^2 = 123.4\text{ m}^2\text{ s}^{-2}$	
	$u = 11\text{ m s}^{-1}$ [ecf from (b)(i)]	**(1)**	$u = \sqrt{123.4\text{ m}^2\text{ s}^2} = 11.1\text{ m s}^{-1}$	
	Use of appropriate trigonometry to determine θ	**(1)**	$\tan\theta = \frac{6.75\text{ m s}^{-1}}{8.82\text{ m s}^{-1}} = 0.765$	
	$\theta = 37°$ [ecf from (b)(i)]	**(1)**	$\theta = \tan^{-1}(0.765) = 37.4°$	
	Total for question 19			**9**

Question Number	Answer	Additional Guidance	Mark
20(a)	In equilibrium, total clockwise moment = total anticlockwise moment **Or** In equilibrium, sum of all moments (about any point) = 0 **Or** In equilibrium, resultant moment (about any point) = 0 **(1)**	Clockwise moment = anticlockwise moment is insufficient.	**1**
20(b)(i)	The weight causes a clockwise moment (about the pivot) **(1)** So the direction (of the moment provided by the motor) is anticlockwise (dependent on MP1) **(1)**		**2**
20(b)(ii)	The motor needs to provide a smaller moment **(1)** So a smaller force is needed (which moves through the same distance) **(1)** So the work done decreases (dependent on MP1 or MP2) **(1)**		**3**
20(b)(iii)	Determines distance from pivot to centre of gravity of section of bridge **(1)** Use of Moment of force $= Fx$ **(1)** Use of principle of moments **(1)** Moment produced by motor = 8.4×10^7 N m **(1)**	<u>Example calculation</u> Distance from pivot to centre of gravity of section $= 33\text{ m} - \frac{33\text{ m} + 12\text{ m}}{2}$ $= 10.5\text{ m}$ $4.0 \times 10^6\text{ N} \times 11\text{ m} + \text{moment produced by motor}$ $= 1.2 \times 10^7\text{N} \times 10.5\text{ m} + 71 \times 10^3\text{ N} \times 28\text{ m}$ Moment produced by motor = 8.40×10^7 N m	**4**
	Total for question 20		**10**