Mark Scheme (Results)

October 2025

Pearson Edexcel International Advanced
Subsidiary level In Physics
WPH11/01A

Edexcel and BTEC Qualifications

Edexcel and BTEC qualifications are awarded by Pearson, the UK's largest awarding body. We provide a wide range of qualifications including academic, vocational, occupational and specific programmes for employers. For further information visit our qualifications websites at www.edexcel.com or www.btec.co.uk. Alternatively, you can get in touch with us using the details on our contact us page at www.edexcel.com/contactus

Pearson: helping people progress, everywhere

Pearson aspires to be the world's leading learning company. Our aim is to help everyone progress in their lives through education. We believe in every kind of learning, for all kinds of people, wherever they are in the world. We've been involved in education for over 150 years, and by working across 70 countries, in 100 languages, we have built an international reputation for our commitment to high standards and raising achievement through innovation in education. Find out more about how we can help you and your students at: www.pearson.com/uk

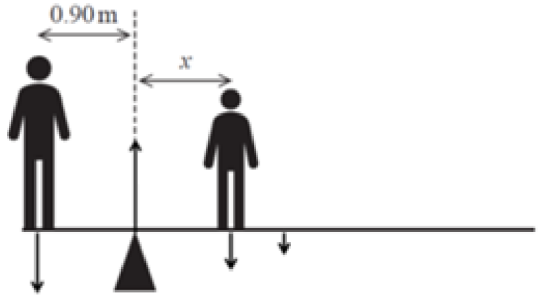
October 2025
Question Paper Log Number P87440A
Publication Code WPH11_01A_2510_MS

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** (velocity) A is not correct because distance is a scalar quantity B is not correct because speed is a scalar quantity D is not correct because work done is a scalar quantity	1
2	**The only correct answer is D** (50 N m^{-1}) A is not correct because $k = \frac{\Delta F}{\Delta x} = \frac{1.5\text{ N}}{0.030\text{ m}} = 50\text{ N m}^{-1}$ B is not correct because $k = \frac{\Delta F}{\Delta x} = \frac{1.5\text{ N}}{0.030\text{ m}} = 50\text{ N m}^{-1}$ C is not correct because $k = \frac{\Delta F}{\Delta x} = \frac{1.5\text{ N}}{0.030\text{ m}} = 50\text{ N m}^{-1}$	1
3	**The only correct answer is B** (s) A is not correct because displacement is measured in metres C is not correct because velocity is measured in metres per second D is not correct because acceleration is a vector	1
4	**The only correct answer is B** (y-axis 2*s*; x-axis t^2) A is not correct because this would give a gradient of *g/2* C is not correct because this would give a gradient of 2/*g* D is not correct because this would give a gradient of 1/*g*	1
5	**The only correct answer is D** A is not correct because vector arrows should be added tip-to-tail and R is in the wrong direction B is not correct because R is in the wrong direction C is not correct because vector arrows should be added tip-to-tail and R goes between the wrong two points	1
6	**The only correct answer is C** (The initial horizontal velocity is equal to the final horizontal velocity) A is not correct because the horizontal component of velocity remains constant throughout the motion. A constant value does not have a minimum or maximum, so it is not appropriate to describe the horizontal velocity as minimum B is not correct because at maximum height the vertical velocity is 0 D is not correct because the final position is below the initial position	1

7	**The only correct answer is B** ($W > 0.5F_1e_1$) A is not correct because the area under the graph is greater than the area of a triangle drawn from the origin to the end of the line C is not correct because work done is a force multiplied by a distance, not divided by a distance D is not correct because work done is a force multiplied by a distance, not divided by a distance	**1**
8	**The only correct answer is D** (-9.8 m s^{-1}) A is not correct because the ball is in freefall so has acceleration due to gravity B is not correct because the ball is in freefall so has acceleration due to gravity C is not correct because the ball is in freefall so has acceleration due to gravity	**1**
9	**The only correct answer is B** (the forces act on the same body) A is not correct because in a Newton's third law pair the forces act in opposite directions C is not correct because in a Newton's third law pair the forces are of the same type D is not correct because the forces have the same magnitude	**1**
10	**The only correct answer is D** (90*g*) A is not correct because by conserving energy, the expression for speed in metres per second should be $\sqrt{2 \times g \times (75 - 30)}$ B is not correct because by conserving energy, the expression for speed in metres per second should be $\sqrt{2 \times g \times (75 - 30)}$ C is not correct because by conserving energy, the expression for speed in metres per second should be $\sqrt{2 \times g \times (75 - 30)}$	**1**

Question Number	Acceptable Answer	Additional Guidance	Mark
11(a)	Three downward arrows to show the forces of the people and the weight of the plank **(1)** Upward arrow to show reaction force at the pivot **(1)**	Example diagram 	**2**
11(b)	Use of moment = $F\,x$ **(1)** Application of principle of moments **(1)** x = 0.89 m **(1)**	Example calculation $950\ \text{N} \times 0.90\ \text{m} = \left(\frac{4.0\ \text{m}}{2} - 0.90\ \text{m}\right) \times 250 + \text{x} \times 650\ \text{N}$ $x = \frac{(950\ \text{N} \times 0.90\ \text{m}) - (1.10\ \text{m} \times 250\ \text{N})}{650\ \text{N}}$ $x = \frac{855\ \text{Nm} - 275\ \text{Nm}}{650\ \text{N}} = 0.89\ \text{m}$	**3**

(Total for Question 11 = 5 marks)

Question Number	Acceptable Answer		Additional Guidance	Mark
12(a)	Use of appropriate trigonometry Use of $\Delta E_{\text{grav}} = mg\Delta h$ **Or** Use of $W = Fs$ P = 180 (W)	**(1)** **(1)** **(1)**	See $\frac{\Delta h}{t} \times \sin(30°)$ $(= 0.255 \text{ m s}^{-1})$ Or see $mg \times \sin(30°)$ $(= 353 \text{ N})$ <u>Example calculation</u> $mg\frac{\Delta h}{t} = 72\text{kg} \times 9.81 \text{ N kg}^{-1} \times \sin(30°) \times 0.51 \text{ m s}^{-1}$ $P = 180 \text{ W}$	**3**
12(b)	Calculates useful power output Use of efficiency $= \frac{\text{useful power output}}{\text{total power input}}$ Power input = 3500 W (= 3800 W if 'show that' value used)	**(1)** **(1)** **(1)**	ecf from 12(a) <u>Example calculation</u> $P_{\text{useful}} = 15 \times 180 \text{ W} = 2700 \text{ W}$ $\text{efficiency} = 0.78 = \frac{2700 \text{ W}}{P_{\text{input}}}$ $P_{\text{input}} = \frac{2700 \text{ W}}{0.78} = 3460 \text{ W}$	**3**

(Total for Question 12 = 6 marks)

Question Number	Acceptable Answer		Additional Guidance	Mark
13(a)	Low speed **Or** laminar flow **Or** an absence of turbulent flow	**(1)**	Ignore small sphere	**1**
13(b)	Use of $W = mg$	**(1)**	Example calculation $W = 9.1 \times 10^{-4}\ \text{kg} \times 9.81\ \text{N kg}^{-1} = 8.93 \times 10^{-3}\text{N}$	**5**
	Use of $U + D = W$	**(1)**	$\text{Drag} = 8.93 \times 10^{-3}\ \text{N} - 1.1 \times 10^{-3}\ \text{N} = 7.83 \times 10^{-3}\ \text{N}$	
	Use of $F = 6\pi\eta rv$	**(1)**	$F = 6\pi \times 8.9 \times 10^{-4}\ \text{Pa s} \times \frac{6.0 \times 10^{-3}\ \text{m}}{2} \times 0.50\ \text{m s}^{-1}$	
	$F = (-)\ 2.5 \times 10^{-5}$ N	**(1)**	$F = 2.52 \times 10^{-5}\ \text{N}$	
	Comparison of calculated value of drag with calculated value for F and corresponding conclusion	**(1)**	$7.83 \times 10^{-3}\ \text{N} \neq 2.52 \times 10^{-5}\ \text{N}$, so no.	

(Total for Question 13 = 6 marks)

<table>
<tr><th>Question Number</th><th>Acceptable Answer</th><th>Additional Guidance</th><th>Mark</th></tr>
<tr>
<td>*14</td>
<td>
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.
<table>
<tr><th>IC points</th><th>IC mark</th><th>Max linkage mark</th><th>Max final mark</th></tr>
<tr><td>6</td><td>4</td><td>2</td><td>6</td></tr>
<tr><td>5</td><td>3</td><td>2</td><td>5</td></tr>
<tr><td>4</td><td>3</td><td>1</td><td>4</td></tr>
<tr><td>3</td><td>2</td><td>1</td><td>3</td></tr>
<tr><td>2</td><td>2</td><td>0</td><td>2</td></tr>
<tr><td>1</td><td>1</td><td>0</td><td>1</td></tr>
<tr><td>0</td><td>0</td><td>0</td><td>0</td></tr>
</table>
The following table shows how the marks should be awarded for structure and lines of reasoning.
<table>
<tr><th></th><th>Number of marks awarded for structure of answer and sustained line of reasoning</th></tr>
<tr><td>Answer shows a coherent and logical structure with linkages and fully sustained lines of reasoning demonstrated throughout</td><td>2</td></tr>
<tr><td>Answer is partially structured with some linkages and lines of reasoning</td><td>1</td></tr>
<tr><td>Answer has no linkages between points and is unstructured</td><td>0</td></tr>
</table>
</td>
<td>
Indicative content:

IC1 Gradient of graph is equal to acceleration

IC2 In vacuum, drag = 0 (and upthrust = 0)
Or In vacuum, resultant force = weight
Or In vacuum, resultant force is constant
Or In vacuum the only force acting is weight

IC3 so in vacuum acceleration/gradient is constant

IC4 In oil, as speed increases, drag force increases

IC5 Until in oil resultant force becomes zero
Or until weight = drag (+ upthrust)
Or until weight – drag (– upthrust) = 0

IC6 so in oil acceleration/gradient decreases to zero
Or so in oil acceleration/gradient decreases until terminal/constant velocity is reached
</td>
<td>6</td>
</tr>
</table>

(Total for Question 14 = 6 marks)

Question Number	Acceptable Answer		Additional Guidance	Mark
15(a)	the stiffness of the material / metal / copper **Or** (Young modulus =) $\frac{\text{Stress}}{\text{Strain}}$ in the linear region **Or** (Young modulus =) $\frac{Fx}{A\Delta x}$ in the linear region with all terms defined	**(1)**		**1**
15(b)(i)	Calculates mean diameter Calculates cross sectional area $A = 4.3 \times 10^{-8}$ m^2 ($= 4.3 \times 10^{-2}$ mm^2)	**(1)** **(1)** **(1)**	Example calculation Mean diameter $= \frac{0.230 \text{ mm} + 0.235 \text{ mm} + 0.230 \text{ mm} + 0.240 \text{ mm}}{4}$ Mean diameter $= 0.234 \times 10^{-3}$ m $A = \pi \frac{(0.234 \times 10^{-3} m)^2}{4} = 4.30 \times 10^{-8}$ m^2	**3**
15(b)(ii)	Use of $W = mg$ Use of $\sigma = \frac{F}{A}$ **and** Use of $\varepsilon = \frac{\Delta x}{x}$ **and** use of $E = \frac{\sigma}{\varepsilon}$ **Or** Calculates gradient $\times \frac{\text{length}}{\text{area}}$ Young modulus = 1.6×10^{11} Pa (ecf from (b)(i))	**(1)** **(1)** **(1)**	Example calculation $\frac{F}{\Delta x} = 195 \text{ kg m}^{-1} \times 9.81 \text{ N kg}^{-1} = 1913 \text{ N m}^{-1}$ $E = 1913 \text{ N m}^{-1} \times \frac{3.50 \text{ m}}{4.30 \times 10^{-8} \text{ m}^2}$ $= 1.557 \times 10^{11}$ Pa	**3**
15(b)(iii)	The gradient will be greater (for the shorter wire) The Young modulus is the same	**(1)** **(1)**		**2**

(Total for Question 15 = 9 marks)

Question Number	Acceptable Answer	Additional Guidance	Mark
16(a)	Use of $\rho = \frac{m}{V}$ **(1)** Calculates cross sectional area of pipe **(1)** Use of volume in 1 second = cross section area × speed **(1)** Speed = 37.1 (m s^{-1}) (to at least 3 significant figures) **(1)**	Example calculation $V = \frac{300\ \text{kg}}{1030\ \text{kg m}^{-3}} = 0.291\ \text{m}^3$ $A = \pi \times (0.050\ \text{m})^2 = 7.85 \times 10^{-3}\ \text{m}^2$ $v = \frac{0.291\ \text{m}^3\ \text{s}^{-1}}{7.85 \times 10^{-3}\ \text{m}^2} = 37.10\ \text{m s}^{-1}$	**4**
16(b)	Pump applies a (forward/upward/rightwards) force to the water **(1)** By Newton's third law, water applies an (equal and) opposite/backward/downward/leftward force to the pump **(1)** **OR** Pump applies a (forward/upward/rightwards) force to the pipe **(1)** By Newton's third law, pipe applies an (equal and) opposite/backward/downward/leftward force to the pump **(1)**	MP2 dependent on MP1 MP2 dependent on MP1 If no other marks scored, allow **1** mark for the direction of the water is to the right, so by Newton's third law the force of the water on the pump is to the left	**2**

16(c)	When pump is turned on there is a resultant force backwards/leftwards on the boat, (so the speed decreases) **(1)** As speed decreases, drag force decreases **(1)** Until resultant force = zero (when speed becomes constant) **Or** Until drag force + force from pump = forward force from engine (when speed becomes constant) **Or** Resultant force = zero when speed is constant **(1)**			**3**

(Total for Question 16 = 9 marks)

Question Number	Acceptable Answer		Additional Guidance	Mark
17(a)(i)	Initial angle at 30° (with a parabolic shape) (judge by eye)	**(1)**	Example diagram 	**1**
17(a)(ii)	Use of $v^2 = u^2 + 2as$ (with $v = 0$) Use of appropriate trigonometry to determine initial velocity u = 57 (m s^{-1}) (to at least 2 significant figures)	**(1)** **(1)** **(1)**	Allow use of appropriate suvat equations to determine u Example calculation $0^2 = (u_{\text{vertical}})^2 + 2 \times (-9.81\ \text{m s}^{-2}) \times 42\ \text{m}$ $u_{\text{vertical}} = \sqrt{824} = 28.7\ \text{m s}^{-1}$ $u = \dfrac{28.7\ \text{m s}^{-1}}{\sin(30°)} = 57.4\ \text{m s}^{-1}$	**3**
17(a)(iii)	Use of suitable equation(s) of motion for vertical motion to determine the time of flight (with a—9.81) Use of appropriate trigonometry to determine horizontal component of velocity Use of $s = ut + \frac{1}{2}at^2$ for horizontal motion (with a = 0) Total horizontal distance travelled = 290 m, which is greater than 200 m so flare can be seen (show that value gives 320 m) (ecf from (a)(ii))	**(1)** **(1)** **(1)**	Example calculation $t = \dfrac{2 \times 57.4\ \text{m s}^{-1} \times \sin(30°)}{9.81\ \text{m s}^{-2}} = \dfrac{57.4\ \text{m s}^{-1}}{9.81\ \text{m s}^{-2}} = 5.85\ s$ $u_{\text{horizontal}} = 57.4\ \text{m s}^{-1} \times \cos(30°) = 49.7\ \text{m s}^{-1}$ $s = 49.7\ \text{m s}^{-1} \times 5.85\ \text{s} = 291\ \text{m}$ 291 m < 200 m so yes	

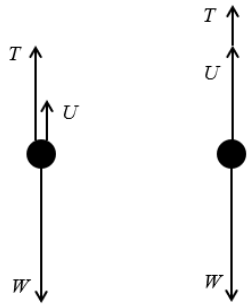
	Or Horizontal distance to maximum height = 150 m, which is less than 200 m so flare cannot be seen (show that value gives 160 m) (ecf from (a)(ii)) **(1)**	**OR** $t = \frac{57.4\ \text{m s}^{-1} \times \sin(30°)}{9.81\ \text{m s}^{-2}} = \frac{28.7\ \text{m s}^{-1}}{9.81\ \text{m s}^{-2}} = 2.93\ s$ $u_{\text{horizontal}} = 57.4\ \text{m s}^{-1} \times \cos(30°) = 49.7\ \text{m s}^{-1}$ $s = 49.7\ \text{m s}^{-1} \times 2.93\ \text{s} = 146\ \text{m}$ 146 m < 200 m so no	**4**

(Total for Question 17 = 8 marks)

Question Number	Acceptable Answer		Additional Guidance	Mark
18(a)	Use of $p = mv$	**(1)**		**3**
	Use of principle of conservation of momentum	**(1)**		
	$v = 6.3$ m s^{-1}	**(1)**	Example calculation $0.17\ \text{kg} \times 1.6\ \text{m s}^{-1} = 0.17\ \text{kg} \times 0.30\ \text{m s}^{-1} + 0.035\ \text{kg} \times v$ $v = \frac{0.272\ \text{kg m s}^{-1} - 0.051\ \text{kg m s}^{-1}}{0.035\ \text{kg}} = 6.31\ \text{m s}^{-1}$	
18(b)	Use of $E_\text{k} = \frac{1}{2}mv^2$	**(1)**		
	Use of appropriate trigonometry to determine vertical height moved by disc **Or** use of appropriate trigonometry to determine component of weight acting along slope	**(1)**	See $0.035\ \text{kg} \times 9.81\ \text{N kg}^{-1} \times \sin(30°)$ **Or** see $\sin(30°) \times 0.065$ m	
	Use of $\Delta E_\text{grav} = mg\Delta h$ **Or** use of $W = Fs$ to determine work done against gravity	**(1)**		
	Use of principle of conservation of energy	**(1)**		
	Use of $W = Fs$	**(1)**		
	$F = 6.6$ N	**(1)**		
	OR			
	Use of $W = mg$	**(1)**		
	Use of appropriate trigonometry to determine component of weight acting along slope	**(1)**	See $0.035\ \text{kg} \times 9.81\ \text{N kg}^{-1} \times \sin(30°)$ **Or** see $0.34 \times \sin(30°)$	
	Use of $v^2 = u^2 + 2as$ to determine acceleration of disc	**(1)**		

	Use of $\Sigma F = ma$ **(1)** Use of friction = $\Sigma F -$ (component of weight acting along slope) **(1)** F = 6.6 N **(1)**	Allow use of any appropriate suvat method to determine acceleration of disc <u>Example calculation</u> $E_{\text{k}} = \frac{1}{2} \times 0.035\ \text{kg} \times (5.0\ \text{m s}^{-1})^2 = 0.438\ \text{J}$ $\Delta E_{\text{grav}} = 0.035\ \text{kg} \times 9.81\ \text{N kg}^{-1} \times \sin(30°) \times 0.065\ \text{m}$ $= 0.0112\ \text{J}$ $W = 0.438\ \text{J} - 0.0112\ \text{J} = 0.427\ \text{J}$ $F = \frac{0.427\ \text{J}}{0.065\ \text{m}} = 6.57\ \text{N}$	**6**

(Total for Question 18 = 9 marks)

Question Number	Acceptable Answer		Additional Guidance	Mark
19(a)	Upwards arrow labelled upthrust / U **and** Upwards arrow labelled tension / T / F / F_{thread}	**(1)**	Arrows must start from dot Example diagrams 	**3**
	Downwards arrow labelled Weight / W / mg	**(1)**		
	Length of downwards arrow ≈ total length of upwards arrows (dependent on MP1 or MP2)	**(1)**		
19(b)(i)	The water exerts an upwards force on the sphere **Or** the water exerts an upthrust on the sphere	**(1)**		**3**
	by Newton's third law the sphere exerts a downward/opposite force on water (dependent on MP1)	**(1)**		
	(so) the force on the balance increases (and the reading increases)	**(1)**		
19(b)(ii)	mass of displaced water = 0.150 kg	**(1)**	(credit correct equivalent physics due to the density of the sphere being double the density of the water leading to the answer of 0.30 kg if correct reasoning shown)	**4**
	Use of $\rho = \frac{m}{V}$ with $\rho = 1000$ kg m^{-3} to determine volume of sphere	**(1)**		
	Use of $\rho = \frac{m}{V}$ with $\rho = 2000$ kg m^{-3} to determine mass of sphere	**(1)**		
	Mass of sphere = 0.30 kg	**(1)**	Example calculation Mass of displaced water = 0.465 kg – 0.315 kg = 0.150 kg	

		Volume of sphere = $\frac{0.150\ \text{kg}}{1000\ \text{kg m}^{-3}} = 1.50 \times 10^{-4}\ \text{m}^3$ Mass of sphere $2000\ \text{kg m}^{-3} \times 1.5 \times 10^{-4}\ \text{m}^3 = 0.300\ \text{kg}$	
19(b)(iii)	Upthrust will be less **Or** weight of displaced oil will be less **Or** downwards force of sphere on liquid will be less **(1)** (So) final reading will be less (than 465 g) **Or** (So) the increase/change in reading will be less (than 150 g) **(1)**	MP2 dependent on MP1	**2**

(Total for Question 19 = 12 marks)
TOTAL FOR PAPER = 120 MARKS