CAMBRIDGE
International Education

Cambridge International AS & A Level

PHYSICS **9702/24**

Paper 2 AS Level Structured Questions **October/November 2025**

MARK SCHEME

Maximum Mark: 60

Published

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2025 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

Annotations guidance for centres

Examiners use a system of annotations as a shorthand for communicating their marking decisions to one another. Examiners are trained during the standardisation process on how and when to use annotations. The purpose of annotations is to inform the standardisation and monitoring processes and guide the supervising examiners when they are checking the work of examiners within their team. The meaning of annotations and how they are used is specific to each component and is understood by all examiners who mark the component.

We publish annotations in our mark schemes to help centres understand the annotations they may see on copies of scripts. Note that there may not be a direct correlation between the number of annotations on a script and the mark awarded. Similarly, the use of an annotation may not be an indication of the quality of the response.

The annotations listed below were available to examiners marking this component in this series.

Annotations

Annotation	Meaning
A	Information missing or insufficient for credit
AE	Arithmetic error
BOD	Benefit of the doubt given
CON	Contradiction in response, mark not awarded
	Incorrect point or mark not awarded
ECF	Error carried forward applied
I	Ignore the response
MO	Mandatory mark not awarded
POT	Power of ten error
SEEN	Blank page seen
SF	Error in number of significant figures

Annotation	Meaning
TE	Transcription error
✓	Correct point or mark awarded
XP	Incorrect physics

Abbreviations

/	Alternative and acceptable answers for the same marking point.
( )	Bracketed content indicates words which do not need to be explicitly seen to gain credit but which indicate the **context** for an answer. The context does not need to be seen but if a context is given that is incorrect then the mark should not be awarded.
___	Underlined content must be present in answer to award the mark. This means either the exact word or another word that has the same technical meaning.

Mark categories

B marks	These are <u>independent</u> marks, which do not depend on other marks. For a **B** mark to be awarded, the point to which it refers must be seen specifically in the candidate's answer.
M marks	These are <u>mandatory</u> marks upon which **A** marks later depend. For an **M** mark to be awarded, the point to which it refers must be seen specifically in the candidate's answer. If a candidate is not awarded an **M** mark, then the later **A** mark cannot be awarded either.
C marks	These are <u>compensatory</u> marks which can be awarded even if the points to which they refer are not written down by the candidate, providing subsequent working gives evidence that they must have known them. For example, if an equation carries a **C** mark and the candidate does not write down the actual equation but does correct working which shows the candidate knew the equation, then the **C** mark is awarded. If a correct answer is given to a numerical question, all of the preceding **C** marks are awarded automatically. It is only necessary to consider each of the **C** marks in turn when the numerical answer is not correct.
A marks	These are <u>answer</u> marks. They may depend on an **M** mark or allow a **C** mark to be awarded by implication.

Question	Answer	Marks
1(a)(i)	$v_H = 28 \times \cos 34°$ $= 23\ \text{m s}^{-1}$	**A1**
	$v_V = 28 \times \sin 34°$ $= 16\ \text{m s}^{-1}$	**A1**
1(a)(ii)	time = 16 / 9.81 = 1.6 s	**A1**
1(a)(iii)	horizontal straight line at $v = 23\ \text{m s}^{-1}$ from $t = 0$ to $t = 3.2$ s	**B1**
1(a)(iv)	straight diagonal line starting at a positive velocity from $t = 0$ to $t = 3.2$ s, crossing the time axis	**B1**
	line starting at $v = 16\ \text{m s}^{-1}$ and ending at $v = -16\ \text{m s}^{-1}$	**B1**
	line passing through $v = 0$ at $t = 1.6$ s	**B1**
1(b)(i)	product of mass and velocity	**B1**
1(b)(ii)	$F = \Delta p / t$	**C1**
	$= 13 / 3.2$ $= 4.1$ N	**A1**

Question	Answer	Marks
1(b)(iii)	$m = \Delta p / v$ $= 13 / (2 \times 16)$ $= 0.41$ kg **or** $m = F / g$ $= 4.06 / 9.81$ $= 0.41$ kg	**A1**

Question	Answer	Marks
2(a)	product of force and distance	**M1**
	perpendicular distance between the (line of action of the two) forces	**A1**
2(b)	straight vertical line drawn from centre to bottom corner	**B1**
2(c)(i)	centre of gravity is to the right of the rod so torque is anticlockwise **or** moment of weight of sheet about rod is clockwise so torque is anticlockwise	**B1**
2(c)(ii)	(horizontal displacement) = $3.3 / (2.8 \times 9.81) = 0.12$ (m)	**A1**
2(d)	$\rho = m / V$	**C1**
	$V = 4.0 \times 10^{-3} \times$ (side length)^2	**C1**
	side length = $\sqrt{\left[2.8 / \left(3000 \times 0.0040\right)\right]} = 0.48\,\text{m}$	**A1**
2(e)	point lies on a straight line at 45° to the horizontal from the bottom-right corner to the edge of the rod	**B1**
	point lies on a vertical line half-way between rod and right-hand edge	**B1**

Question	Answer	Marks
3(a)	force is proportional to extension	**B1**
3(b)(i)	length = 37 m	**A1**
3(b)(ii)	spring constant = F / x	**C1**
	= e.g. $1800 / (120 - 37)$ = 22 N m^{-1}	**A1**
3(c)(i)	$((\Delta)E) = mg(\Delta)h$	**C1**
	= 64 × 9.81 × 120 = 75 000 J **or** 75 kJ	**A1**
3(c)(ii)	$(E =) \frac{1}{2}Fx$ **or** $(E =) \frac{1}{2}kx^2$ **or** $(E =) \frac{1}{2}F^2 / k$ **or** $(E =)$ area under graph	**C1**
	$(E =) \frac{1}{2} \times 1800 \times (120 - 37) = 75\,000$ J **or** 75 kJ **or** $(E =) \frac{1}{2} \times 21.7 \times (120 - 37)^2 = 75\,000$ J **or** 75 kJ	**A1**
3(d)	(all) gravitational potential energy has been converted / equal to elastic potential energy (so no kinetic energy)	**B1**
	kinetic energy is zero so speed is zero	**B1**

Question	Answer	Marks
4(a)	when two (or more) waves meet	**M1**
	(resultant) displacement equals the sum of the displacements of the (two separate) waves	**A1**
4(b)(i)	the incident and reflected waves superpose	**B1**
	(the waves superpose so that the resultant) amplitude is maximum at an antinode	**B1**
	(the waves superpose so that the resultant) amplitude is minimum / zero at a node	**B1**
4(b)(ii)	$c = f\lambda$	**C1**
	$f = (3.00 \times 10^8) / 0.026$ $= 1.2 \times 10^{10}$ Hz	**A1**
4(b)(iii)	microwave	**B1**
4(b)(iv)	distance = 0.026 / 4 $= 6.5 \times 10^{-3}$ m	**A1**

Question	Answer	Marks
5(a)(i)	potential difference per unit current	**B1**
5(a)(ii)	resistor connected to cell in a closed loop **and** correct circuit symbols used for all components	**B1**
	ammeter connected in series with resistor **and** voltmeter connected in parallel with resistor	**B1**
5(b)(i)	(resistance) = 1.38 / 0.276 = 5.00 (Ω)	**A1**
5(b)(ii)	$\rho = RA / L$	**C1**
	$\rho = 5.00 \times \pi \times (0.496 \times 10^{-3})^2 / (4 \times 0.864)$	**C1**
	$= 1.12 \times 10^{-6}\ \Omega\ \text{m}$	**A1**
5(b)(iii)	calculation of a fractional or percentage uncertainty in one quantity 0.001 / 0.864 **or** 0.002 / 0.496 **or** 0.02 / 1.38 **or** 0.001 / 0.276	**C1**
	percentage uncertainty = [(0.001 / 0.864) + (2 × 0.002 / 0.496) + (0.02 / 1.38) + (0.001 / 0.276)] × 100 = 2.7%	**A1**
5(b)(iv)	$\Delta\rho = 0.03 \times 1.12 \times 10^{-6}$ $= 3 \times 10^{-8}\ \Omega\ \text{m}$	**A1**

Question	Answer	Marks
6(a)(i)	W deflects upwards	**B1**
	W has deflection that is the mirror image of X	**B1**
	Y deflects downwards less than X **or** path of Y is parallel to particle Z	**B1**
6(a)(ii)	nucleus has most of the mass of the atom **or** nucleus is charged	**B1**
6(a)(iii)	atom is mostly empty space **or** nucleus occupies a very small proportion of the space in the atom	**B1**
6(b)	mass = 4 u	**A1**
	charge = (+)2*e*	**A1**
6(c)(i)	baryon	**B1**
6(c)(ii)	charge on up quark = $(+)\frac{2}{3}(e)$ **and** charge on down quark = $-\frac{1}{3}(e)$	**C1**
	(proton is up up down and neutron is up down down) $\left(2\times\frac{2}{3}\right)e-\left(1\times\frac{1}{3}\right)=1e$ **and** $\left(1\times\frac{2}{3}\right)e-\left(2\times\frac{1}{3}\right)e=0$	**A1**