

APOLLO

Motion in electromagnetic fields

HL

Physics

First assessment 2025

8 questions | mark schemes

Mark-scheme answers

Physics HL | Paper 1A | May 2025 TZ2 | Q25 | 1 marks

25. A

Physics HL | Paper 1A | May 2025 TZ2 | Q26 | 1 marks

26. A

3.	a		$E = \llcorner \frac{120}{8.0 \times 10^{-2}} = \gg 1.5 \times 10^3 \text{ NC}^{-1} \text{ OR } V\text{m}^{-1} \checkmark$		[1]
	b	i	$F = \llcorner eE = \gg 3.2 \times 10^{-19} \times 1.5 \times 10^3 \text{ OR } 4.8 \times 10^{-16} \text{ N} \checkmark$ $a = \llcorner \frac{F}{m} = \gg \frac{4.8 \times 10^{-16}}{4 \times 1.67 \times 10^{-27}} \text{ OR } 7.2 \times 10^{10} \text{ ms}^{-2} \checkmark$	<i>Allow ECF from a).</i> <i>Award [1] if they use a charge of e and a mass of 2u obtaining the right result.</i>	[2]
	b	ii	ALT 1 $t = \sqrt{\frac{2s}{a}} \checkmark$ $t = \llcorner \sqrt{\frac{2 \times 8.0 \times 10^{-2}}{7.2 \times 10^{10}}} = \gg 1.5 \times 10^{-6} \text{ s} \checkmark$ ALT 2 $v = \sqrt{2as} \llcorner = 1.06 \times 10^5 \text{ ms}^{-1} \gg \checkmark$ $t = \llcorner \frac{v}{a} = \gg 1.5 \times 10^{-6} \text{ s} \checkmark$	<i>Award [2] if $1.5 \times 10^{-6} \text{ s}$ is seen as the answer without working.</i>	[2]
	b	iii	240 eV $\checkmark$	<i>Accept $3.8 \times 10^{-17} \text{ J}$</i>	[1]
	c		$F_m = F_e \text{ OR } qvB = qE \text{ OR } B = F_e / qv \checkmark$ $B = \llcorner \frac{E}{v} = \frac{1.5 \times 10^3}{5.0 \times 10^5} = \gg 3.0 \times 10^{-3} \text{ T} \checkmark$	<i>Award [2] if $3.0 \times 10^{-3} \text{ T}$ is seen as the answer without working.</i> <i>Allow ECF from a) and b) i)</i>	[2]

– 9 –

2225–6715M

	d		Horizontal / undeflected path $\checkmark$		[1]

– 10 –

2225–6715M

Question	Answers	Notes	Total
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Mark-scheme answers

Physics HL | Paper 1A | Nov 2025 TZ1 | Q28 | 1 marks

28. C

Physics HL | Paper 1A | Nov 2025 TZ1 | Q29 | 1 marks

29. B

Physics HL | Paper 1A | Nov 2025 TZ3 | Q32 | 1 marks

32. B

3.	a		$\ll 8.99 \times 10^9 \times \left(\frac{9Q}{0.30^2} + \frac{Q}{0.06^2} \right) = 3.26 \times 10^7 \text{ so } \gg Q = 9.6 \times 10^{-6} \checkmark$		[2]
			C $\checkmark$		
3.	b	i	$qvB = m \frac{v^2}{R} \checkmark$ Hence answer		[1]
3.	b	ii	Force is perpendicular to the velocity / F acts as centripetal / F does no work / F only changes direction of velocity $\checkmark$	<i>Do not accept reference to centripetal acceleration only</i>	[1]
3.	c		loss of energy / speed reduced $\checkmark$ so radius decreases $\checkmark$	<i>MP2 scores only if MP1 is scored.</i>	[2]

Question	Answers	Notes	Total
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1.	a	i	0.02 «kV» ✓		1
1.	a	ii	by measuring the time for many bounces ✓ and dividing the result by the number of bounces ✓		2
1.	a	iii	it is not possible to draw a straight line through all the error bars ✓		1
1.	a	iv	$T = 0.5 \text{ s}$ ✓ « $\frac{0.1}{0.5} \Rightarrow 0.2$ » ✓		2
1.	b	i	a best-fit line drawn through the entire range of the data ✓ large triangle greater than half a line or two data points on the line greater than half a line apart ✓ correct read offs consistent with the line, eg $\frac{1.6 - 0}{0.40 - 0} = 4.0$ ✓	Accept answer in the range 3.8–4.2	3
1.	b	ii	kV s ✓		1
1.	b	iii	the angle between the string and the vertical should be very small «for any position of the ball» ✓ so that the tension in the string is «almost» balanced by the ball's weight OR restoring force from the string / horizontal component of tension negligibly small «compared with electric force» ✓	OWTTE	2

Question	Answers	Notes	Total
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