

APOLLO

Forces and momentum

SL

Physics

First assessment 2025

22 questions | mark schemes

Mark-scheme answers

Physics SL | Paper 1A | May 2025 TZ1 | Q3 | 1 marks

3. A

Physics SL | Paper 1A | May 2025 TZ1 | Q4 | 1 marks

4. C

Physics SL | Paper 1A | May 2025 TZ1 | Q6 | 1 marks

6. A

Physics SL | Paper 1A | May 2025 TZ2 | Q4 | 1 marks

4. D

Physics SL | Paper 1A | May 2025 TZ2 | Q5 | 1 marks

5. D

Physics SL | Paper 1A | May 2025 TZ3 | Q3 | 1 marks

3. C

Physics SL | Paper 1A | May 2025 TZ3 | Q4 | 1 marks

4. D

Physics SL | Paper 1A | May 2025 TZ3 | Q5 | 1 marks

5. D

Physics SL | Paper 1A | May 2025 TZ3 | Q6 | 1 marks

6. D

1.	a		ALT 1 KE before is $\frac{1}{2} \times 3.0 \times 6.0^2 = 54 \text{ J} \checkmark$ KE after is $\frac{1}{2} \times 3.0 \times 2.0^2 + \frac{1}{2} \times 6.0 \times 4.0^2 = 54 \text{ J} \checkmark$ ALT 2 In elastic collisions relative velocity remains constant in magnitude $\checkmark$ $6 - 0 = -2 - 4 \checkmark$	Ignore references to conservation of momentum	[2]
	b	i	$F = \frac{6.0 \times 4.0}{40 \times 10^{-3}} \text{ OR } F = \frac{3.0 \times (6.0 - (-2.0))}{40 \times 10^{-3}} \checkmark$ $F = 6.0 \times 10^2 \text{ N} \checkmark$	Allow ECF from a wrong time interval. If the final answer is incorrect, award MP1 for [1max] for any attempt to use rate of change of momentum or mass x acceleration with wrong data values for masses and velocities.	[2]
	b	ii	Alternative 1 $\Delta E_K = \frac{1}{2} \cdot 6.0 \cdot 4.0^2 \text{ OR } 48 \text{ J} \checkmark$ $P = \ll \frac{\Delta E_K}{\Delta t} = \gg \frac{48}{40 \times 10^{-3}} = 1200 \text{ W} \checkmark$ Alternative 2 $\bar{P} = \bar{F} \frac{u+v}{2} \checkmark$ $\bar{P} = 600 \times \frac{0+4.0}{2} = 1200 \text{ W} \checkmark$	Award [2] if 1200 <<W>> is seen as the answer without working Award [1] for 2400 W. Allow ECF from bi) in ALT 2.	[2]

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2225 – 6718M

	b	iii	KE is $\frac{1}{2} \times (3.0 + 6.0) \times 2.0^2 = 18 \text{ J} \checkmark$ PE is $54 - 18 = 36 \text{ J} \checkmark$	Allow ECF from MP1	[2]
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2225 – 6718M

Question	Answers	Notes	Total
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1.	a	It is a ratio between two forces therefore units cancel out. OR $\mu = F_f/N$, therefore units cancel out. ✓		1
1.	b	uses the static coefficient ✓ $F = 0.36 \times 1.2 \times 9.8 = 0.36 \times 11.76$ OR $F = 4.2 \text{ «N»}$ ✓	Must see full substitution OR answer to 2 (or more) significant figures for MP2.	2

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1.	c	ALT 1 $F_f = 0.28 \times 1.2 \times 9.8 = 3.29 \text{ «N»}$ ✓ $W \text{ done over } 0.35 \text{ m} = (14 - 3.29) \times 0.35 = 3.75 \text{ «J»}$ ✓ $d = \text{«}3.75 \text{ J} / 3.29 \text{ N} \text{»} = 1.14 \text{ «m»}$ ✓ ALT 2 $a = (14 - 0.28 \times 1.2 \times 9.8) / 1.2 = 8.92 \text{ «m s}^{-2}\text{»}$ ✓ $v = \sqrt{(2)(8.92)(0.35)} = 2.50 \text{ «m s}^{-1}\text{»}$ ✓ $d = \text{«}2.5^2 / (2 \times 0.28 \times 9.8) \text{»} = 1.14 \text{ «m»}$ ✓	Allow ECF from MP1 Only award marks from one ALT.	3
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2225 – 6724M

Question	Answers	Notes	Total
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Mark-scheme answers

Physics SL | Paper 1A | Nov 2025 TZ1 | Q3 | 1 marks

3. A

Physics SL | Paper 1A | Nov 2025 TZ1 | Q4 | 1 marks

4. A

Physics SL | Paper 1A | Nov 2025 TZ3 | Q3 | 1 marks

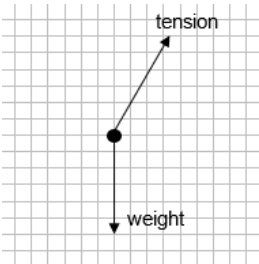
3. B

Physics SL | Paper 1A | Nov 2025 TZ3 | Q4 | 1 marks

4. C

1.	a		milligram OR 0.001 g ✓	Accept half milligram / 0.0005 g Ignore use of plus/minus	[1]
1.	b		$(0.001427 - 0.001208) \cdot 9.8$ OR 2.1 mN ✓	Allow the calculation to give a result in mN or N. Look for full substitution or answer with at least two SF.	[1]
1.	c		$\rho g V = 0.002146$ ✓ $\rho = 1200 \text{ kg m}^{-3}$ ✓	Do not penalise the use of SF. Watch for ECF from 1b and POT errors.	[2]
1.	d		A single, straight line passing through most points, which does not attempt to pass through the origin. ✓ Curved line passing through first three points ✓	Allow MP1 straight lines to extend to the x-axis	[2]
1.	e		The gradient is constant / the line is straight « when the terminal v is reached » ✓	Ignore any comments not explicitly referring to the graph	[1]
1.	f		$\eta = 0.2512$ ✓ 7% OR 0.02 ✓ $\eta = 0.25 \pm 0.02$ ✓ Pa s OR $\text{kg m}^{-1} \text{s}^{-1}$ ✓	MP1 and MP2 are for the calculations, accept any number of SF, MP3 is for the matching precision of the value and its uncertainty. ECF may apply but uncertainty may only have 1SF. Allow other suitable units such as Nm^{-2}s	[4]
1.	g		the value lies within the range of the uncertainties « so the experiment was accurate » ✓	Watch for ECF from 1f	[1]

Question	Answers	Notes	Total
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2.	a	i	 Labelled vertical weight / W / mg / F_g and tension / T / F_T in approximately correct direction ✓ With vertical T component equal to weight ✓	Ignore other forces drawn for MP1	[2]
2.	a	ii	$T \sin 30^\circ = ma$ OR $T \cos 30^\circ = mg$ ✓ $a = g \tan 30^\circ = 5.66 \approx 5.7 \text{ m s}^{-2}$ ✓	Accept reversed trig functions if 60° used. Award [2] for CNA	[2]
2.	b		The ball is in equilibrium / forces are balanced / net force is zero / no acceleration / the vertical weight must be balanced by a vertical tension ✓ The angle is zero ✓	For MP2, accept an answer of 10° if from the students' answer it can be understood that they interpreted the vertical as the perpendicular line to the ceiling of the truck, so that their answer of 10° implies that the string is vertically downwards.	[2]

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Question			Answers	Notes	Total
2.	c		$\mu mg = m \frac{v^2}{R}$ ✓ $v = \sqrt{0.6 \times 9.8 \times 75}$ 21 ms ⁻¹ ✓	Award [2] for a CNA.	[2]
2.	d		ALTERNATIVE 1 $\text{KE } \frac{1}{2} \times 1400 \times 15^2$ OR $1.6 \times 10^5 \text{ J}$ ✓ Work done by drag force $520 \times \pi \times 75$ OR $1.2 \times 10^5 \text{ J}$ ✓ This is less than the KE so the truck will make it ✓ ALTERNATIVE 2 Truck decelerates at $\frac{520}{1400}$ OR 0.371 ms^{-2} ✓ Speed at gas station is $\sqrt{15^2 - 2 \times 0.371 \times \pi \times 75}$ OR 7.0 ms^{-1} OR truck stops after a distance $\ll \frac{15^2}{2 \times 0.371} = \gg 303 \text{ m}$ ✓ Speed is not zero OR $303 \text{ m} > 75 \pi$ OR $303 \text{ m} > 236 \text{ m}$ ✓	Allow MP3 for a consistent conclusion if any previous calculation is wrong.	[3]

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Question	Answers	Notes	Total
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Mark-scheme answers

Physics SL | Paper 1A | Specimen 2025 | Q2 | 1 marks

2. C

Physics SL | Paper 1A | Specimen 2025 | Q4 | 1 marks

4. D

Physics SL | Paper 1A | Specimen 2025 | Q6 | 1 marks

6. D

2.	a		3 sf is inappropriate for A ✓ rejects trial 3 as outlier for B ✓		2
2.	b		beam bends under its own weight / weight of pan OR specified systematic error in d ✓		1
2.	c		units of W : kg m s^{-2} ✓ work leading to $x = 1$ and $y = 3$ ✓		2
2.	d	i	instrument (capable of reading to 0.05 mm) with reason related to resolution of instrument ✓	<i>eg micrometer screw gauge, Vernier caliper, travelling microscope</i>	1
2.	d	ii	attempt to calculate fractional uncertainty in either a or b [0.0357, 0.0167] ✓ $0.0357 + 0.0167 = 0.05 = 5\%$ ✓		2

1.	a		static friction force «between blocks» AND directed to the right✓		1
1.	b		$F = 60a$ ✓ $F_f = 0.6 \times 15 \times 9.8$ «= 88.2N» ✓ $88.2 = 15 \times \frac{F}{60} \Rightarrow F = 350$ «N» ✓	Allow use of $a = 0.6g$ leading to 353 N.	3

Question	Answers	Notes	Total
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