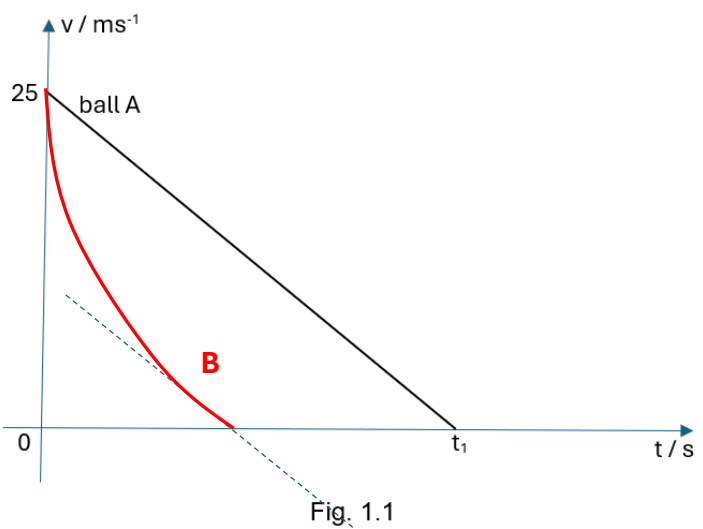
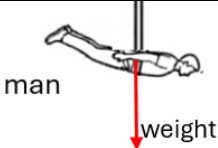
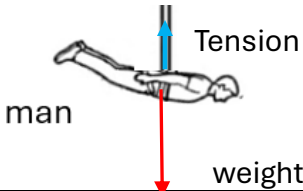
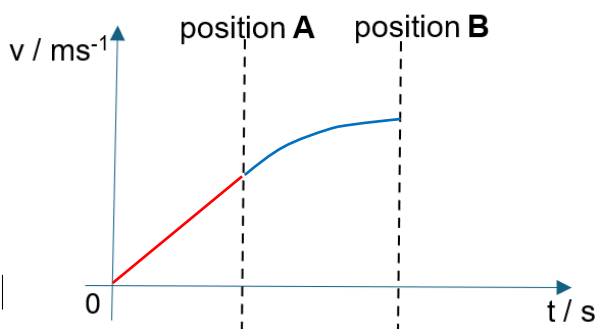


V2 - Solution for Pure Physics Prelim Paper 2 (2026)

	Solution	Marks/Comments
1a	$a = (v-u)/t$ $-10 = (0-25)/t$ $t = 2.5\text{s}$	B1
b	Max height = area under graph $= \frac{1}{2} \times 2.5 \times 25$ $= 31.25$ $= 31\text{ m}$	M1 (o.e) A1 (2sf)
ci	 Fig. 1.1	B1 – Start from 25m/s End with 0 m/s earlier than t_1 B1 - Decreasing deceleration shape Do not penalize if slope is near zero at horizontal axis.
ii	As ball B moves upward, its speed decreases. Hence, the (downward) <u>air resistance</u> acting against the ball <u>decreases</u>. Since <u>resultant force = weight + air resistance</u>, the <u>resultant force decreases</u>. Hence, the ball falls with <u>decreasing deceleration</u>. 1. Air resistance decreases 2. $F_{\text{net}} = W + \text{air resistance}$ 3. F_{net} decreases 4. Decreasing acceleration Hit any 2points award 1 mark Hit all 4 points full marks Allow ecf max 1 mark from ci	B1 B1
		7 marks

2ai		B1 – Weight, downwards (Do not mark down on CG position)
2aii		B1 – both tension and weight Arrow of weight is longer.
2aiii	 Fig. 2.2	B1 – straight line from 0m/s to position A B1 – decreasing acceleration profile from A to B
bi	The resultant force is opposite to direction of motion/velocity.	B1
bii	$F_{\text{net}} = ma$ Take upward as positive, $T - W = ma$ $T - (60 \times 10) = 60 (3.0)$ $T = 180 + 600$ $= 780 \text{ N}$	M1 (calculate weight 600N correctly) A1
		7 marks
3a	It is a point where entire weight of the object appears to act.	B1
bi	$m = W/g = 3.0/10 = 0.30 \text{ kg}$	B1 (2 sf)
bii	$A_{\text{cw}} \text{ moment} = C_{\text{w}} \text{ moment}$ $F \times 1.10 = 44.0 \times (1.70 - 1.10) + 3.0 \times (4.00 - 1.10)$ $= 44.0 \times (0.60) + 3.0 \times (2.90)$ $F = 31.9090$ $= 32 \text{ N}$	M1 A1 (accept 2sf or 3sf)

biii	Total upward force = Total downward force $F_{\text{upward}} = 44.0 + 3.0 + 32$ $= 79 \text{ N}$	B1 A1 (accept 2 or 3 sf)
		6 marks
4a	Diff in gpe = $mg(h_1 - h_2)$ $= 330 (4.0 - 1.1)$ $= 957$ $= 960 \text{ J}$	M1 A1 (2 sf)
b	W.D = change in GPE – KE at Y $52 \times d = 957 - 540$ $d = 8.019$ $= 8.0 \text{ m}$	M1 A1 (2sf)
c	Energy in the gravitational potential store of the child is transferred to the <u>kinetic store</u> of the child and <u>internal store</u>. (of the child & surrounding)	B1 B1
d	$\frac{1}{2} mv^2 = 540$ $\frac{1}{2} (330/10) v^2 = 540$ $v = 5.7 \text{ m/s}$	M1 A1 (accept 2 to 3 sf)
		8 marks
5a	Weight of oil = weight of water $(V\rho g)_{\text{oil}} = (V\rho g)_{\text{water}}$ $0.272 \times \frac{0.80}{10000} \times \rho \times 10 = 0.245 \times \frac{0.80}{10000} \times 1000 \times 10$ $\rho = 900.735$ $= 901 \text{ kg/m}^3$	M1 A1 Note: No need to convert V to SI unit is ok. Do not penalise as they will cancel off and still give same answer.
b	Pressure at B = $(h\rho g)_{\text{water}} + P_{\text{atm}}$ $= 0.245 \times 1000 \times 10 + 101000$ $= 103450$ $= 103000 \text{ Pa}$	M1 A1
c	Height should be equal/ the same. Pressure is <u>independent</u> of volume/cross sectional area Alternative: Since $P = h\rho g$. Density & gravitational field strength are constant, Pressure will be dependent <u>only</u> on the height of the liquid column.	B1 B1
		6 marks

6a	The more energetic/faster particles close to the surface of the water have enough energy to overcome intermolecular /attractive forces and escape. The (average) kinetic energy of the remaining particles is now lower, leading to a decrease in temperature.	B1 B1
b	In one second, $Q = mL_f$ $= \frac{0.020}{1000} \times 3.34 \times 10^5$ $= 6.68 \text{ J}$ % efficiency = $\frac{6.68}{45} \times 100\%$ $= 14.844$ $= 15\%$	M1 (for convert mass to per kg) M1 (allow error forward in Q=6.68) A1 (ans in 2sf)
		5 marks
7a	Amplitude of wave X: 10 cm (accept 10.0 cm as ½ smallest div) Wavelength of wave Y: 0.4m (accept 0.40m as ½ smallest div)	B1
b	Wave Y. It has a larger amplitude.	B1
c	Agree. Since both waves have the same speed and wavelength, By $v=f\lambda$, they have the same frequency and hence same pitch.	B1 B1
		4 marks
8a	$R = \frac{1}{2} \times 18$ $= 9.0 \Omega$	A1
bi	$I = V/R$ $= 6.2 / 18$ $= 0.34 \text{ A}$	B1
ii	V = 0V V = 6.2V	B1 B1
c	The voltmeter reading decreases. Total resistance decreases as the (fixed) resistor is parallel to the resistance wire. Hence, (total) current increases. Since resistance across CB is fixed, by $V=IR$, voltage across CB increases. Thus voltage of AC/voltmeter reading decreases.	B1 (award if student can conclude current increase) B1

	OR The voltmeter reading decreases. Total resistance decreases as the (fixed) resistor is <u>parallel</u> to the resistance wire. By <u>potential divider rule</u>, voltage across AC decreases.	B1 B1
d	Maximum voltage of lamp in Fig. 8.2 is <u>less than 6.2V</u>. By $P = V^2/R$, the <u>maximum power is less</u> and thus less bright.	B1
		7 marks
9a	$P = VI$ Current of fan, $I = P / V = 300 / 240 = 1.25 \text{ A}$ current of heater = 10.4 A $P = VI$ $I = 2500 / 240 = 10.4 \text{ A}$ Total current = $1.25 + 10.41 = 11.66 \text{ A}$ Since total current exceeds 11A, the fuse will melt and is not suitable.	M1 (correct current of either fan or heater) B1 (correct explanation, allow 1 mark based on deduction from calculation)
b	The fuse is wrongly connected to the neutral wire. A fuse should be connected to the live wire. The earth wire is wrongly connected to the heater coil . The earth wire should be connected to the <u>metal casing</u> of the heater. (must mention the metal case)	B1 B1
ci	AB downwards, CD upwards	B1
cii	When <u>a current flows</u> through AB, it <u>generates a magnetic field</u> . This magnetic field <u>interacts with the magnetic field of the magnet</u> to produce a force.	B1
ciii	To <u>reverse the direction of current</u> every <u>half a revolution</u> so as to <u>ensure continuous rotation</u> .	B1
civ	By <u>Lenz's law</u>, the induced e.m.f must be in a direction that <u>produce a magnetic effect</u> which <u>opposes</u> the <u>changes</u> in the magnetic flux linkages. Since induced e.m.f is <u>opposite polarity</u> to supply e.m.f, the net e.m.f decreases and current decreases.	B1
		8 marks

10ai	The force acting on the blade (or force exerted by wind) is <u>larger than resistive force</u> acting against the blade when the wind is larger than the cut-in speed. (accept overcome resistive force)	B1
aii	The turbine (blades) might get damaged. OR The current produced might be too large/excessive for safe use/ system to handle.	B1
b	At wind speed of 12 m/s, power is at rated = 650 W $P = VI$ $I = P/V$ $= 650/48$ $= 13.5$ $= 14 \text{ A}$	M1 A1 (2sf but do not deduct for sf)
ci	average energy generated per day $= \frac{2000}{365} = 5.48 \text{ kWh}$ Also accept if in Joules, $5.48 \text{ kWh} = 5480 \times 60 \times 60 = 19.7 \times 10^6 \text{ J}$	B1 (accept 2 or 3 sf)
cii	energy consumed by the home per day $= (0.6 \times 6) + (0.02 \times 10) + (0.75 \times 3)$ $= 6.05 \text{ kWh}$ Since the average energy generated is less than the energy consumed per day, the suggestion is not suitable .	B1 B1
di	The air particles are <u>decelerated/slow down</u> upon hitting on the blades, so by Newton's second law, there must be a (net) <u>force by blade on the air particles</u> . By Newton's third law, there must also be a <u>reaction-pair force by air particles on the blades</u> , which turns the blades.	B1 B1
dii.1	Mass of air which hits the blades per second $= 0.25 \times \frac{9000}{60} = 37.5 \text{ kg/s}$	B1 (accept 2 or 3 SF)

dii.2	Amount of kinetic energy transferred to the blades per second = $\frac{1}{2}mv^2 - \frac{1}{2}mu^2$ = $\frac{1}{2}(37.5)(4^2 - 1^2)$ = 281.25W Power of the turbine = 281 W	Allow full ecf from dii.1 for mass. M1 (diff in KE) A1 (accept 2 or 3sf)
		12 marks

Section B

11ai	As the plane flies to the right, wing PQ <u>cuts the magnetic flux/field lines</u>. By Faraday's <u>law of electromagnetic induction</u>, an induced e.m.f is produced. OR As the plane flies to the right, there is a <u>rate of change of magnetic flux linkages</u> formed with wing PQ. By Faraday's <u>law of electromagnetic induction</u>, an induced e.m.f is produced.	B1
a ii	Q to P. (Accept QP) Accept electrons flow from P to Q	B1
a iii	P	B1
b	As air rubs against the wing, the <u>atoms at the surface</u> of the wing becomes agitated and <u>loses electrons</u> to the surrounding air molecules.	B1 (look at the wick tip, it is positively charged, indicating the wings loses electrons due to charging by friction.)
ci	For transformer B, Power in primary coil = power in secondary coil $V_p I_p = V_s I_s$ $400\,000 \times I_p = 200 \times 12.5$ $I_p = 6.3 \text{ mA}$	M1 A1(accept 2/3 sf)
cii	A high voltage will result in a very <u>small current</u> in transmission cable. By $P=I^2R$, the <u>power loss</u> through (Joule) heating is very <u>little</u>.	B1
di	nucleon number = 212 proton number = 82	B1 B1
dii	Beta decay	B1

		10 marks
12ai	Frequency of light	B1
aii	$n = \frac{\sin 21}{\sin 14}$ $= 1.4813 = 1.48$ Speed of light in plastic $= (3 \times 10^8)/1.4813$ $= 2.03 \times 10^8 \text{ m/s}$	M1 A1 (2 or 3 sf)
bi & ii	Magnification = 0.7 = image height / 50 cm Image height = 35cm # of small squares = 35/25 x 5 = 7 small squares	For image B1 – 35 cm (7 small squares) B1 – correct position with the help of light ray thru optical centre. B1 – correct position of focal point
ci	10 min^{-1} (observe the count-rate at the end where the radioactive source is almost all decayed)	B1
cii	curve is not smooth or curve fluctuates/curve is jagged	B1

ciii	At count rate 140 min^{-1}, $t = 0.4 \text{ h}$ At count rate 140 min^{-1}, $t = 0.4 \text{ h}$ Account for back-ground radiation, count rate of source = $140 - 10 = 130 \text{ min}^{-1}$ Account for back-ground radiation, count rate of source = $140 - 10 = 130 \text{ min}^{-1}$ After $\frac{1}{2}$ life, the count rate of source = $130/2 = 65 \text{ min}^{-1}$. But total count = $65 + 10 = 75 \text{ min}^{-1}$ $t = 2.3 \text{ h}$ Thus, half-life = $2.3 - 0.4 = 1.9 \text{ h}$ Alternative At count rate 40 min^{-1}, $t = 4.4 \text{ h}$ Account for back-ground radiation, count rate of source = $40 - 10 = 30 \text{ min}^{-1}$ After $\frac{1}{2}$ life, the count rate of source = $30/2 = 15 \text{ min}^{-1}$. But total count = $15 + 10 = 25 \text{ min}^{-1}$ $t = 5.8 \text{ h}$ Thus, half-life = $5.8 - 4.4 = 1.4 \text{ h}$	B1 –consider background count OR award if student halves the count rate A1 – Acceptable range of answer is 1.4h to 1.9h (Look at students working on graph to award mark.)
		10 marks
