

Marking Scheme
Physics (6091) Preliminary Examination 2026

Mark scheme will use these abbreviations

/	alternatives
+	statements on both sides of the + are needed for that mark
R	reject
A	accept (for answers correctly cued by the question)
lg	ignore as irrelevant
ref	with reference to
ecf	error carried forward
AW	alternative wording (where responses vary more than usual)
AVP	alternative valid point
ORA	or reverse argument
OWTTE	or words to that effect
<u>underline</u>	actual word given must be used by candidate (grammatical variants excepted)
()	the word / phrase in brackets is not required but sets the context

Accept 2 sf

Paper 2 – Section A

Qn	Marking Scheme	Marks	Marker's Report
1a	$W = mg$ $m = 2400/10$ $m = 240 \text{ kg}$ $d = m/v$ $d = 240/(64)$ $d = 3.75$ $d = 3.8 \text{ kg/m}^3$	[1] [1]	
1b	$1.0 \text{ g/cm}^3 = 1000 \text{ kg/m}^3$ <i>Compares density using same unit</i> Density of the cube is lower than density of water, therefore it would float on water.	[1] [1]	ecf
1c	Mass of X = $240 - 3.8 = 236.2 \text{ kg}$ Mass of Y = 20 kg Effective density = total mass/total volume = $256.2 / 64$ = 4.0 kg/m^3	[1] [1] [1]	
	Total	[7]	

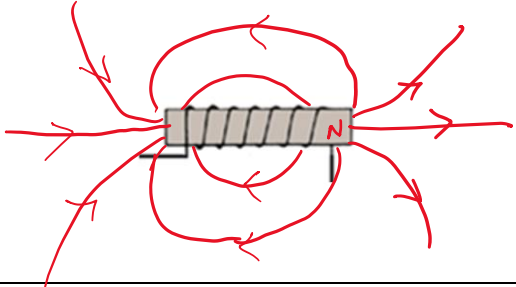
Qn	Marking Scheme	Marks	Marker's Report
2	T_1 and T_2 drawn to scale with 113° accurately draw between them. Parallogram or tip-to-tail diagram completed correctly Direction of resultant force or T_3 drawn correctly/arrows drawn correctly $T_3 = 7.9 \text{ N}$ (7.1 N to 8.7 N)	[1] [1] [1] [1]	
	Total	[4]	

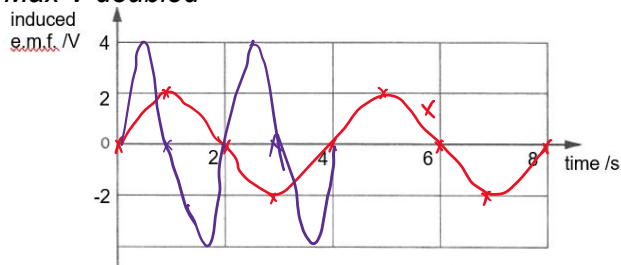
Qn	Marking Scheme	Marks	Marker's Report
3a	When the pan is empty, only the 2.0 N weight and the weight of the steelyard acts on the steelyard. At R, 2.0 N weight produces a CWM and that implies that the weight of the steelyard must produce an ACWM for the steelyard to be in equilibrium. Thus, the weight of the steelyard must act between P to Q, to the left of pivot.	 [1] [1]	
3b	Moment due to weight of steelyard = moment due to 2.0 N weight = $2.0 \times 0.05 \text{ m}$ = 0.10 Nm direction = anticlockwise	 [1] [1]	Allow 1 sf
3c	Max CWM = 0.65×2.0 = 1.3 Nm ACWM due to weight of steelyard = 0.10 Nm ACWM left for weight of other objects = $1.3 - 0.1 = 1.2 \text{ Nm}$ Maximum weight of other objects = $1.2 / 0.15$ = 8.0 N	 [1] [1]	ecf
	Total	[6]	

Qn	Marking Scheme	Marks	Marker's Report
4a	Freq. = $4/8 = 0.50$ Hz Wavelength = 0.40 m $V = f \lambda$ $V = 0.50 (0.4)$ $= 0.20$ m/s	[1] [1] [1]	
4b	1.5 second later > wave moved $0.2 \times 1.5 = 0.30$ m to the right. $d1 = -2.0$ cm $d2 = 0.60$ m from $t = 4.0$ s to $t = 5.5$ s, p moves upwards until $d1$ is 2.0 cm then moves downwards (until $d1 = -2.0$ cm).	[1] [1] [1]	ecf
	Total	6	

Qn	Marking Scheme	Marks	Marker's Report
5a	$I = (6.0 - 3.5)/100$ $I = 0.025$ A $R = 3.5 \text{ V} / 0.025 \text{ A}$ $R = 140 \Omega$	[1] [1]	Accept alternative method.
5b	For 25°C to 40°C the resistance of the thermistor decreases, by potential divider rule it would cause more p.d. to be across R and hence the bulb. $P = V^2/R$, the power and thus the brightness of the bulb would increase.	[1] [1]	
	Total	[4]	

Qn	Marking Scheme	Marks	Marker's Report
6a	So that if they melt and break the circuit, the components of the circuit would be at low potential/ not Live.	[1]	
6b	Current draw of 1 lamp = $60/220 = 0.27$ A Max total lamps = $3.1\text{A} / 0.27 \text{ A} = 11.48\dots$ lamps More lamps = $11 - 3 = 8$ lamps	[1] [1]	accept whole number
6c	The earth wire is to provide an alternate path of low resistance when there is fault in the circuit making the casing live. By doing so it would increase the current in the circuit and causing the fuse to melt and break the circuit.	[1] [1]	
	Total	[5]	

Qn	Marking Scheme	Marks	Marker's Report
7a		[1]	
7b	Shape direction of field 	[1] [1]	ecf
7c	The compass needle would follow the magnetic field lines it experiences... ... and point towards the left.	[1] [1]	ecf
Total		5	

Qn	Marking Scheme	Marks	Marker's Report
8ai	Using flemming's right hand rule, with the thumb point upwards in the direction of the force, and the index finger pointing to the right in the direction of the magnetic field, current represented by the third finger would be... ...in the BA direction/into paper.	[1] [1]	
8aai	When the wire is held stationary, there will be no rate of change of magnetic field lines linking the wire. Thus, no induced emf would be formed and the needle would not deflect.	[1] [1]	
8bi	<i>Sine graph starting from (0,0)</i> <i>Max V is 2 V and 4 s for 1 complete cycle.</i>	[1] [1]	[-1] if not labelled properly, and not min 2 cycles
8bii	<i>Period halved</i> <i>Max V doubled</i> 	[1] [1]	[-1] if not labelled properly, And not min 2 cycles
		7	

Qn	Marking Scheme	Marks	Marker's Report
9a	It is an electron.	[1]	
9bi	${}_{91}^{233}\text{Pa}$	[1]	
9bii	${}_{54}^{137}\text{Xe}$	[1]	
9biii	${}_{38}^{94}\text{Sr}$	[1]	
9c	$100\% > 50\% > 25\% > 12.5\% > 6.25\% > 3.125\% > 1.5625\% > 0.78125\%$ $7 \text{ half-lives} = 7 \times 75$ $= 525$ $= 530 \text{ s (2sf)}$	 [1] [1]	
	Total	[6]	

Qn	Marking Scheme	Marks	Marker's Report
10a	$t = 1.5 \text{ s}$ to $t = 1.6 \text{ s}$: negative linear line from 15 m/s to 12 m/s. $t = 1.6 \text{ s}$ to $t = 2.8 \text{ s}$: positive linear line from 12 m/s to 0 m/s.	[1] [1]	
10b	acceleration is the rate of change velocity.	[1]	
10c	$a = (-12 - 15) / (1.6 - 1.5)$ $a = -270 \text{ m/s}^2$	[1] [1]	
10d	As the ball is falling without air resistance, the only force/resultant force acting on it is its own weight. Since $F = ma$ and $W = mg$, thus $a = g$.	[1] [1]	
10e	Initial height = $\frac{1}{2} (1.5)(15) = 11.3 \text{ m}$ Maximum rebound = $\frac{1}{2} (1.2)(12) = 7.2 \text{ m}$ $11.3 > 7.2$ Therefore, initial height > maximum rebound	[1] [1] [1]	ecf no ecf
	Total:	[10]	

Qn	Marking Scheme	Marks	Marker's Report
11a	Energy cannot be created nor destroyed it can only be transferred from one store to another. The total energy in an isolated system is constant.	[1]	
11bi	P = 4(120 000) P = 480 000 J/s	[1] [1]	
11bii	Power needed to be absorbed by coolant = 480 000 J/s 480 000 = (flow rate) c (change in temp) 480 000 = 16 c (25-10) c = 2 000 J/(kg °C)	[1] [1]	ecf
11c	copper, painted black copper, painted black	[1] [1]	
11d	It is to increase the contact area of the pipes with each other... ...to increase the rate of transfer via conduction (and electromagnetic radiation).	[1] [1]	
11e	<i>Any acceptable answer</i> e.g. Increase the number of turns/contact area of the pipes within the heat exchanger. Cover the heat exchanger with an insulator to reduce the heat transferred to the surrounding.	[1]	
	Total	10	

Paper 2 – Section B

Qn	Marking Scheme	Marks	Marker's Report
12a	$E_{gp} = mgh$ $E_{gp} = 80(10)(5)$ $E_{gp} = 4\,000\text{ J}$	[1]	
12b	$E_k = \frac{1}{2}mv^2$ $= \frac{1}{2}80(5.0^2 - 4.0^2)$ $= \frac{1}{2}80(25 - 16)$ $= 360\text{ J}$	[1] [1]	
12c	(At A, it has energy in the chemical potential store and kinetic store). Energy is transferred mechanically from the chemical potential store to the kinetic store (increasing it) and gravitational potential store .	[1] [1]	
12di	$E_k \text{ at C} = \frac{1}{2}mv^2$ $= \frac{1}{2}80(5.0^2)$ $= 1000$ $E_k \text{ at D} = 4000 + 1000 = 5000\text{ J}$ $WD = F \times d$ $5000 = 500 \times d$ $d = 10\text{ m}$	[1] [1] [1]	
12 dii	<i>Any two:</i> The energy is transferred to the internal store of the cyclist and bicycle. The energy is transferred out of the system to the surroundings by heating. The energy is transferred (mechanically) out of the system to the ground. The energy is transferred out of the system by the propagation of (sound) waves.	[2]	
	Total:	10	

Qn	Marking Scheme	Marks	Marker's Report
13a	$n_1 \sin \theta_1 = n_2 \sin \theta_2$ $1 \sin 90 = n_2 \sin 70$ $n_2 = 1/\sin 70$ $= 1.06$ $= 1.1 \text{ (2 sf)}$	[1] [1]	
13b	$1 \sin X = 1.06 \sin 40$ $X = 42.9$ $X = 43^\circ$	[1] [1]	Ecf <i>Note truncation error:</i> $1 \sin X = 1.1 \sin 40$ $X = 45^\circ$
13ci	$n = c/v$ $1.06 = 3.0 \times 10^8 / v$ $v = 2.8 \times 10^8 \text{ m/s}$	[1]	Ecf <i>Note truncation error:</i> $1.1 = 3.0 \times 10^8 / v$ $v = 2.7 \times 10^8 \text{ m/s}$
13ci	The complete reflection of light within the optically denser medium... ...when it travels from an optically denser medium to an optically less dense medium and its angle of incidence is larger than the critical angle.	[1] [1]	
13cii1	The greater the refractive index of the core, the smaller the critical angle. Hence, more light rays would/easier for light rays to undergo total internal reflection.	[1] [1]	
13cii2	$n = c/v$. The greater the refractive index the slower the speed of light inside the core.	[1]	
	Total:	10	