

CONVENT OF THE HOLY INFANT JESUS SECONDARY
2025 4 EXPRESS PRELIMINARY EXAM
SCIENCE (PHYSICS) 5086 – MARKING SCHEME

Paper 1

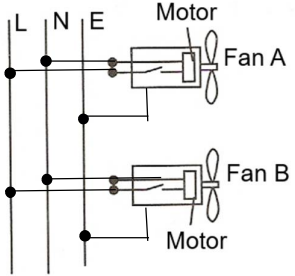
1	2	3	4	5	6	7	8	9	10
A	D	D	C	B	D	A	C	D	C
11	12	13	14	15	16	17	18	19	20
A	A	B	A	C	A	D	A	D	C

Paper 2

Section A

1	(a)	It is the rate of change of velocity.	[1] both DO NOT accept change of speed.
	(b) (i)	The acceleration increases.	[1]
	(ii)	constant/uniform acceleration.	[1]
	(c)	$\text{acc} = \frac{9000-7000}{1500-1000} = 2,$ $F = 7.4 \times 10^6 \times 2 = 1.48 \times 10^7 \text{ N}$	[1] [1] Answer in standard form is not required. Allow ecf
2	(a)	Force A	[1]
	(b)	The cyclist will decelerate.	[1]
	(c) (i)	KE of the girl = $\frac{1}{2} \times 70 \times 11^2 = 4235$ All KE has converted to internal energy, hence work done to make the bicycle come to rest = 4230 (3sf) Unit = Joule	[1] [1] accept 4235 [1] accept J
	(ii)	Kinetic store to internal store.	[1] accept heat energy
3	(a)	X: gravitational potential store Y: kinetic store	[1] [1]
	(b)	Mass = density x volume = $1000 \times (10000) =$ $1.0 \times 10^7 \text{ kg}$ GPE = $1.0 \times 10^7 \times 10 \times 50 = 5.0 \times 10^9 \text{ J}$	[1] [1] answer in standard form is not required. Allow ecf
4	(a)	Draw convection current on Fig. 4.1. When the air surrounding the burner is heated up, it expands and becomes less dense and rises.	[1] [1] [1]

		The colder air which is denser will sink to replace the heated air. A convection current is set up.	[1] do not need to give if mark is already given for the convection current drawn on Fig. 4.1
	(b)	Dull black is a good emitter of radiation. It emits heat faster from the chimney to the surrounding.	[1] [1]
5	(a)	For transverse wave, the displacement of particles is perpendicular to the wave motion whereas the displacement of particles is parallel to the wave motion for longitudinal wave. AND any relevant answers.	[1]
	(b)(i)	One wavelength = 1.2×10^4 m Distance between J and K = 1.5 wavelength Distance = $1.5 \times 1.2 \times 10^4 = 1.8 \times 10^4$ m Distance = 18 km	[1] [1]
	(b)(ii)	$V = f\lambda$, $f = 4800/12000 = 0.4$ Hz Period = $1/0.4 = 2.5$ s Time taken to make 5 oscillations = $5 \times 2.5 = 12.5$ s	[1] [1] allow ecf
6	(a)	A is softer than B since the amplitude of A is smaller than that of B.	[1] Answer needs to explain using amplitude.
	(b)	A has lower pitch than C since A has lower frequency than B.	[1] answer needs to explain using frequency.
7	(a)	$1.47 = \frac{\sin 35^\circ}{\sin r}$, $r = 23^\circ$	[2]
	(b)	Corn oil and glycerol has the same optical density. OR The speed of light does not change when it passes from corn oil to glycerol.	[1]
	(c)	A ray that is bent away from the normal is drawn.	[1]
8	(a)	0.08 m	[1]
	(b)	Diminished/real/inverted (any two)	[2]
	(c)	Camera/eyes	[1]
	(d)	A virtual image has been formed as the object distance is less than the focal length of the lens.	[1] mark awarded as long as virtual image is mentioned.

9	(a)(i)	$I = 10/20 = 0.50 \text{ A}$	[1] award mark if students writes 0.5 A
	(a)(ii)	Total resistance = $15 + \left(\frac{1}{5} + \frac{1}{10} + \frac{1}{10}\right)^{-1} = 17.5 \Omega$ $I = 10/17.5 = 0.571 \text{ A}$	[1] [1] allow ecf
	(b)	The resistor across AB $\rightarrow 0$ Hence, $I = 10/15 = 0.667 \text{ A}$	[1] [1]
10	(a)	When the current flows through XY, the interaction between the magnetic field lines of XY and permanent magnet causes a force to be produced on XY. The XY will move towards the magnet based on FLHR.	[1] [1] mark awarded without mentioning FLHR but direction of force is correct.
	(b)	Lower resistance allows bigger current flowing through the circuit. The force is larger and the XY will accelerate at a bigger value.	[1] [1] mark awarded as long as mention about smaller force.
11	(a) (i)	parallel	[1]
	(a) (ii)	Air conditioner has much greater power and hence requires a separate fuse to protect it.	[1]
	(a)(iii)	Energy = $0.2(168) + 0.5(20) + 0.06(70) + 2(50)$ = 147.8 kWh Cost = $\$29.56/147.8 = \0.20	[1] [1]
	(b)(i)	1. The casing should be connected to Earth wire. 2. The switch should be connected to live wire. 3. The fans should be connected in parallel. Any 2.	[2]
	(b)(ii)		L and N connected correctly [1] E connected to casing [1]
	(b)(iii)	Fuse. It cuts off the current supply if it exceeds fuse rating .	[1] [1] Award only if fuse rating is mentioned.

Section B

12	(a)	For a system in equilibrium , the sum of clockwise moment is equal to the sum of anticlockwise moment about the same pivot .	[1]
	(b) (i)	Clockwise moment = $60 \times 1.7 = 102 \text{ Nm}$	[2]
	(b) (ii)	CW = ACW $102 = 230 \text{ N} \times d$, $d = 0.443 \text{ m}$	[1] [1]
	(c)(i)	Statement: the joint will turn anticlockwise. OR the right side of the bar will raise etc. Explanation: when the current flows through the coil, the coil will be magnetised and induced a opposite pole at the soft iron bar A. Since unlike poles attract, a force will be exerted on bar A and causes the anticlockwise moment to be greater than the clockwise moment.	[1] any idea to indicate the moment is no longer balanced. [1] [1]
	(c)(ii)	Steel is a permanent magnet. The bar can no longer be lowered even when the current supply is switched off.	[1] [1]

13	(a)(i)	particle P : alpha radiation particle Q: electrons	[1] [1]
	(a)(ii)	It has the same number of protons as Boron. It has a different number of neutrons from Boron.	[1] [1]
	(b) (i)	A moving electron	[1]
	(b) (ii)	A line drawn towards positively-charged plate.	[1]
	(b) (iii)	It is the time taken for half the nuclei of the nuclide in any sample to decay.	[1]
	(b) (iv)	70 s ($\pm 5\text{s}$) Indicate at least 2 half-lives on the graph	[1] [1]
	(b) (v)	It has small half-life. The lesson will have enough time to collect enough data for a decay curve.	[1]