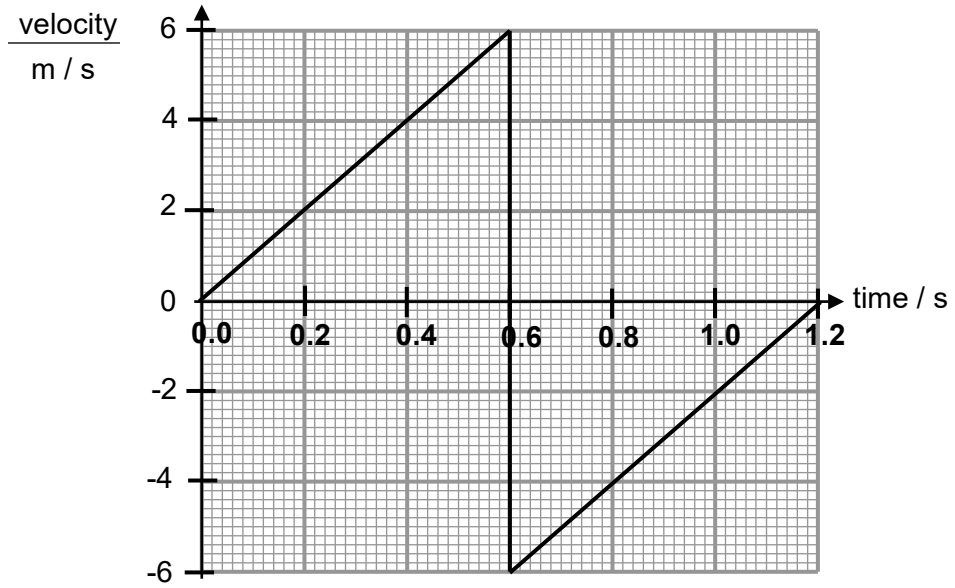
Jurongville Secondary School
Science Department 2024
Marking Scheme

Assessment: Physics Preliminary Examinations **Level:** Sec 4 Exp

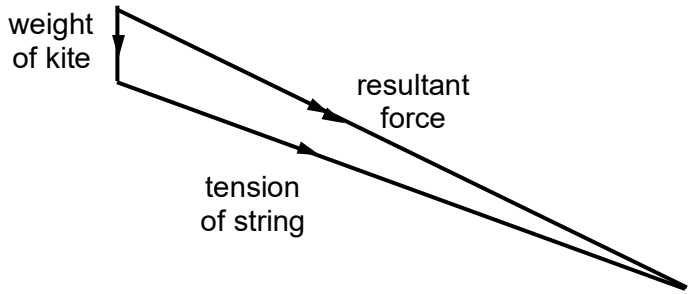
Paper 1

Qn	Ans	Qn	Ans	Qn	Ans	Qn	Ans	Qn	Ans	Qn	Ans	Qn	Ans	Qn	Ans	Qn	Ans	Qn	Ans
1	D	2	D	3	D	4	B	5	A	6	A	7	B	8	C	9	B	10	B
11	C	12	A	13	D	14	C	15	B	16	C	17	C	18	C	19	B	20	D
21	D	22	B	23	D	24	A	25	B	26	A	27	D	28	A	29	C	30	C
31	A	32	C	33	A	34	A	35	D	36	D	37	B	38	A	39	C	40	B

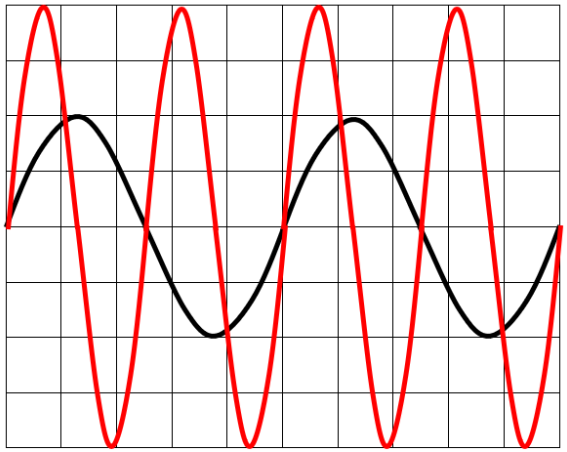
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Qn	Marking Scheme	Remarks	Marks
1(a)	Acceleration due to gravity = 10.0 (6.0 – 0) / t = 10.0 t = 6.0 / 10.0 = 0.6 s	 Correct working Correct answer and unit	 C1 A1
1(b)		Each correct straight line Allow for ecf from (a)	B1, B1
1(c)	Height = Area under velocity-time graph = ½ (0.6)(6) = 1.8 m	Correct working Correct answer and unit Allow for ecf from (a)	C1 A1

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Qn	Marking Scheme	Remarks	Marks
2(a)	Scale 1 cm rep 5 N  	Correct diagram with arrows Appropriate scale	B1
	Magnitude of wind force = 42 N ± 0.5 N	Correct magnitude	B1
	Direction of wind force = 26° clockwise from the horizontal	Correct angle	B1
2(b)	Mass of kite = 5 / 10 = 0.5 kg		
	Resultant force = m a	Correct working	C1
	42 = 0.5 x a	Correct answer and unit	A1
	a = 42 / 0.5 = 84 m/s^2	Allow for ecf from (a)	
3(a)	The load is placed vertically above support B. The perpendicular distance between the load and support B is zero. Thus there is no moment about support B.	OWTTE	B1
	Taking moments about support B,		
3(b)	Force at support A x 1.4 = (24)(1.4 / 2)		
	Force at support A = 16.8 / 1.4 = 12 N	Correct working	C1
3(c)	For maximum distance that load can move to the right, the weight of plank just balance the load at support B and no force at support A.	Correct answer and unit	A1
	Taking moments about support B		
	76 x Maximum distance that load can move to the right = (24)(1.4 / 2)		
	Maximum distance that load can move to the right = 16.8 / 76	Correct working	C1
	= 0.22 m	Correct answer and unit	A1
4(a)	Pressure is the force per unit area.	OWTTE	B1
4(b)	Pressure = Force / Area		
	23000 = 29 x 10 / Area		
	Area = 290 / 23000	Correct working	C1
	= 0.126 m^2	Correct answer and unit	A1
4(c)	Pressure in gas cylinder + 13600 x 10 x (0.059 – 0.035) = 100000		
	Pressure in gas cylinder = 100000 – 3264	Correct working	C1
	= 96736 = 96700 Pa (3 s.f.)	Correct answer and unit	A1

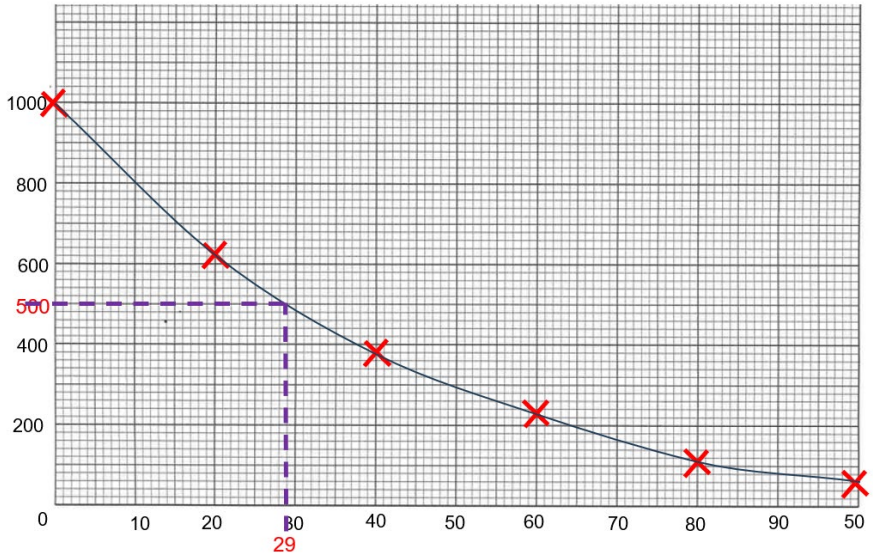
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Qn	Marking Scheme	Remarks	Marks
5(a)	There dust particles moving faster means that there is an **increase in its kinetic store/energy**.	OWTTE	B1
	This means that there is an **increase in the temperature of the gas**.		B1
5(b)	An electric heater used to heat room air is placed on the floor to ensure convection currents to take place in the room. The **air near the heater becomes hot and is less dense**. The hot air rises and cold air in the room sinks. This **causes convection current to take place**.	OWTTE	B1 B1 B1
5(c)(i)	The specific latent heat of vaporization of a substance is the amount of energy required to change 1 kg of the substance from liquid to gas, or vice versa, without any change in temperature.	OWTTE	B1
5(c) (ii)	Power x time = energy gain by pot + energy gain by water $2000 \times t = 1.2 \times 445 \times (120 - 30) + 3.0 \times 4200 \times (100 - 30) + 0.5 \times 2.3 \times 10^6$ t = (48060 + 882000 + 1150000) / 2000 = 1040 s = 17.3 min	 Correct working Correct answer and unit	 C1 A1
6(a)	Sound is produced by the vibration of air particles around the vibrating violin string. A series of compression and rarefaction pressure regions forming longitudinal waves transmit sound by vibrating air particles.	OWTTE	B1 B1
6(b)		Wave is twice amplitude of original wave Wave frequency is twice of original wave	B1 B1
6(c)	Speed of sound = wavelength / period = 1.2 / 0.002 = 600 m/s	 Correct working Correct answer and unit	 C1 A1

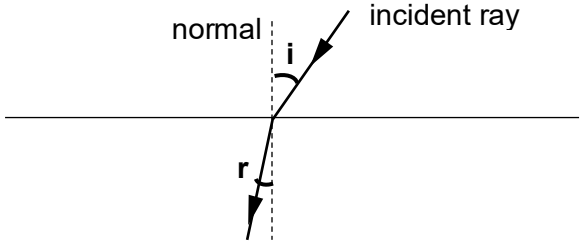
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Qn	Marking Scheme	Remarks	Marks
7(a)	Effective resistance when circuit is in a dark and hot room $= [1 / (100 + 15000) + 1 / (300 + 50)]^{-1} = 342\ \Omega$ Current in battery = 12 / 342 = 0.0351 A	Correct working Correct answer and unit	C1 A1
7(b)	The current flow in the battery will be largest when the circuit is in a bright and hot room. This is because the effective resistance of the circuit is the lowest.	OWTTE	B1 B1
7(c)	Potential difference across LDR = [12 / (100 + 400)](400) = 9.6 V	Correct answer and unit	B1
7(d)	The current flow in the LDR is not affected by the resistance of the thermistor since the LDR and thermistor are connected in parallel.	OWTTE	B1
8(a)	The three-pin plug is necessary because **the oven has exposed metal parts**. If there is a fault, the metal parts may become live and the **earth wire in the three-pin plug will provide a low resistance path for current to flow and protect the user**.	OWTTE	B1 B1
8(b)	The fuse has a resistance wire that only allows certain amount of current to flow through it. It will **melt and stop current flow if current exceed the allowed current in the fuse**. It is **connected in the live wire**.	OWTTE	B1 B1
8(c)	Current = Power / Voltage = 800 / 240 = 3.33 A The 5 A fuse is selected as it is slightly above 3.33 A	Correct working Correct answer	B1
9(a)	**Hard magnetic materials is not easily magnetized but does not lose magnetism easily once it is magnetized** **Soft magnetic materials can be easily magnetized but loses magnetism easily**.	OWTTE	B1 B1
9(b)	This is because **soft iron would concentrate the magnetic field from the coils of wires for a stronger magnetic field.**	OWTTE	B1
9(c)	**The function of the commutator is the to change the contact from one brush to the other. This would reverse the direction of current in the coil and ensure the coil rotate in one direction.**	OWTTE	B1 B1

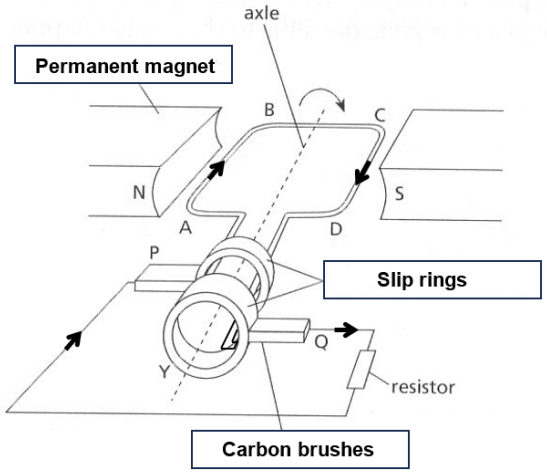
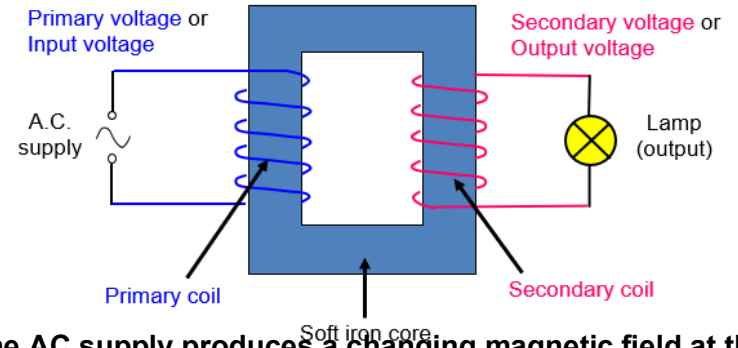
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Qn	Marking Scheme	Remarks	Marks
10(a)	$^{90}_{38}Sr$	CAO	B1
10(b)	Nuclear decay is a random process which an unstable atomic nucleus loses its energy by emission of electromagnetic radiation or particles.	OWTTE	B1
10(c)	$^{90}_{38}Sr \longrightarrow {}^{90}_{39}Y + {}^{0}_{-1}e$	Correct nuclide notation of yttrium Correct nuclide notation for beta particle	B1
10(d)	Nuclear fission is a process in which the **nucleus of an atom splits** and releases a large amount of energy while nuclear fusion is a process in which **two atomic nuclei combine to form a heavier nucleus** and releases a large amount of energy.	OWTTE	B1 B1
10(e)		Correct plotted points and best fit curve Line on graph to determine half-life	B1 B1
	Half-life = 29 years		B1
10(f)(i)	The Geiger-Muller counter will **detect the amount of strontium-90 that is able to pass through the steel sheet**. If **the counter detects too much radiation**, that means the **steel sheet is too thin**. If the **counter detects less than normal radiation**, that means the **steel sheet is too thick**.	OWTTE	B1 B1
10(f)(ii)	1. The radioactive substance could be contained in a thick lead / concrete container. 2. Remote controlled devices can be used to move the radioactive substances.	Any two suitable ways	B1 B1

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Qn	Marking Scheme	Remarks	Marks
11(a)	Gravitational potential energy = m g h		
	= 25 x 3	Correct working	C1
	= 75 J	Correct answer and unit	A1
11(b)	Energy required = 75 + (12 x 5)	Correct working	
	= 75 + 60	Correct answer and unit	C1
	= 135 J	Allow for ecf for (a)	A1
11(c)	Energy required to overcome friction = 60 J		
	Kinetic energy at bottom of slope = ½ m v^2 = 75 – 60 = 15 J	Correct working	C1
	15 = ½ x (25 / 10) v^2 = 1.25 v^2	Correct answer and unit	A1
	Speed = √ (15 / 1.25) = 3.46 m/s (3 s.f.)	Allow for ecf for (a) and (b)	
11(d)	Efficiency = output energy / input energy	Correct working	
	Energy required by motor = 135 / 0.85	Correct answer and unit	C1
	= 159 J (3 s.f.)	Allow for ecf for (b)	A1
			Total: 70
12(a)		Normal line drawn with angle of incidence and angle of refraction shown clearly Refracted ray drawn at an angle closer to normal	B1 B1
12(b)	$n_i \sin i = n_r \sin r$		
	1 x sin i = 1.34 x sin 25.3°	Correct working	C1
	$i = \sin^{-1} 0.573 = 35.0°$	Correct answer and unit	A1
12(c)	Refractive index of a medium is the ratio of the speed of light in vacuum to the speed of light in medium.	OWTTE	B1
12(d)	1.34 = 3 x 10^8 / speed of light in water		
	Speed of light in water = 3 x 10^8 / 1.34	Correct working	C1
	= 2.24 x 10^8 m/s (3 s.f.)	Correct answer and unit	A1
12(e)	Critical angle is the angle of incidence in the optically denser medium for which the angle of refraction in the less dense medium is 90°.	OWTTE	B1
12(f)	Critical angle = $\sin^{-1}$ (1/n)	Correct working	C1
	= $\sin^{-1}$ (1/1.34) = 48.3 °	Correct answer and unit	A1

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Qn	Marking Scheme	Remarks	Marks
13(a)	1. Move the magnet faster towards the coil of wires. 2. Increase the number of turns round the cylinder. 3. Wound the wires round a soft iron core instead of hollow cardboard cylinder.	Any three suitable answers	B1 B1 B1
13(b) (i)(ii)		Correct labelling of diagram Correct direction of arrows	B1 B1
13(c)(i)	**Step-up transformer increases the voltage in the transmission line while step-down transformer decreases the voltage supply to the homes. This would reduce power losses in the transmission wires.**	OWTTE	B1 B1
13(c) (ii)		Labelled diagram	B1
	The AC supply produces a changing magnetic field at the primary coil. This causes the secondary coil to induce emf to oppose the changing magnetic field. The difference in the number of turns in the primary coil and secondary coil will cause the primary voltage and secondary voltage to be different.	OWTTE	B1 B1
			Total: 10

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