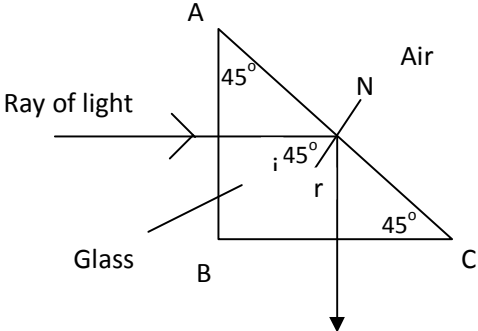
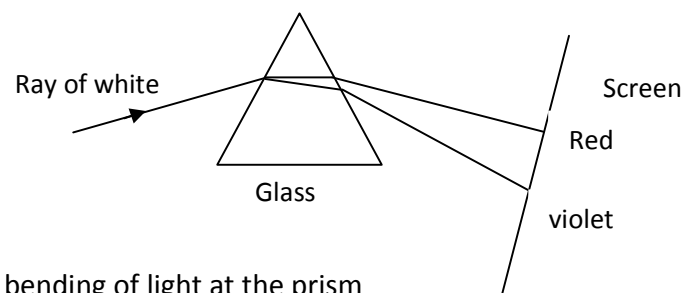
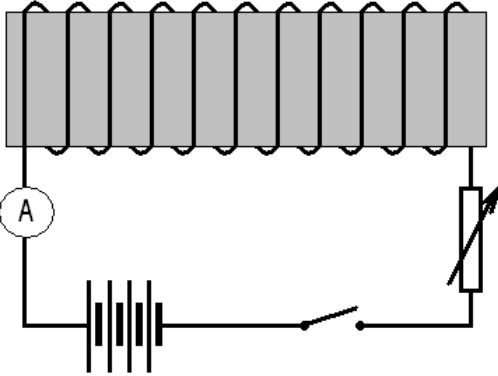


**Marking scheme : Sample SEC papers: Paper 2A**

		<b>Answer</b>	<b>Mark</b>
1.			
(a)		← (from 20 <sup>0</sup> to 12 <sup>0</sup> )	1 mark
(b)	(i)	No	1 mark
	(ii)	The polymer foam traps the air and does not allow hot air to move upwards and cold air downwards.	1 mark 1 mark
	(iii)	No	1 mark
	(iv)	Polymer foam is a bad conductor of heat / good reflector of heat, does not allow transfer of heat by motion of 'free' electrons	1 mark 1 mark
	(v)	Since convection is eliminated and conduction is low the flow of heat from inside to outside is very slow reducing heat losses and costs of heating	1 mark 1 mark
	(vi)	The insulation keeps the heat from entering the room from outside The room is cool in summer	1 mark 1 mark
(c)	(i)	Both thermometers register a rise in temperature Thermometer A reads a higher temperature than thermometer B.	1 mark 1 mark
	(ii)	Heat travels by radiation from the metal to the thermometers The higher temperature of thermometer A shows that the black surface is a better emitter of heat by radiation	1 mark 1 mark
	(iii)	Q = m c Δθ 12000 = m x 800 x (45 – 20) m = 12000/800 x 25 (correct subject of the formula) m = 0.6kg (correct answer)	1 mark 1 mark 1 mark
	(iv)	Factory roofs are painted silver to reduce heat losses during winter and absorbing heat in summer. Back pipes of fridge are painted black so that heat is lost at a fast rate. (any other plausible example of application)	1 mark 1 mark
			20 marks
2.			
(a)	(i)	 <p style="text-align: right;"><b>Diagram 3</b></p> <p>Angle of incidence labelled correctly Normal labelled correctly</p>	1 mark 1 mark
	(ii)	45 <sup>0</sup>	1 mark
	(iii)	Angle of reflection is 45 <sup>0</sup> and so ray is totally internally reflected vertically downwards	1 mark 1 mark

		Ray passes straight through side BC	
(b)	(i)	Total Internal reflection takes place at points P, Q and R	1 mark
	(ii)	Light has to be incident on a boundary from an optically dense to a less optically dense medium Angle of incidence must be greater than the critical angle	1 mark 1 mark
	(iii)	Yes, It is possible to bend the cable and light is still transferred through it due to total internal reflection	1 mark 1 mark
	(iv)	It does not use conventional electrical energy and so is environmentally friendly (any other acceptable advantage)	1 mark
	(v)	Energy is lost at each point of incidence of the ray of light on the boundary/ there is energy lost with every reflection as some light energy is lost.	1 mark
	(vi)	Less energy losses since there is no electrical resistance in optic fibres	1 mark
(c)	(i)	 <p>Ray of white</p> <p>Glass</p> <p>Screen</p> <p>Red</p> <p>violet</p> <p>bending of light at the prism dispersion of white light into its component colours</p>	1 mark 1 mark
	(ii)	Correct position of red and violet colours	1 mark
	(iii)	Dispersion	1 mark
	(iv)	The different colours have different wavelengths and so are refracted through different angles.	1 mark
	(v)	White light from the sun passing through water droplets is refracted The different colours are separated and the rainbow is obtained	1 mark 1 mark
			20 marks
3.			
(a)	(i)	Earth	1 mark
	(ii)	Metals have 'free' electrons which transfer electrical energy when there is a p.d.	1 mark 1 mark
	(iii)	Wire A – Neutral Wire B – Earth Wire C – Live	1 mark 1 mark 1 mark
(b)	(i)	The Earth wire The plastic casing provides enough protection against electric shock.	1 mark 1 mark
	(ii)	$1\text{ kWh} = 1000 \times 60 \times 60 = 3,600,000\text{J}$ Energy used by radio = $Pt = 100 \times 6 \times 60 \times 60 = 2,160,000\text{J}$ No. of kWh = $2,160,000/3,600,000 = 0.6\text{ kWh}$ $1\text{ Kw hr} = 15\text{c}$ $0.6\text{kWhr} = 15 \times 0.6$ $= 9\text{c}$ (correct answer) OR $\text{kWh} = P \text{ in kW} \times t \text{ in h}$ $\text{kWh} = 100 / 1000 \times 6 = 0.6\text{ kWh}$	1 mark 1 mark 1 mark 1 mark

		Cost = $15c \times 0.6 = 9c$	
(c)	(i)	Transformer	1 mark
	(ii)	$P = VI, I = P/V = 48/12$ = 4A (correct answer) 5 A fuse is acceptable	1 mark 1 mark
	(iii)	When the current is high, the fuse melts and cuts off the current to the circuit.	1 mark
	(iv)	A thicker wire has a lower resistance and will take longer to melt and will melt at a greater current.	1 mark 1 mark
	(v)	Length Material Or Temperature	1 mark 1 mark
			20 marks
4.			
(a)	(i)	The electromagnet will attract only the iron bolts. Bolts will be picked up while the aluminium nuts are left behind.	1 mark 1 mark
	(ii)	 <p>Components in series Solenoid / iron core labelled rheostat labelled</p>	1 mark  1 mark 1 mark
	(iii)	Electromagnet will only be magnetised when a current flows through the surrounding wire.	1 mark
(b)	(i)	The size of the current in the circuit is varied by adjusting the rheostat setting. The number of items attracted is noted for the different current values. Procedure is repeated for different currents.	1 mark 1 mark 1 mark
	(ii)	that the number of items attracted is proportional to the size of the current	1 mark
(c)	(i)	The rotating magnets provide a continuously changing magnetic field The field lines are cut by the solenoid inducing current flow through the solenoid.	1 mark 1 mark
	(ii)	Electric currents induced in the steel pipes (steel being a conductor) may effect the rotation of the turbine and the flow of water itself.	1 mark 1 mark
	(iii)	Use stronger magnets Increase the number of turns in the solenoid	1 mark 1 mark

		Or Move the solenoid closer to the turbine	
	(iv)	1.5 litres/s produce 5mA 7.5 litres/s produce ? = $5 \times 7.5/1.5$ = 25 mA (correct value) Energy = $VIt = 2 \times 0.025 \times 10 = 0.5J$	1 mark 1 mark 1 mark
			20 marks
5.			
(a)	(i)	Mercury Because it is closest to the sun and so goes round it fastest / closest to the sun and takes the smallest time to orbit the sun.	1 mark 1 mark
	(ii)	There is a gravitational force of attraction between any two masses (planets and sun) Since the sun is much larger and heavier than planets, the planets orbit round sun rather than the other way round.	1 mark 1 mark
	(iii)	24 hours is the time the Earth takes to turn once about its axis which is called 'a day'	1 mark 1 mark
	(iv)	Pluto is no more a planet because it does not dominate its neighbourhood	1 mark
(b)	(i)	Moons	1 mark
	(ii)	Gravitational force	1 mark
	(iii)	Colder Jupiter is much further away from the Sun than Earth	1 mark 1 mark
(c)	(i)	more powerful telescopes were invented	1 mark
	(ii)	Light and radio waves are both electromagnetic waves Both waves can be used by telescopes to study the universe	1 mark 1 mark
	(iii)	Clearer images can be obtained due to no distortion by earth's atmosphere	1 mark
(d)	(i)	This means that Jupiter is very far away from Earth And electromagnetic waves take 30 minutes to travel from Jupiter to Earth	1 mark 1 mark
	(ii)	1 light year = $1 \times 365 \times 24 \times 60 \times 60 = 31536000s$ speed = $s/t$ $s = \text{speed} \times t = 3 \times 10^8 \times 10^9 \times 31536000 = 94608000 \times 10^{17}$ = $9.46 \times 10^{24} \text{ m}$ (correct value)	1 mark 1 mark 1 mark
			20 marks