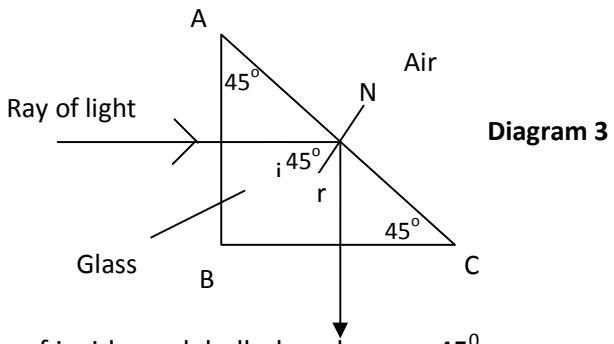
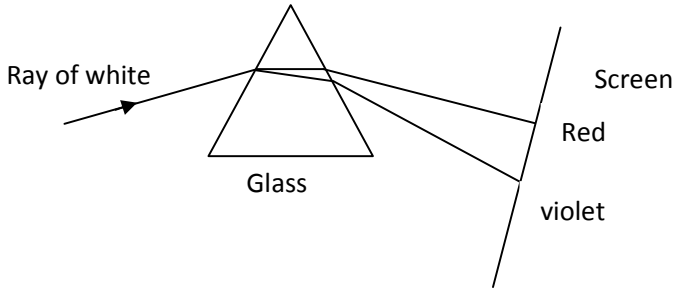
Marking scheme : Sample SEC papers: Paper 2B

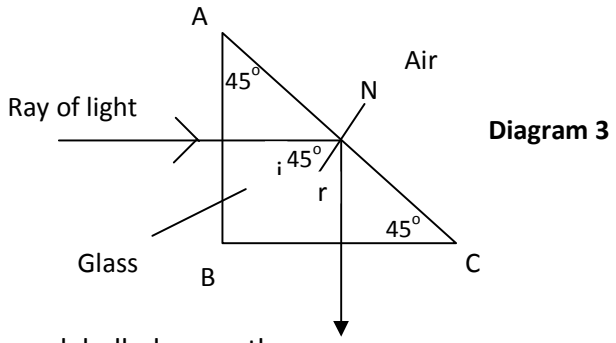
		Answer	Mark
1.	(a)	← (from 20^0 to 12^0)	1 mark
	(b) (i)	air is a bad conductor of heat	1 mark
	(ii)	No, convection cannot take place	1 mark
		The polymer foam traps the air and does not allow it to flow (hot air upwards, cold air downwards)	1 mark
	(iii)	Radiation conduction	1 mark 1 mark
	(iv)	The insulation will keep the heat from entering the room from outside The room will be kept cool in summer	1 mark 1 mark
	(c) (i)	Thermometer A	1 mark
	(ii)	Matt black surface	1 mark
	(iii)	So that it give off heat quickly As black makes the engine a better emitter of heat	1 mark 1 mark
	(iv)	White is a bad absorber of heat / good reflector of heat And so heat absorbed from roof by radiation is slow	1 mark 1 mark
	(v)	Large roofs are painted silver Back of fridges is painted black to make loss of heat/cooling faster Any other plausible suggestion	1 mark 1 mark
	(d) (i)	0.6kg	1 mark
	(ii)	$45 - 20 = 25^0$C	1 mark
	(iii)	$Q = m\ c\ \Delta\theta = 0.6 \times 800 \times 25$ (correct eqn. & values) = 12,000J (correct answer)	1 mark 1 mark
			20 marks
2.			
	(a) (i)	 **Diagram 3** Angle of incidence labelled as shown = 45^0	1 mark
	(ii)	Ray is incident on face BC perpendicularly and passes through BC undeviated (continues straight on as shown in diagram)	1 mark
	(iii)	Angle of incidence r^0 as shown in diagram above	1 mark
	(iv)	Angle of reflection is 45^0 Since 45^0 is greater than the critical angle (42^0) total internal	1 mark 1 mark

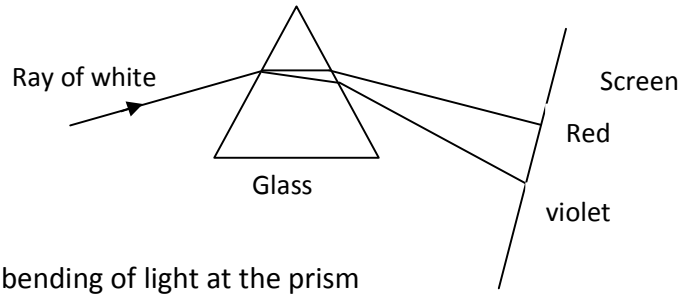
		reflection takes place	
	(v)	Reflection Larger/greater Medium Energy communications	1 mark 1 mark 1 mark 1 mark 1 mark
	(vi)	Yes Because due to total internal reflection, light can travel round bends	1 mark 1 mark
	(vii)	It does not use electricity and thus is environmentally friendly/does not pollute. (Any other plausible advantage)	1 mark
	(viii)	$V = f\lambda$ $f = 5 \times 10^{8}/5.05 \times 10^{-7}$ $f = 5.95 \times 10^{14}$Hz (correct value)	 1 mark 1 mark
	(b)(i)	 red and violet at each end as indicated	1 mark 1 mark
	(ii)	Dispersion	1 mark
	(iii)	When white light passes through water droplets, the light is refracted With refraction the different colours are separated and the rainbow is obtained	1 mark 1 mark
			20 marks
3.			
	(a) (i)	Conductors insulators	1 mark 1 mark
	(ii)	Earth	1 mark
	(iii)	Wire A – neutral Wire B – Earth Wire C – Live	1 mark 1 mark 1 mark
	(b) (i)	The Earth wire It is missing because the plastic casing provides enough protection from shock.	1 mark 1 mark
	(ii)	1kwhr = 3,600,000J Energy used by radio = Pt = 100 x 6 x 60 x 60 (hrs converted into seconds) = 2,160,000J No. of kWhr = 2,160,000/3,600,000 = 0.6 kWhr	 1 mark 1 mark 1 mark
	(iii)	1 Kw hr = 15c	

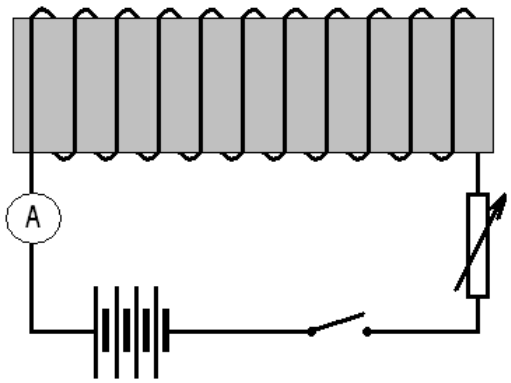
		0.6kWhr = 15 x 0.6 = 9c (correct answer)	1 mark 1 mark
	(c) (i)	Transformer	1 mark
	(ii)	P = VI, I = P/V = 48/12 = 4A (correct answer)	1 mark 1 mark
	(iii)	5A	1 mark
	(iv)	When the current is high, the fuse melts and cuts off the current to the circuit.	1 mark
	(v)	A thicker wire has a low resistance and will take longer to melt and will melt at a greater current.	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)	ammeter solenoid iron core rheostat battery	1 mark 1 mark 1 mark 1 mark 1 mark
	(b) (i)	The value of the rheostat is varied. The current in the circuit is noted. The number of items attracted is noted for the different current values.	1 mark 1 mark 1 mark
	(ii)	Repeated observations Care is taken that the items are always placed at the same distance from the solenoid. (one mark for any plausible precaution put forward)	1 mark 1 mark
	(c) (i)	Field Lines Solenoid current	1 mark 1 mark 1 mark 1 mark
	(ii)	Use stronger magnets Make solenoid with more turns OR Move solenoid closer to the turbine	1 mark 1 mark
	(iii)	1.5 litres/s produce 5mA 7.5 litres/s produce ? = 5 X 7.5/1.5 = 25 mA (correct value)	 1 mark 1 mark
			20 marks
5.			
	(a) (i)	24 hours	1 mark
	(ii)	365 days	1 mark
	(iii)	Mercury Because it is closest to the sun / goes fastest around the sun	1 mark 1 mark

	(iv)	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
	(v)	Pluto is no more a planer because it does not dominate its neighbourhood	1 mark
	(vi)	Milky Way Galaxy	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)	A galaxy consists of a number of solar systems grouped together	1 mark
	(ii)	They enable scientists is see far away objects clearer/larger than their eyes can	1 mark
	(iii)	Yes They both use waves from the electromagnetic spectrum (light and radio waves)	1 mark 1 mark
	(iv)	Photos are clearer as they are not effected by the atmosphere.	1 mark
	(d) (i)	Yes This means that Jupiter is very far away from Earth	1 mark 1 mark
	(ii)	It is the distance that light can travel in one year.	1 mark

Marking scheme : Sample SEC papers: Paper 2A

		Answer	Mark
1.			
(a)		← (from 20^0 to 12^0)	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)	$Q = m\ c\ \Delta\theta$ $12000 = m \times 800 \times (45 - 20)$ $m = 12000/800 \times 25$ (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)	 **Diagram 3** Angle of incidence labelled correctly Normal labelled correctly	 1 mark 1 mark
	(ii)	45^0	1 mark
	(iii)	Angle of reflection is 45^0 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)	 bending of light at the prism dispersion of white light into its component colours	 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)	1kwhr = 1000 x 60 x 60 = 3,600,000J Energy used by radio = Pt = 100 x 6 x 60 x 60 = 2,160,000J No. of kWhr = 2,160,000/3,600,000 = 0.6 kWhr 1 Kw hr = 15c 0.6kWhr = 15 x 0.6 = 9c (correct answer) OR kWh = P in kW x t in h kWh = 100 / 1000 x 6 = 0.6 kWh	1 mark 1 mark 1 mark 1 mark

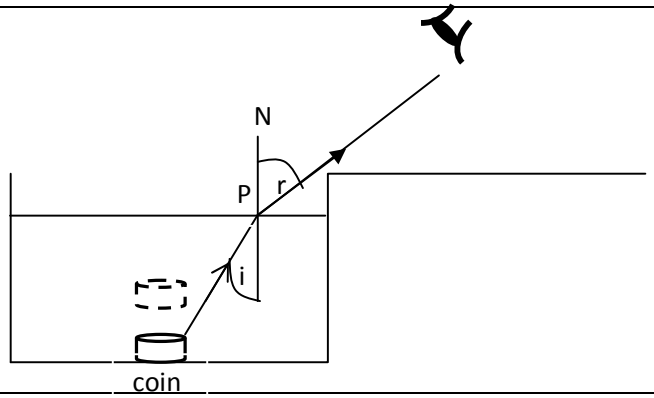
		Cost = 15c x 0.6 = 9c	
(c)	(i)	Transformer	1 mark
	(ii)	P = VI, I = P/V = 48/12 = 4A (correct answer) 5 A fuse is acceptable	 1 mark 1 mark
	(iii)	When the current is high, the fuse melts and cuts off the current to the circuit.	1 mark
	(iv)	A thicker wire has a lower resistance and will take longer 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)	 Components in series Solenoid / iron core labelled rheostat labelled	1 mark 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 X 7.5/1.5 = 25 mA (correct value) Energy = VIt = 2 x 0.025 x 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 x 365 x 24 x60 x 60 = 31536000s speed = s/t s = speed x t = 3 x 108 x 109 x 31536000 = 94608000 x 1017 = 9.46 x 1024 m (correct value)	1 mark 1 mark 1 mark
			20 marks

Marking scheme Paper 1: Sample SEC papers

	Answer	Mark
1. (a)	Refraction of light	1 mark
(b) (i)	Ray drawn refracted away from the normal*	1 mark
(ii)	Correct labelling of normal (N)	1 mark
	Correct labelling of Angle of Incidence (i)	1 mark
	Correct labelling of Angle of Refraction (r)	1 mark
(c)	n= real depth/apparent depth = 2/1.5	1 mark
	n = 1.33 (correct value)	1 mark
(d)	n= vel(air)/vel(medium) = 3 x 10^8/v (medium)= 1.33	1 mark
	v(medium) = 2.2 x 10^8 m/s	1 mark
(e)	Otherwise there is total internal reflection on the surface. The rays would have been reflected down and would not have reached Joanne.	1 mark

*



2. (a)	Solid	1 mark
	Gas	1 mark
	Solid	1 mark
	Liquid	1 mark
(b) (i)	Decrease in mass of gas	1 mark
(ii)	Decrease in density	1 mark
(iii)	No change	1 mark
(iv)	Decrease in number of collisions	1 mark
(c) (i)	Decrease in pressure	1 mark
(ii)	Balloon will become rounder	1 mark

3. (a)	Bulb	1 mark
	Resistor/resistance	1 mark
	Switch	1 mark
(b)	Ammeter for Current	1 mark
	Voltmeter for potential difference (p.d.)	1 mark
(c)	Ammeter connected in series	1 mark
	Voltmeter connected in parallel across C	1 mark
(d)	Resistance across D & E 1/R = 1/5 +1/5 = 2/5 R =2.5 Ω	1 mark
	Total resistance = 2.5 + 12 = 14.5 Ω	1 mark
	I=V/R = 24/14.5 = 1.66 A	1 mark
4. (a)	0 → A constant/uniform acceleration	1 mark
	A → B constant/uniform velocity	1 mark
	B →C constant/uniform deceleration	1 mark
(b)	Area under Graph gives distance travelled	1 mark
(c)	**Method 1**: Area of trapezium = ½(OC+AB) x 8 = ½(240 +120) x 8	1 mark
	360 x 8 = 1440 m Correct value as answer	1 mark
	Method 2: Area = area Δ + area $\underline{\sqcap}$ + area Δ =(½ x 90 x 8) + (8 x 120) + (½ x 30 x 8)	(1 mark)
	= 360 + 960 + 120 = 1440 m Correct value as answer	(1 mark)
(d)	Distance for OA is three times distance for BC Or Distance covered during BC is one third distance covered across OA.	1 mark

	Area under OA is 3 times that under BC Or Time under OA is three times longer than under BC	1 mark
(e)	Av. Speed = tot dist./tot time = 1440/240 Correct values	1 mark
	= 6 m/s Correct value	1 mark
5. (a)	B	1 mark
(b)	correct axes	1 mark
	correct points marked	1 mark
	correct scale	2 mark
(c) (i)	15.0 V	1 mark
(ii)	16.0 V	1 mark
(d) (i)	6.0 V	1 mark
(ii)	$N_1/N_2 = V_1/V_2$ N_2 = 400 turns	1 mark 1 mark
6. (a) (i)	Acceleration due the gravity downwards is the same for both apples Or Acceleration downwards does not depend on the mass	1 mark
(ii)	10 m/s^2	1 mark
(b) (i)	Total momentum before collision = total momentum after collision	
	$m_1v_1 + m_2v_2 = (m_{1+}m_2)v$ $(0.5 \times 0.25) + (0.45 \times 0) = (0.5 + 0.45)v$	1 mark
	0.125 + 0 = 0.95v v = 0.125/0.95 = 0.13 m/s Correct Value	1 mark
	Conservation of momentum	1 mark
(ii)	Total K.E. = ½ mv^2 (½ x 0.5 x 0.25^2)	1 mark
	= 0.016 J	1 mark
(iii)	Total K.E. after = ½ x 0.95 x 0.13^2	1 mark

	= 0.008 J	1 mark
(iv)	Some of the KE before collision was changed to heat and sound energy	1 mark
7. (a)	Renewable sources are types of energy that can be used again	1 mark
	Non-renewable sources of energy are fuels which once used up cannot be reused again	1 mark
(b)	They produce less pollution Thus the air quality is better / There will be an improvement in climate change and global warming (Or any other plausible reason)	1 mark 1 mark
(c)	1. Switch off when not necessary 2. Use personal transport less, but walk, use bikes, car sharing etc. 3. Use air conditioner less although it is cold/hot (or any other acceptable action)	1 mark 1 mark
(d)	Solar – Malta is a sunny country with long spells of sun – and it does not pollute	1 mark 1 mark
	Wind – Malta is a windy country and it does not pollute	1 mark 1 mark
	In this question: 1 mark for every plausible type of renewable energy identified & 1 mark for a plausible reason put forward.	
8. (a)	Centre of Gravity is the point at which the weight/gravity appears to act on an object	1 mark
(b) (i)	550 N	1 mark
(ii)	Force acting at the correct point and acting downwards	1 mark
(c) (i)	Correct force of cliff on Luke's Foot Correct force rope exerts on Luke	1 mark 1 mark
(ii)	Correct tension in the rope	1 mark
(d)	Strength So that is can withstand impacts of a large force	1 mark 1 mark
	Crushable	1 mark

	So that large force of impact is absorbed by crushing / When it is crushed time of impact is longer and force on head is less	1 mark
9. (a) (i)	To check for fractured bones / To look inside the human body for swellings / In radiography (Any other plausible reason)	1 mark
(ii)	They pass through human tissue but not through bones. / They blacken a photographic film / plates and images are produced	1 mark
(iii)	scanning of luggage at airports / fine art photography / inspection of welding in industry / in detecting the atomic structures of crystals / any other plausible answer	1 mark
(b) (i)	Gamma Radiation	1 mark
	Gamma Radiation passes through the human body and can be traced while alpha particles are stopped by tissue and cannot be traced.	1 mark
(ii)	Short Half – life	1 mark
	So that radioactivity inside the person's body is present for only a short time as otherwise it will be dangerous to health	1 mark
(iii)	Left kidney The radioactive count continues to grow showing that the kidney is not allowing flow of liquid and so is blocked	1 mark 1 mark 1 mark
10. (a)(i)	Steel	1 mark
(ii)	A and B have unlike/different poles	1 mark
(iii)	A = North B = South	1 mark 1 mark
(iv)	Correct pattern of magnetic field Correct direction (from North to South)	1 mark 1 mark
(b)(i)	A current carrying conductor is placed between two poles of a magnet. When current flows through the conductor, it is observed to give a kick in one direction	1 mark 1 mark
(ii)	magnet strength size of current	1 mark 1 mark