Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Mark Schemes

Q1.

Question number	Answer	Additional guidance	Mark
	explanation linking any two from: (smaller currents) reduce heating effect (in cables) (1) less energy / power wasted (in cables) (1) increases efficiency (1)	accept thermal energy for heat energy allow will not get (as) hot / heat loss is reduced allow 2 marks for 'reduce(s) heat energy loss'	**(2)** **AO1**

Q2.

Question Number:	Answer	Mark
(i)	a power station	**(1)** AO 1 1

Question Number:	Answer	Mark
(ii)	the national grid	**(1)** AO 1 1

Question Number:	Answer	Mark
(iii)	heat loss is reduced	(1) AO 1 1

Q3.

Question Number:	Answer	Additional Guidance	Mark
	substitution (1) $(I_s) = \frac{230 \times 0.02}{5.0}$ evaluation (1) 0.9(A)	accept 0.92 (A) award full marks for the correct answer without working	(2) AO 2 1

Q4.

		Indicative Content	Mark
		A comparison including some of the following ideas • Transformers can be used or voltages/currents can be changed/transformed • AC (can transmit) at lower current/high(er) voltage • National Grid is (usually) over ground (DC cables (were) underground) • Less energy lost in transmission • National Grid system can supply to customers further away • Possible to create a grid linking power stations • More flexibility in voltage for consumer	(6) **Exp**

		• Consumer can draw large(r) current • More flexibility in power drawn • Great(er) range of devices can be powered Ignore methods of electricity production	
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited (maybe implied) comparison giving one fact e.g: AC can be at high(er) voltage OR the National Grid can supply houses not close to a power station/ further (away/than the New York system.) • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple comparison including two ideas which may be linked or not eg Nat. Grid can supply whole country and can be used for more appliances (than just lighting). e.g: AC can be transmitted further (than DC) (because it) wastes less energy • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy	
3	**5 - 6**	• A detailed comparison including at least three ideas, with at least one direct link between two of them. • e.g. AC can be transmitted further (than DC) because AC can be transformed to lower current/high(er) voltages. OR AC can be transformed to lower current/high(er) voltages. Greater range of devices used. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors	

Q5.

Question Number:	Answer	Mark
	D transformers have primary and secondary coils. **The only correct answer is D** ***A*** *is not correct because transformers can step-up and step-down voltages* ***B*** *is not correct because transformers can step-up and step-down voltages* ***C*** *is not correct because transformers only work with alternating current*	**(1)** AO 1 1

Q6.

	Answer	Acceptable answers	Mark
(a)	transformer	Step-up transformer Step-down transformer	**(1)**
(b)	A suggestion to include any 2 of the following • (LED) turns on and off • as voltage/current changes direction/from +ve to –ve/ twice each second (1) • (LED) on for (+ve) part of cycle (1) • (LED) off for (-ve) part of cycle (1)	Flash(es) / flicker(s) (on and off) current changes every 0.25 s /4 times each second Turns on twice each second = 2 marks Only on when voltage/current is +ve gains both marks	**(2)**
(c)	substitute (1) 3 = I × 12 transformation (1) I = 3 ÷ 12 evaluation (1) 0 .25 (A) Ignore any unit given by candidate	Subst. and transform. either order 1 mark only can be scored for correct substitution after incorrect transposition. Accept any number of sig. figs. that rounds to 0.25 (A) 250 mA gains 3 marks give full marks for correct answer, no working 2.5 × any other	**(3)**

		power of ten = 2 marks eg 25 (A) gains 2 marks	

		Indicative Content	Mark
QWC	***(d)**	A discussion including some of the following points • improved lighting levels for LEDs • energy savings per year for LEDs or calculation of payback time • calculation of energy savings over lifetime of LEDs or calculation of monetary savings by using LEDs per year • link to savings in fossil fuels for LEDs or link to reduced CO_2 produced for LEDs and reduced global warming • comparison of lifetimes and maintenance cost	**(6)**
Level	**0**	No rewardable content	
1	**1 - 2**	• a limited discussion of benefits using some pieces of the information provided, e.g. LEDs last 40 000 hours longer and the lighting levels are 200% brighter. • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy	
2	**3 - 4**	• a simple discussion of benefits using some pieces of the information and processing one of them OR 2 processed pieces of information. e.g. LEDs save 3000 kW h of energy each year and are much brighter. The money they save each year compared to fluorescents is £420. OR The payback time for the LEDs is about 5 years and in that time they would have to pay for the fluorescent lights to be replaced 5 times. • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately	

		• spelling, punctuation and grammar are used with some accuracy
3	**5 - 6**	• a detailed discussion of benefits using processed information covering more than half of the data points in the table e.g. LEDs use less energy each year and this means that fossil fuel reserves are not used up as quickly. The LEDs save £420 each year and have a payback time of about 5 years. • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors