

Q1.

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

Q2.

Question Number:	Answer	Mark
(i)	a power station	<p><b>(1)</b> AO 1 1</p>

Question Number:	Answer	Mark
(ii)	the national grid	<p><b>(1)</b> AO 1 1</p>

Question Number:	Answer	Mark
(iii)	heat loss is reduced	<p><b>(1)</b> AO 1 1</p>

Q3.

Question Number	Answer	Acceptable answers	Mark
<b>(b)</b>	<p>An explanation linking any two of:</p> <ul style="list-style-type: none"> <li>• increase voltage (1)</li> <li>• decrease current (1)</li> <li>• reduce {loss / waste} of {energy / heat} (1)</li> </ul>	<p>Increase efficiency (of energy transmission)</p> <p>Ignore "more efficient" by itself</p> <p>Accept power instead of energy</p> <p>Accept no energy loss</p>	<b>(2)</b>

Q4.

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

Q5.

Question Number	Answer	Acceptable answers	Mark
(a)	<p>An explanation linking two from</p> <p>MP1 (so that they) decrease the (high) voltages (1)</p> <p>MP2 high voltages used for efficiency/energy saving (1)</p> <p>MP3 (step-down transformers) used {near / for} {homes / factories/appliances} (1)</p> <p>MP4 (so that it is) safer (1)</p>	<p><b>stepping down voltage reducing from {high/eg 200 000 V} to {low /e.g.230 V} voltage</b></p> <p><b>low current used for efficiency/ energy saving</b></p> <p>less risk of electrocution</p> <p>high voltages are dangerous</p>	(2)

Q6.

		Indicative Content	Mark
		<p>A comparison including some of the following ideas</p> <ul style="list-style-type: none"> <li>Transformers can be used or voltages/currents can be changed/transformed</li> <li>AC (can transmit) at lower current/high(er) voltage</li> <li>National Grid is (usually) over ground (DC cables (were) underground)</li> <li>Less energy lost in transmission</li> <li>National Grid system can supply to customers further away</li> <li>Possible to create a grid linking power stations</li> <li>More flexibility in voltage for consumer</li> <li>Consumer can draw large(r) current</li> <li>More flexibility in power drawn</li> <li>Great(er) range of devices can be powered</li> </ul> <p>Ignore methods of electricity production</p>	(6) Exp
<b>Level</b>	<b>0</b>	No rewardable content	
<b>1</b>	<b>1 - 2</b>	<ul style="list-style-type: none"> <li>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.)</li> <li>the answer communicates ideas using simple language and uses limited scientific terminology</li> <li>spelling, punctuation and grammar are used with limited accuracy</li> </ul>	
<b>2</b>	<b>3 - 4</b>	<ul style="list-style-type: none"> <li>a simple comparison including two ideas which may be linked or not eg Nat.</li> </ul>	

		<p>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</p> <ul style="list-style-type: none"> <li>the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately</li> <li>spelling, punctuation and grammar are used with some accuracy</li> </ul>
<b>3</b>	<b>5 - 6</b>	<ul style="list-style-type: none"> <li>A detailed comparison including at least three ideas, with at least one direct link between two of them.</li> <li>e.g. AC can be transmitted further (than DC) because AC can be transformed to lower current/high(er) voltages.</li> </ul> <p>OR</p> <p>AC can be transformed to lower current/high(er) voltages. Greater range of devices used.</p> <ul style="list-style-type: none"> <li>the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately</li> <li>spelling, punctuation and grammar are used with few errors</li> </ul>

Q7.

SSQ NO:	CS NO:	Answer	Mark
*		<p>Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme.</p> <p>The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant.</p> <p style="text-align: center;"><b>AO1 strand 1 (6 marks)</b></p> <ul style="list-style-type: none"> <li>• Q is a step-up transformer</li> <li>• step up V causes I to be lower</li> <li>• voltage increases (25 kV to 400 kV)</li> <li>• R is a transmission line / (national) grid / cable</li> <li>• smaller currents in transmission lines</li> <li>• less energy lost though heating those wires</li> <li>• <math>V = I \times R</math></li> <li>• smaller voltage drop across the transmission line</li> <li>• S is a step-down transformer reducing voltage to 230V</li> <li>• ready for use in homes T</li> <li>• detail of transformers – iron core + coils</li> <li>• transformers are not 100% efficient</li> <li>• idea of power as <math>V \times I</math> or <math>P = I^2 R</math></li> </ul>	<p><b>(6)</b></p> <p><b>AO1.1</b></p>



Level	Mark	Descriptor
	0	No rewardable material.
Level 1	1-2	<ul style="list-style-type: none"> <li>• Demonstrates elements of physics understanding, some of which may be inaccurate. Understanding of scientific ideas lacks detail. (AO1)</li> <li>• Presents an explanation with some structure and coherence. (AO1)</li> </ul>
Level 2	3-4	<ul style="list-style-type: none"> <li>• Demonstrates physics understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas is not fully detailed and/or developed. (AO1)</li> <li>• Presents an explanation that has a structure which is mostly clear, coherent and logical. (AO1)</li> </ul>
Level 3	5-6	<ul style="list-style-type: none"> <li>• Demonstrates accurate and relevant physics understanding throughout. Understanding of the scientific ideas is detailed and fully developed. (AO1)</li> <li>• Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)</li> </ul>

#### Summary for guidance

Level	Mark	Additional Guidance	General additional guidance – the decision within levels
	0	No rewardable material.	Eg - At each level, as well as content, the scientific coherency of what is stated will help place the answer at the top, or the bottom, of that level.
Level 1	1-2	<u>Additional guidance</u> isolated ideas e.g. identifying two of Q, S and R	<u>Possible candidate responses</u> Q and S are transformers R is a wire / cable

Level 2	3-4	<u>Additional guidance</u>  more detail about the process of what at least two of Q, R and S do / achieve	<u>Possible candidate responses</u>  Q is a step-up transformer - voltage increases  R is a high voltage transmission line / cable / part of the National Grid  S is a step-down transformer → idea of reducing voltage to 230V
Level 3	5-6	<u>Additional guidance</u>  understanding is detailed and fully developed.  includes detail about functions and efficiency explanation	<u>Possible candidate responses</u> need for step up and step-down functions via transformers to transfer energy at high voltages (voltage may be specified e.g. 400kV)  transformers are not 100% efficient  smaller currents in transmission lines so less energy lost though heating those wires: makes system more efficient



Q8.

Question Number	Answer	Mark
*	<p>Answers will be credited according to candidate's deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme.</p> <p>The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant.</p> <p style="text-align: center;">AO1(6 marks)</p> <p>Understanding of physics</p> <ul style="list-style-type: none"><li>• (long) transmission wires have resistance</li><li>• reduced p.d. at the destination</li><li>• (thermal) energy is dissipated in the transmission wires</li><li>• this creates a power loss (refers to <math>P=I^2R</math>)</li><li>• transformers are used to step up to a high voltage for transmission</li><li>• this means a low current (refers to <math>V_P I_P = V_S I_S</math>)</li><li>• so power loss is small(er)</li><li>• transformers used to step down to a safer voltage for consumers</li><li>• consumer wires are shorter and so power loss is less of an issue</li></ul>	<p><b>(6)</b> AO 1 1</p>

Level	Mark	Descriptor
	0	<ul style="list-style-type: none"> <li>No rewardable material.</li> </ul>
Level 1	1-2	<ul style="list-style-type: none"> <li>An explanation that demonstrates elements of physics understanding, some of which is inaccurate. Understanding of scientific, enquiry, techniques and procedures lacks detail. (AO1)</li> <li>Presents an explanation that is not logically ordered and with significant gaps. (AO1)</li> </ul>
Level 2	3-4	<ul style="list-style-type: none"> <li>An explanation that demonstrates physics understanding, which is mostly relevant but may include some inaccuracies. Understanding of scientific ideas, enquiry, techniques and procedures is not fully detailed and/or developed. (AO1)</li> <li>Presents an explanation of the procedure that has a structure which is mostly clear, coherent and logical with minor steps missing. (AO1)</li> </ul>
Level 3	5-6	<ul style="list-style-type: none"> <li>An explanation that demonstrates accurate and relevant physics understanding throughout. Understanding of the scientific ideas, enquiry, techniques and procedures is detailed and fully developed. (AO1)</li> <li>Presents an explanation that has a well-developed structure which is clear, coherent and logical. (AO1)</li> </ul>