

Name of the Student: _____

Max. Marks : 19 Marks

Time : 19 Minutes

Mark Schemes

Q1.

Question number	Answer	Additional guidance	Mark
(b)	<p>an explanation linking in a logical order any four of the following:-</p> <p>(alternating) current produces (changing) magnetic field (around coil)(1)</p> <p>the coil is in a magnetic field (of fixed magnets) (1)</p> <p>(varying current in magnetic field) produces a force (1)</p> <p>the force on the coil /cone (continuously) changes direction (1)</p> <p>the paper cone /coil vibrates/ moves to and fro (1)</p>	<p>magnetic fields interact</p> <p>making the air molecules (in the cone) vibrate</p>	(4)

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;">AO1 strand 1 (6 marks)</p> <ul style="list-style-type: none"> • Q is a step-up transformer • step up V causes I to be lower • voltage increases (25 kV to 400 kV) • R is a transmission line / (national) grid /cable • smaller currents in transmission lines • less energy lost though heating those wires • $V = I \times R$ • smaller voltage drop across the transmission line • S is a step-down transformer reducing voltage to 230V • ready for use in homes T • detail of transformers – iron core + coils • transformers are not 100% efficient • idea of power as $V \times I$ or $P = I^2 R$ 	(6) AO1.1

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

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

Q3.

Question number	Answer	Additional guidance	Mark
	<p>an explanation linking three from:</p> <p>needle oscillates (1)</p> <p>either side of (centre) zero (1)</p> <p>(in response to) pole entering and pole leaving (end of coil) (1)</p> <p>(producing) {p.d. / voltage / emf} <u>induced</u> (via changing magnetic field) (1)</p> <p>(producing) an <u>alternating</u> current (1)</p>	<p>needle vibrates / moves side to side</p> <p>positive and negative</p> <p>accept N / north / S / south for pole</p> <p>do not accept magnet</p> <p>accept current produced / induced</p> <p>accept (induce) an <u>alternating</u> emf / voltage</p>	<p>(3) A01.2</p>

Question number	Indicative content	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> <ul style="list-style-type: none"> • coil moving/cuts through magnetic field • coil experiences changing magnetic field • induces a voltage/current in the coil • size of voltage/current depends on rate of change of magnetic field • rate of change depends on angle between direction of movement and direction of field. • greatest (rate of) change when coil moving perpendicular to field. • maximum current at Q and S • coil is horizontal at Q and S • coil moving vertically up at Q and down at S • direction of current at Q opposite to S. • no change when coil moving parallel to field. • zero current at P, R and T • coil vertical at P, R, and T <p>Credit can be given for correctly labelled diagrams</p>	<p>(6) AO2 and AO3</p>

Level	Mark	Descriptor
	0	<ul style="list-style-type: none"> No awardable content
Level 1	1–2	<ul style="list-style-type: none"> Interpretation and evaluation of the information attempted but will be limited with a focus on mainly just one variable. Demonstrates limited synthesis of understanding. (AO3) The explanation attempts to link and apply knowledge and understanding of scientific ideas, flawed or simplistic connections made between elements in the context of the question. (AO2)
Level 2	3–4	<ul style="list-style-type: none"> Interpretation and evaluation of the information on both variables, synthesising mostly relevant understanding. (AO3) The explanation is mostly supported through linkage and application of knowledge and understanding of scientific ideas, some logical connections made between elements in the context of the question. (AO2)
Level 3	5–6	<ul style="list-style-type: none"> Interpretation and evaluation of the information, demonstrating throughout the skills of synthesising relevant understanding. (AO3) The explanation is supported throughout by linkage and application of knowledge and understanding of scientific ideas, logical connections made between elements in the context of the question. (AO2)

Level	Mark	Additional Guidance	General additional guidance – the decision within levels e.g. - 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.
	0	No rewardable material.	
Level 1	1–2	<u>Additional guidance</u> isolated facts about interaction of electric current and magnetic fields or one salient feature of the graph	<u>Possible candidate responses</u> the coil experiences a changing magnetic field as it rotates. Size of the (induced) current varies.
Level 2	3–4	<u>Additional guidance</u> simple description of why current changes (either in direction or magnitude) and reference to at least one relevant point on the graph.	<u>Possible candidate responses</u> at position R the (plane of the) coil is parallel to the field and there is no current Or at position Q the coil is moving quickly through the field and the current is large.
Level 3	5–6	<u>Additional guidance</u> Full description of why current changes in magnitude or direction and reference to at least two relevant points on the graph	<u>Possible candidate responses</u> At Q, the coil is horizontal and moving most quickly across the field so the current is at its greatest. At R the coils is vertical and moving parallel to the field so there is no current.