

| Question Number | Answer | Mark |
|-----------------|--------|------------|
| 1(a)(i) | C | (1) |

| Question Number | Answer | Acceptable answers | Mark |
|-----------------|---|---|------------|
| 1(a)(ii) | Any continuous line which has a section above and below the time axis without going (deliberately) back in time | Fractions of a cycle that meet the criteria Ignore anything appearing after the arrow on the time axis | (1) |

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|-----------------|--|--|------------|
| 1(b) | substitution (1) $2400/200 = 230/V_s$ transposition (1) $(V_s =) 230 \times 200/2400$ Evaluation (1) $(V_s =) 19 \text{ (V)}$ | substitution and transposition in either order $230/12 = 2$ marks (s&t) $200/10.43 = 2$ marks (s&t) 19.2 (V) 19.17 (V) Give full marks for correct answer, no working $1.9 \times \text{any other power of } 10 = 2$ | (3) |

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|-----------------|--|--|------------|
| 1(c)(i) | An explanation linking any three of the following <ul style="list-style-type: none"> • <u>step-up transformer(s)</u> (1) • increase voltages (1) • (this) reduces the current (1) • (which) reduces the {<u>heat / thermal</u>} {energy / power} losses (1) | Assume 'they' refers to transformers 'steps up the voltage' scores second MP only Reject for MP2 and MP3: 'increases voltage <u>and</u> current.' but beware: 'increases voltage and current decreases' = 2 marks ignore unqualified energy losses Allow reverse arguments for last two points, e.g. high current wastes more heat energy = 2 marks Ignore references to efficiency ignore step-down statements except where they contradict | (3) |

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| 1(c)(ii) | <p>An explanation linking two of the following</p> <ul style="list-style-type: none"> • {kite / string} touching the power line (1) • {movement of charge / current} (1) • (electricity) {to earth / through the kite-flyer} (1) • giving (the kite-flyer) an <u>electric</u> shock (1) | <p>anything which implies contact for touching eg 'caught up in'</p> <p>spark ignore energy ignore electricity</p> <p>to ground needs idea of 'through' not 'into' the person ignore 'completing the circuit'</p> <p>electrocution stopping heart</p> | (2) |

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| 2(a)(i) | B | (1) |

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| 2(a)(ii) | A | (1) |

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|-----------------|---|------|
| 2(b)(i) | substitution into correct equation (1) $= 1.9 \times 10.0 \times 9.0$ answer (1) 171 (J) (which is about 170 J) Answer must be shown to 3 significant figures | (2) |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|--|------|
| 2(b)(ii) | rearrangement (1) (useful energy transferred) = efficiency \times total energy supplied substitution (1) $= (70 \times 170) \div 100$ answer (1) 119 (J) | award full marks for correct numerical answer without working accept (useful energy transferred) $= 170 \times 0.7$ OR $= 171 \times 0.7$ accept alternative answer from 171 (J) i.e. 120 (J) | (3) |

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| 2(c) | B | (1) |

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| 2(d) | <p>An explanation that combines identification – understanding (1 mark) and reasoning/justification – understanding (2 marks):</p> <ul style="list-style-type: none"> • the coil contains wires which have a resistance (1) • and current in the wire is due to movement of electrons through (close-packed) lattice of positive ions (1) • hence collisions between electrons and ions in the lattice transfer energy from electrons to the lattice (causing the temperature of the wires/coil to rise) (1) | (3) |