# Static and Charge

**Mark scheme:**

**Total mark – 23**

**1.**

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| | | **A** ✓ | 1(AO1.1) | |
| | | **Total** | **1** | |

**2.**

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| **C** ✓ | 1(AO1.1) | **Examiner's Comments**<br><br>The term 'source' was not clearly understood by some candidates. In this context a 'source of potential difference' is 'something which will give a voltage that pushes the flow of charge around the circuit.' |
| **Total** | **1** | |

**3.**

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| i | **Error**: only positive charges can move ✓<br><br>**Correction**: negative charges/electrons can move ✓ | 2<br>(AO3.2a)<br>(AO1.2) | **ALLOW** indication on the student's notebook<br><br>**Examiner's Comments**<br><br>A number of candidates provided the correct answer (that it is electrons that move) but did not identify that mistake in the student's homework (i.e. only positive charges can move). The two most common ways that candidates identified the student's mistake were: by putting a cross next to it on the homework sheet, or by writing that statement 4 was wrong in their answer. Over a third of candidates omitted to identify the student's mistake in their answer (see Exemplar 1 below). Candidates were instructed to do this in the stem of the question and identifying the error was the marking point for the first mark.<br><br>**AfL** |

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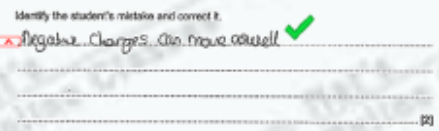
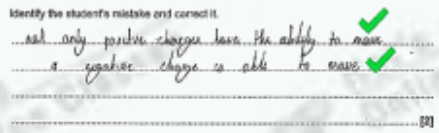
| | | | | | Underlining the command words can ensure that candidates answer the question that is being asked. In this example both 'identify' and 'correct' needed to be answered for both marks. Relying on the reader to assume that what the mistake is from the answer provided is testing the reader's knowledge and understanding not that of the candidate.<br><br>Exemplar 1<br><br>  <br><br><br>Exemplar 2<br><br>  <br> |
| | | ii | 4A ✓ | 1<br>(AO1.2) | **Examiner's Comments**<br><br>Half of all candidates did know that the current must be the same both sides of the bulb. The most common misconception was attempts to calculate and answer using the data on the circuit diagram. |

**4.**

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| a | i | (Ruler has) equal numbers of protons and electrons / ORA✓ | 2 (AO2 x 1.1) | **ALLOW** equal numbers of positive and negative charges/opposite charges / ORA<br>**ALLOW** ruler has not lost/gained electrons / ORA<br>**ALLOW** ruler is / atoms are neutral unless they lose/gain electrons / ORA<br>**ALLOW** if the ruler had been charged, movement of electrons (to/from the air) would discharge it<br><br>**ALLOW** overall/net charge is zero/neutral / ORA<br>**IGNORE** just charge is neutral |
| | | So (effects of positive charges and negative charges) cancel out / AW / ORA ✓ | | |
| | ii | Electrons are transferred (from/to the ruler or from/to the cloth) / ORA ✓<br><br>**And any one from:**<br>Charges are no longer equal / AW ✓<br><br>Different numbers of protons and electrons / AW ✓<br><br>Effects no longer cancel out / AW ✓ | 2 (AO2 x 1.1) | **ALLOW** electrons are lost/gained<br>**DO NOT ALLOW** protons/positive charges move<br><br>**ALLOW** ruler becomes negative/positive with correct movement of electrons ✓✓ |
| | b | They must be opposite/unlike charges / one is positive and one is negative / one is a proton and one is an electron ✓<br><br>**And any two from:**<br>They are being attracted ✓ | 3 (AO3 x 1.2) | **ALLOW** A is positive and B is negative for this mark only |
| | i | The arrows show a force on the positive (charge)/(charge) B ✓<br><br>Forces / field (lines) go from positive to negative ✓<br><br>(Charge) A is negative **AND** (charge) B is positive✓ | | **ALLOW** forces / field (lines) go from B to A<br><br>**ALLOW** maximum of 1 mark if described as positive and negative poles |

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| | | | **Any one from:**<br>North and South (poles) (replace positive and negative charges) ✓<br><br>The arrows/field lines go from North to South (as opposed to positive to negative) ✓ | | |
| | | ii | They have similar shape field (patterns) ✓<br><br>Closeness of field lines represents strength of field (in each case) ✓<br><br>Opposite <u>poles</u> (and opposite charges) attract ✓<br><br>Both show direction of field (lines) / forces ✓ | 1<br>(AO1.1) | |

**5.**

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| a | i | potential difference ✓<br><br>closed or complete circuit ✓ | 2<br>(AO2 × 1.1) | **IGNORE** ions / charge<br>**ALLOW** voltage<br><br>**ALLOW** higher level answers<br>eg. must have delocalised electrons / electrons that are free to move<br><br>**<u>Examiner's Comments</u>**<br><br>Only about 10% here gained both marks. Delocalised electrons was a common |
| | | | | correct answer for 1 mark. Less often seen were a potential difference [1] and a complete circuit [1]. |
| | ii | **FIRST CHECK THE ANSWERON ANSWER LINE**<br><br>**If answer = 1500 (C) award 4 marks**<br><br>Q = It ✓<br><br>t = 5 × 60 = 300 (s) ✓<br><br>Q = 5 × 300 ✓<br><br>Q = 1500 (C) ✓ | 4<br><br>(AO1.1)<br><br>(AO2.1)<br><br>(AO2.1)<br><br>(AO2.1) | **<u>Examiner's Comments</u>**<br><br>This was reasonably well answered and about two thirds of candidates gained 3 marks for 1500. Some forgot to convert minutes to seconds but were credited some reward for their working. |

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| | | | | **IGNORE** positive electrons / movement of protons / ions for this answer.<br>**ALLOW** Water bends or moves towards rod<br><br>**OR** for candidates that have misinterpreted the diagram as repulsion of water then **ALLOW**<br><br>Rod **repels** water / water bends or moves away from rod ✓ |
| b | | Rod **attracts** water ✓<br><br>• Opposite charges attract ✓<br>• water has both + and − charges / idea of polarisation / AW ✓ | 3 (AO3 × 1.2) | • Like charges repel ✓<br>• water has both + and − charges / idea of polarisation / AW ✓<br><br>**Examiner's Comments**<br><br>The diagram was interpreted differently by candidates. Some thought it attracted (ideal scenario) and others thought it repelled. However marks were made available for both lines of thought as both interpretations were valid from the diagram. It gave a full range of marks and discriminated well with |