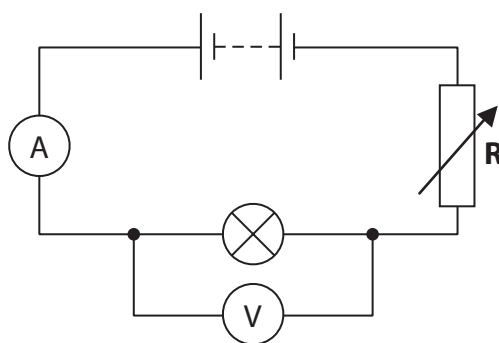


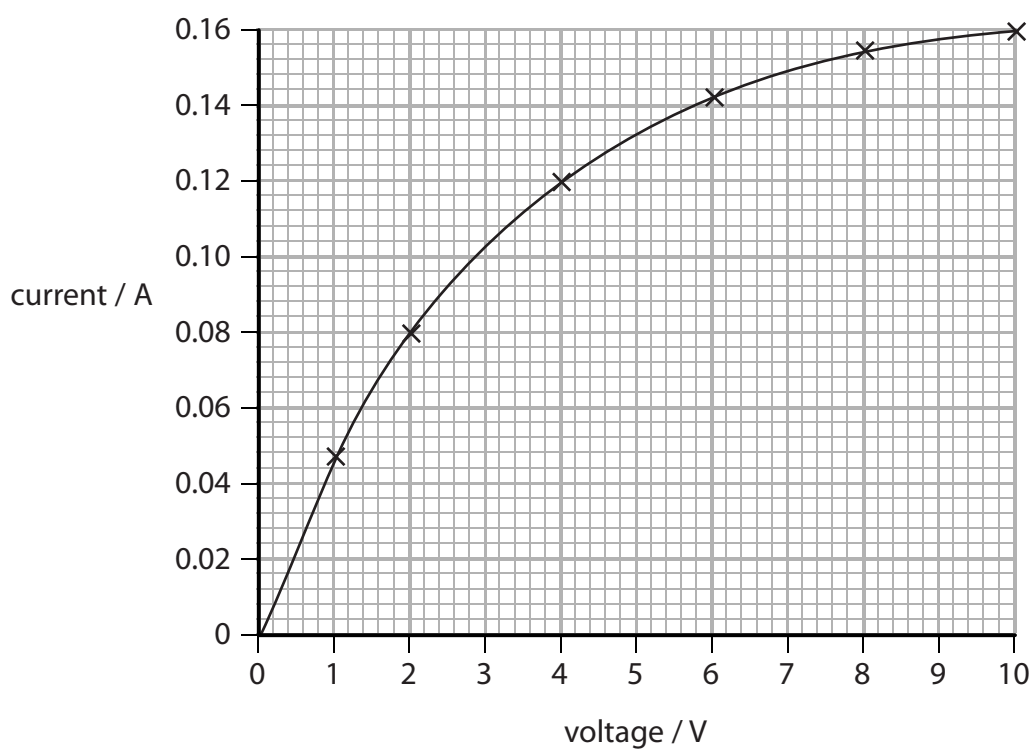
- 5 A student investigates how the resistance of a lamp varies as the current is changed. She sets up the circuit shown.



- (a) Give a reason why component **R** is included in the circuit.

(1)

- (b) The student draws a graph of his results.



- (i) Describe how the current in the lamp changes as the voltage changes.
Use data from the graph to support your answer.

(3)

- (ii) State the relationship between voltage, current and resistance.

(1)

- (iii) Calculate the resistance of the lamp when the voltage is 2.5 V.

(3)

resistance = Ω

- (c) State what happens to the resistance of a lamp when the current increases.

(1)

(Total for Question 5 = 9 marks)

| Question number | Answer | Additional guidance | Mark |
|-----------------|--------------------------------------|---|------|
| 5(a) | In order to vary the current/voltage | allow because there is no variable voltage supply | 1 |

| Question number | Answer | Additional guidance | Mark |
|-----------------|--|--|------|
| 5(b)(i) | <p>A description that makes reference to the following three points:</p> <ul style="list-style-type: none"> a simple pattern statement e.g. as the voltage increases the current increases (1) a statement about linearity e.g. gradient decreases with voltage (1) reference to data from the graph e.g. at 0 V the current is 0 A, but at 10 V, the current is 0.16 A (1) | <p>allow alternative statements</p> <p>the increase is greater at low voltages</p> | 3 |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---------------------------------------|--|------|
| 5(b)(ii) | voltage = current \times resistance | equation can be given in words or accepted symbols | 1 |

| Question number | Answer | Additional guidance | Mark |
|-----------------|---|--|------|
| 5(b)(iii) | <ul style="list-style-type: none"> Rearrangement Substitution Evaluation <p>e.g. $R = V/I$ (1) $= 2.5/0.092$ (1) $= 27.8 / 28$ (Ω)</p> | <p>seen anywhere</p> <p>allow a range of ± 0.02 A for the reading of current from graph</p> <p>max two marks if current incorrect</p> | 3 |

| Question number | Answer | Mark |
|-----------------|----------------------|------|
| 5(c) | Increases/equivalent | 1 |

Total for Question 5 = 9 marks

- 9 In 2011, a nuclear accident happened at Fukushima in Japan.

This released radioactive materials into the environment.

A month later, the radioactivity of seaweed on the west coast of USA was tested.

The seaweed was found to contain radioactive iodine-131.

The half-life of iodine-131 is 8.0 days.

- (a) Three samples of the same mass of seaweed were taken.

The number of counts in 10 minutes of the samples are shown in the table.

| | sample 1 | sample 2 | sample 3 |
|--------------------------------|----------|----------|----------|
| number of counts in 10 minutes | 3970 | 3970 | 3985 |

Explain why three separate samples were used.

(2)

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- (b) Iodine-131 emits beta particles.

There was not a high risk to the public from the iodine-131 in the seaweed.

Explain **one** reason why the risk was not high.

(2)

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(Total for Question 9 = 4 marks)