

Test: Electric Circuits

1. Atoms in materials are made up of negative electrons and positive nuclei.

(a) Draw arrows on the diagram below to show the forces acting between charges.



(2 marks)

(b) Explain why a balloon attracts your hair after rubbing the balloon against your hair.

(3 marks)

(c) State the difference between conductors and insulators.

(1 mark)

2. A voltmeter is used to measure the potential energy difference in a circuit.

(a) Draw a diagram to show an example of how a voltmeter would be connected to a circuit.

(1 mark)

(b) Suggest a reason why it is useful to measure potential difference in a circuit.

(1 mark)

3. High electrical currents flowing can be dangerous, so safety devices are put in place.

(a) State how electron flow is related to conventional current.

(1 mark)

(b) Describe how current is different to voltage.

(2 marks)

(c) Describe how very high currents can lead to electrical fires.

(2 marks)

(d) One fuse has a current rating of 250 mA.

Draw a picture of the fuse after 1.50 C travelled through it over 5.00 seconds.
Show all working.

(3 marks)

(e) The potential difference across the fuse is 0.050 volts.

Calculate the resistance of the fuse.

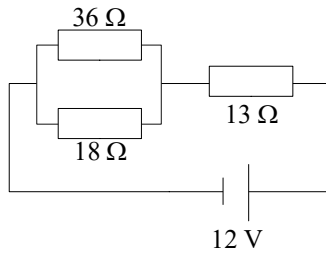
(2 marks)

(f) The wire in the fuse is replaced with a wire with twice the original thickness.

State the effect of the thicker wire on the resistance of the fuse.

(1 mark)

4. A circuit consisting of two resistors in parallel, one in series, and a battery is shown below:



(a) Show that the total resistance of the two parallel resistors is $12\ \Omega$.

(2 marks)

(b) Hence calculate the total resistance in the circuit.

(2 marks)

(c) Hence calculate the current flowing through the $13\ \Omega$ resistor.

(2 marks)

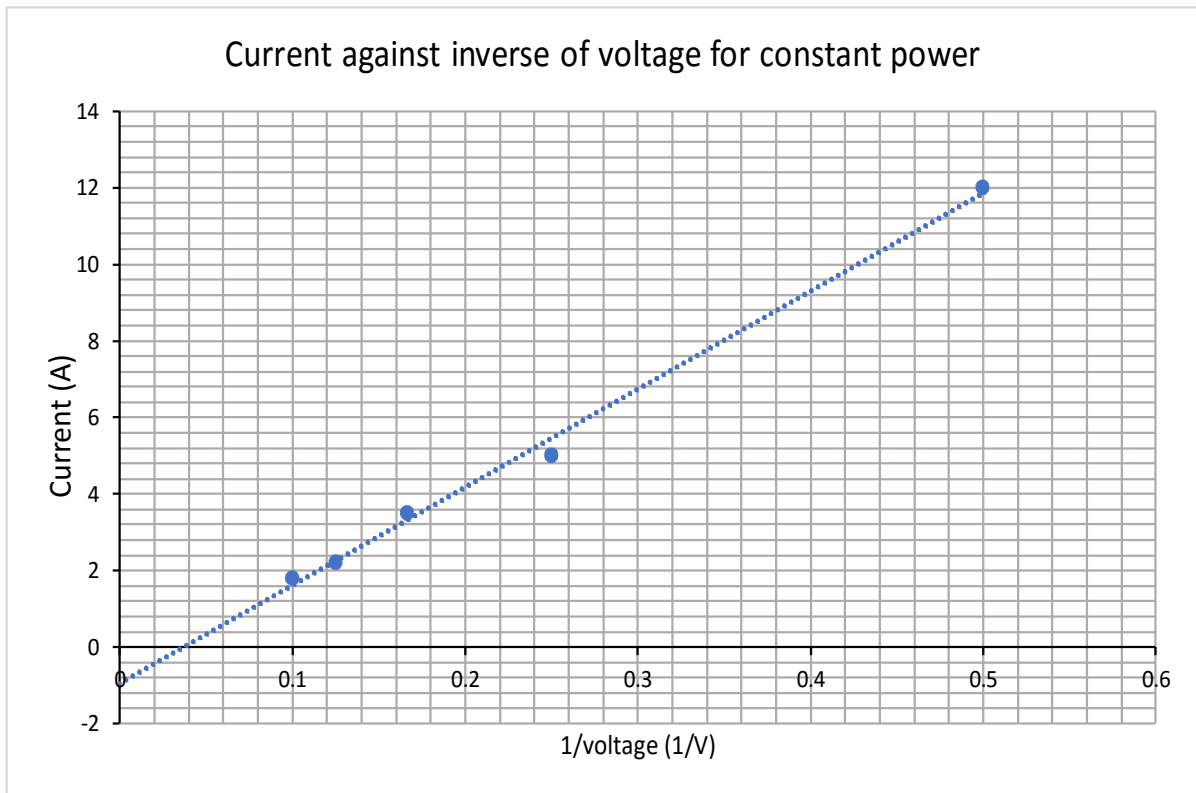
(d) Calculate the potential difference across the $18\ \Omega$ resistor.

(3 marks)

5. Calculate the cost of transferring $0.28\ \text{kWh}$ of energy to water, using a kettle with 60% efficiency, given the electricity price is 30c per kWh.

(3 marks)

6. An experiment is conducted in which voltage of a circuit is changed, current is measured, and power is kept constant. The results are shown on the graph below:



(a) Calculate the slope of the line of best fit above. Include the units for the slope.

(3 marks)

(b) Use the slope to calculate the power of the circuit.

(3 marks)