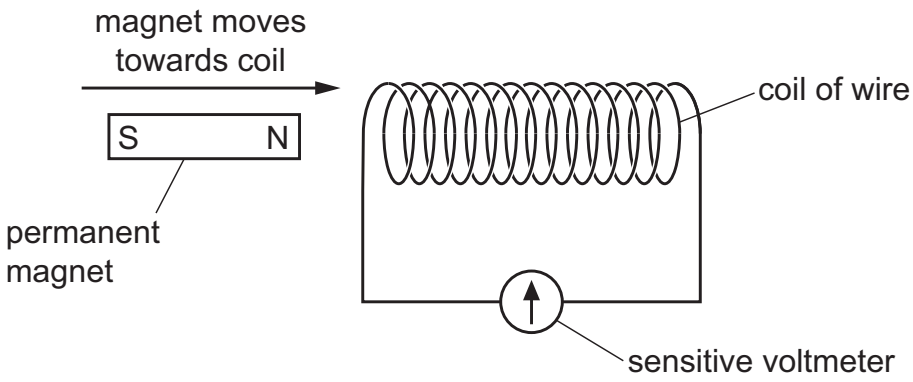
1 The diagram shows a magnet moving towards a coil of wire.



When the magnet moves towards the coil of wire, an electromotive force (e.m.f.) is induced.

Students are asked for one change that will increase the magnitude of the induced e.m.f.

Three changes are proposed.

1 Move the magnet more quickly.

2 Use a stronger magnet.

3 Increase the number of turns on the coil.

Which changes, on their own, will increase the magnitude of the induced e.m.f.?

A 1, 2 and 3 **B** 1 and 2 only **C** 1 and 3 only **D** 2 and 3 only

2 A 5.0 Ω resistor is connected in series with a 10 Ω resistor.

There is a constant current in the 5.0 Ω resistor.

Which statement about the two resistors is correct?

A The current is greater in the 5.0 Ω resistor.

B The current is greater in the 10 Ω resistor.

C The potential difference (p.d.) is greater across the 5.0 Ω resistor.

D The potential difference (p.d.) is greater across the 10 Ω resistor.

3 Which statement explains where the switch for an electric lamp is connected?

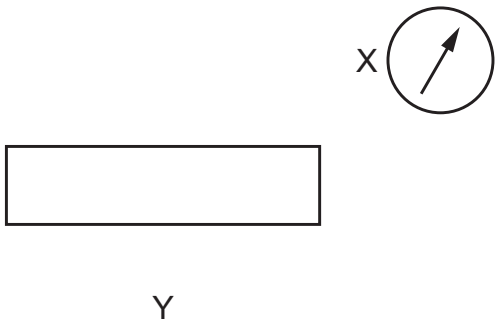
A The switch is in **either** the live wire **or** in the neutral wire as both wires carry the current.

B The switch is in the earth wire to prevent the fuse from blowing when the lamp is in use.

C The switch is in the live wire so that the lamp is disconnected from the mains supply when the switch is off.

D The switch is in the neutral wire to prevent current leakage when the lamp is switched off.

4 A plotting compass is placed at position X near to a bar magnet. The diagram shows the direction in which the compass points.



Which diagram shows the direction in which the plotting compass placed at position Y points?

A **B** **C** **D**



5 A student uses a coil and a magnet on a spring to generate an electromotive force (e.m.f.) that varies. He suspends the magnet above a coil as shown in Fig. 11.1.

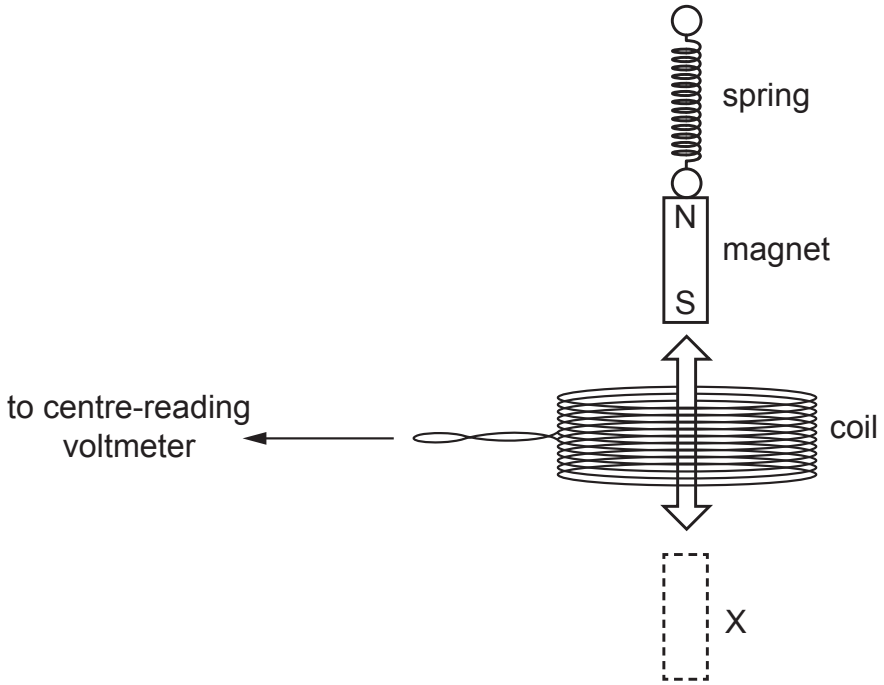


Fig. 11.1

(a) The student pulls the magnet through the coil to X and then releases it. The magnet moves up and down through the coil.

State the type of voltage induced in the coil. Tick (✓) **one** box.

alternating	☐
digital	☐
direct	☐

[1]

(b) State **two** ways of increasing the voltage induced in the coil.

1. .....

2. .....

[2]

[Total: 3]

6 A student tests various materials to determine whether they are electrical conductors or insulators. The student uses the circuit shown in Fig. 9.1.

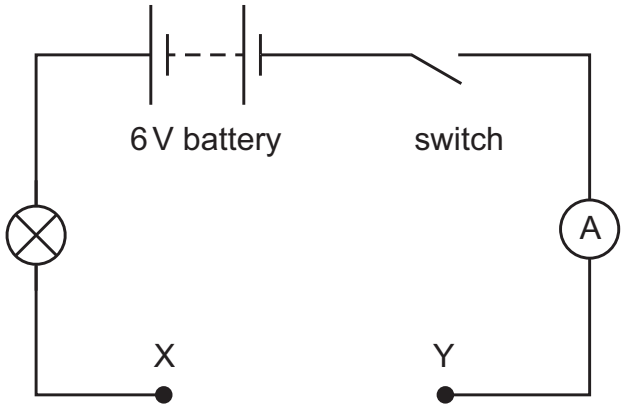


Fig. 9.1

(a) The student connects a piece of tin metal between X and Y.

Describe how the student can determine whether tin is an electrical conductor.

.....

.....

..... [2]

(b) Describe electrical conduction in a metal.

Use your ideas about electrons in your answer.

.....

.....

.....

..... [3]

[Total: 5]

7 Fig. 9.1 shows a router. The router emits Wi-Fi signals.

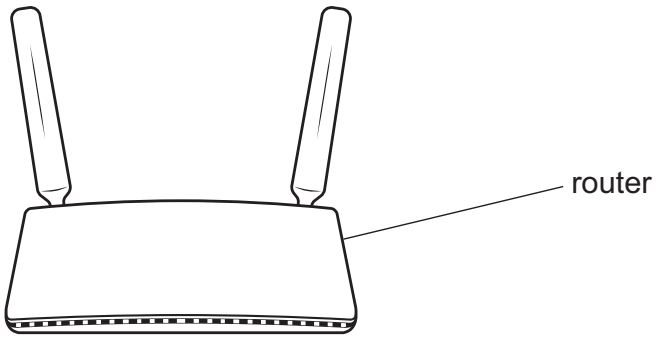


Fig. 9.1

(a) The power input to the router circuit is 9.0 W. The potential difference across the router circuit is 12 V.

Calculate the current in the router circuit.

current in router circuit = ... A [3]

(b) The energy used by the router each hour is 0.0090 kW h. One unit (kW h) of energy costs 50 cents.

Calculate the cost of using the router for 24 hours.

cost for 24 hours = ... cents [3]

(c) The router uses a transformer. The number of turns N_p on the primary coil of the transformer is 3600. The primary voltage V_p to the transformer is 240 V. The secondary voltage V_s of the transformer is 12 V.

Calculate the number of turns N_s on the secondary coil of the transformer.

number of turns on secondary coil = ... [3]

(d) The mains plug for the router includes a fuse that protects the router.

Explain how a fuse works.

.....

.....

..... [3]

[Total: 12]

8 **(a)** State and explain why electrical sockets and plugs used outside in a garden need to be different from those that can be used safely in a room inside a house.

.....

.....

.....

..... [2]

(b) State and explain why fuses and circuit breakers are installed in electrical circuits connected to the mains supply.

.....

.....

.....

..... [2]

[Total: 4]

9 **(a)** A coal-fired power station is far from a city. The electricity generated by the power station is transmitted to the city at a high voltage.

State **two** advantages of high-voltage transmission of electricity.

1 .....

2 .....

[2]

(b) In the city, transformers reduce the high voltage.

Fig. 8.1 shows one of these transformers.

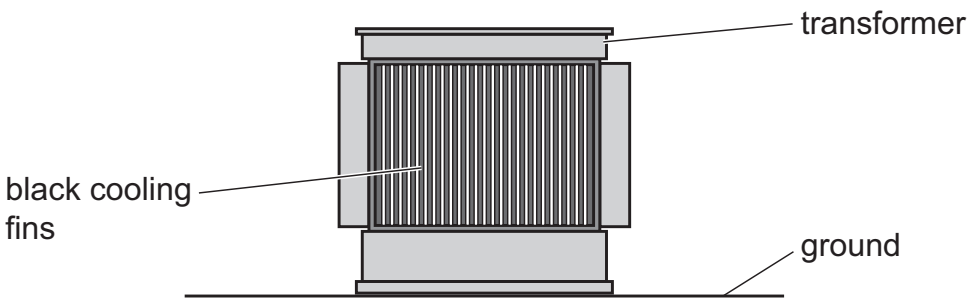


Fig. 8.1

Transformers become hot when they reduce the high voltage. There are black cooling fins on the casing which contains the transformer.

Explain why the fins are black.

.....

..... [2]

(c) Describe the construction and materials of a simple step-down transformer. You may draw a labelled diagram as part of your answer.

.....

.....

..... [3]

[Total: 7]

10 Fig. 6.1 shows a person using a magnetic window cleaner. The part on the outside of the window is attracted to the inside part through the glass window.

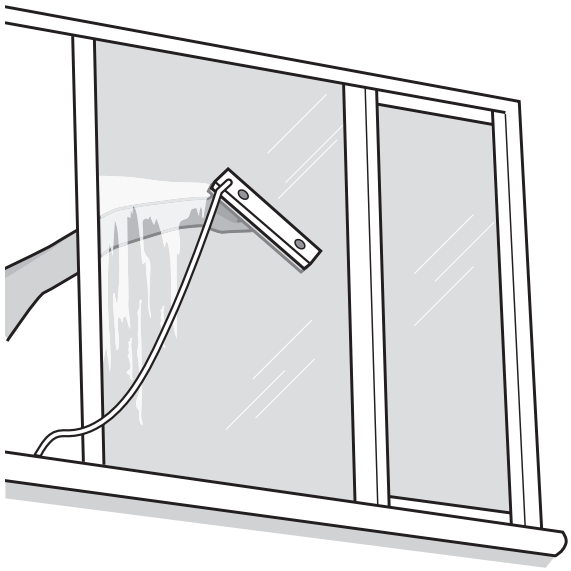


Fig. 6.1

Each part of the window cleaner contains two magnets. Fig. 6.2 shows the magnetic field between the parts of the window cleaner.

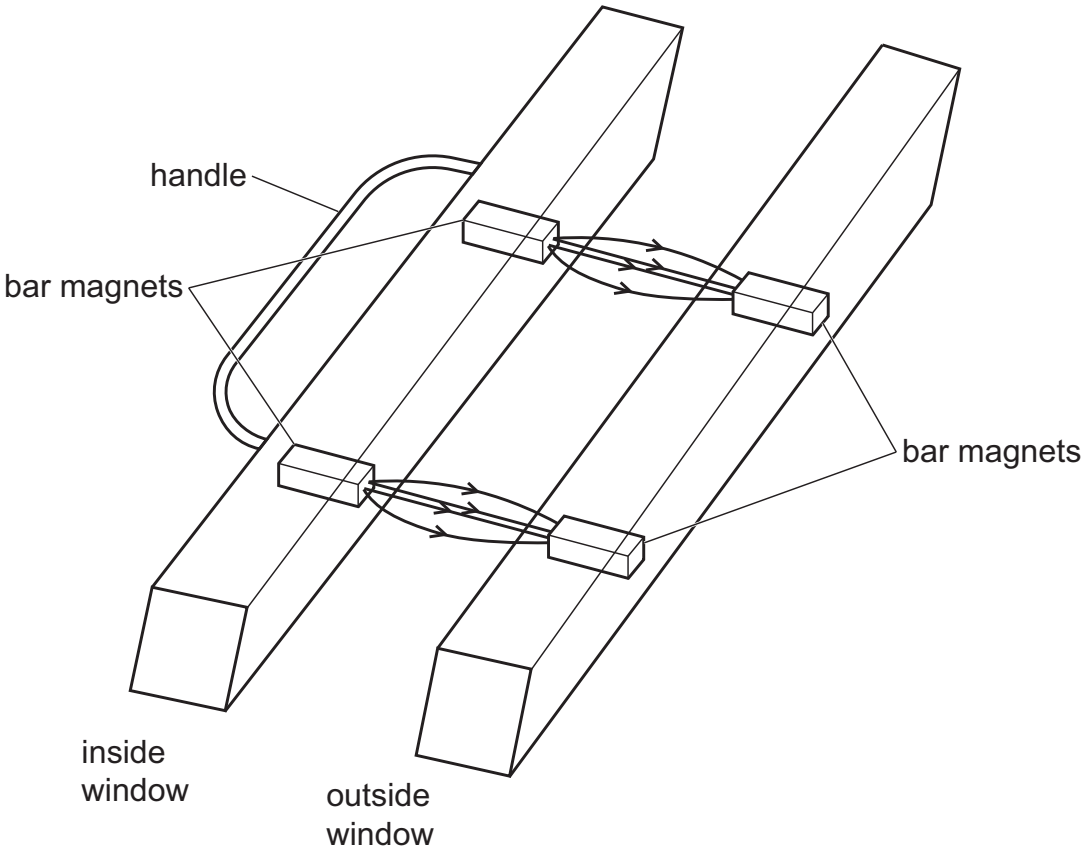


Fig. 6.2

(a) Glass is **not** a magnetic material.

State the difference between magnetic and non-magnetic materials.

.....

..... [1]

(b) Suggest a suitable material for the magnets in the window cleaner. Explain your answer.

.....

..... [1]

(c) Label the poles of the magnets in Fig. 6.2. [1]

(d) State how the field lines in Fig. 6.2 show different strengths of the magnetic field between the magnets.

.....

..... [1]

[Total: 4]

11 **(a)** Draw the circuit symbol for a potential divider.

[1]

(b) Fig. 7.1 shows a circuit.

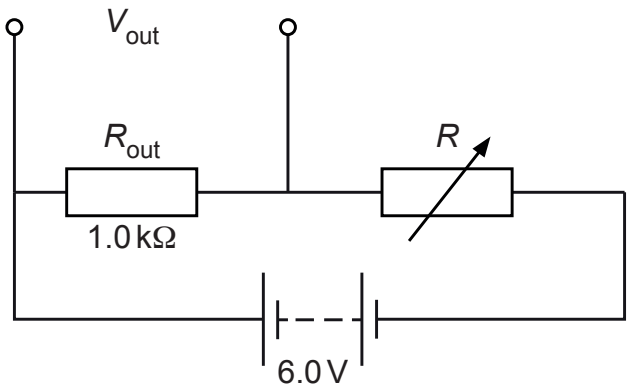


Fig. 7.1

(i) Calculate the value of V_{out} when the value of R is 3.0 kΩ.

V_{out} = ... [2]

(ii) The value of R is adjusted until the current in the circuit is 1.7 mA.

Calculate the charge that flows through the circuit in 300 s.

charge = ... [2]

[Total: 5]

12 **(a)** State what is meant by a magnetic field.

.....

..... [1]

(b) Fig. 8.1 shows an ammeter connected to a coil wound on a thin plastic cylinder. A small trolley is placed on a curved track which passes through the cylinder.

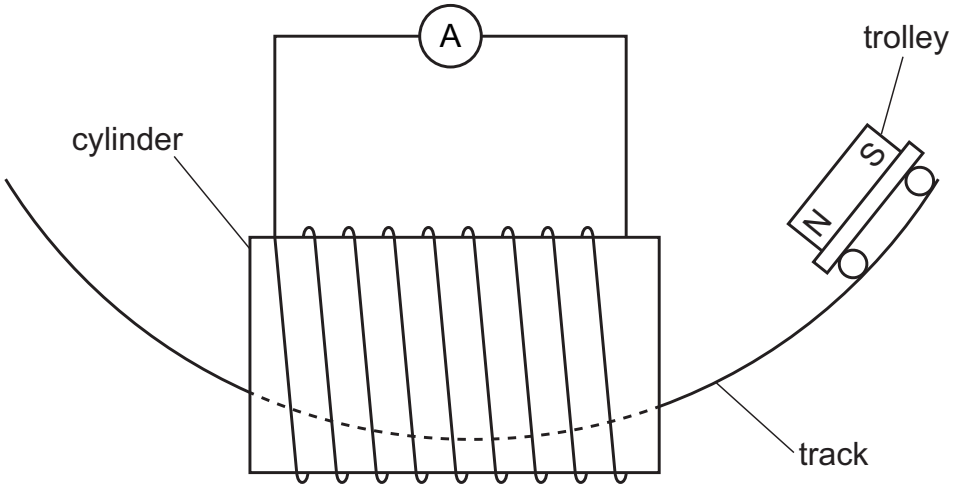


Fig. 8.1

The trolley is released from the position shown in Fig. 8.1. It travels through the coil from right to left. The trolley travels back from left to right. It has a lower maximum speed when it travels from left to right.

The plastic cylinder does not affect any magnetic field. A magnet is fixed to the trolley.

(i) State why there is a lower maximum speed when the trolley travels back from left to right.

.....

..... [1]

(ii) Fig. 8.2 shows a close-up view of the ammeter.

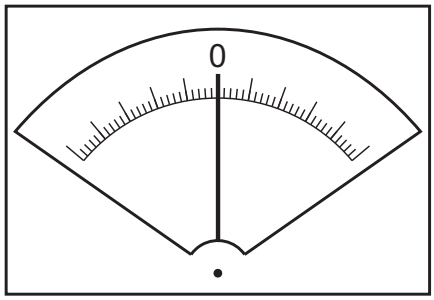


Fig. 8.2

As the trolley enters the coil moving from right to left, the ammeter needle deflects to the left and then returns to zero.

State and explain any changes to the deflection on the ammeter as the trolley enters the coil when moving back from left to right.

.....

.....

.....

.....

.....

..... [3]

[Total: 5]