

TWENTY FIRST CENTURY
science

Module P5

ELECTRIC CIRCUITS

Practice test

FOUNDATION

Name:

Form/teaching set:

Answer all of the questions.

Write your answers in the spaces provided on this paper.

Useful relationships

$$\text{speed} = \frac{\text{distance travelled}}{\text{time taken}}$$

$$\text{momentum} = \text{mass} \times \text{velocity}$$

$$\text{change in momentum} = \text{resultant force} \times \text{time for which it acts}$$

$$\text{work done by force} = \text{force} \times \text{distance moved by force}$$

$$\text{change in energy} = \text{work done}$$

$$\text{change in GPE} = \text{weight} \times \text{vertical height difference}$$

$$\text{kinetic energy} = \frac{1}{2} \times \text{mass} \times (\text{velocity})^2$$

$$\text{resistance} = \frac{\text{voltage}}{\text{current}}$$

$$\frac{\text{voltage in primary coil}}{\text{voltage in secondary coil}} = \frac{\text{number of turns in primary coil}}{\text{number of turns in secondary coil}}$$

$$\text{power} = \text{potential difference} \times \text{current}$$

$$\text{energy transferred} = \text{power} \times \text{time}$$

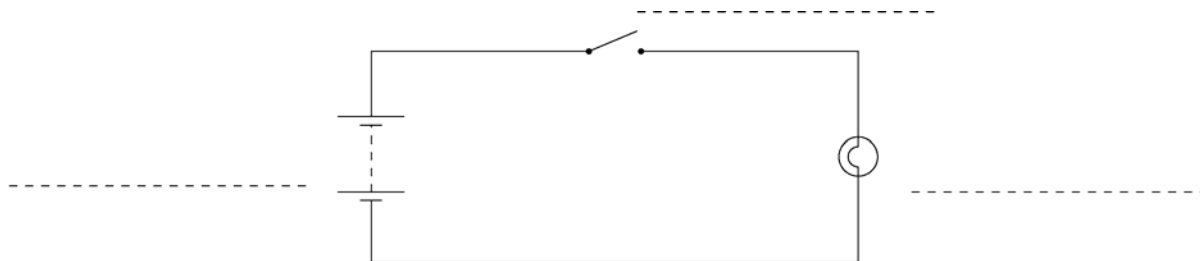
$$\text{efficiency} = \frac{\text{energy usefully transferred}}{\text{total energy supplied}}$$

$$\text{wave speed} = \text{frequency} \times \text{wavelength}$$

1 Neil is designing a torch.

He builds a simple circuit using a switch, bulb and battery.

(a) Complete the labels on the diagram.



[1]

(b) Neil decides he wants the bulb to be brighter.

He needs to increase the current in the bulb.

Which of the following will increase the current through the bulb?

Put ticks (✓) in the **two** correct boxes.

Add an extra battery in series.

Use longer wires to connect the battery and the bulb.

Add a resistor in series with the bulb.

Add an ammeter to the circuit.

Increase the voltage of the battery.

[2]

(c) Which two statements explain why the bulb gives off light?

Put ticks (✓) in the **two** correct boxes.

A hot wire gives off light.

An electric current gives off light.

An electric current in a wire makes the wire get hot.

The switch lets the light get from the battery to the bulb.

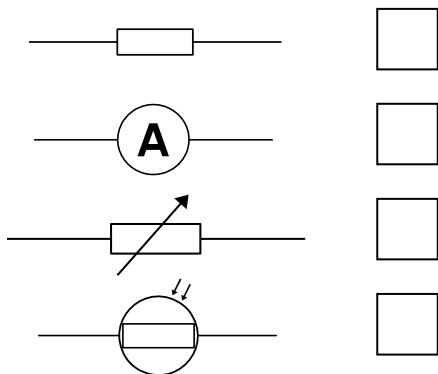
The battery produces light.

[2]

(d) Neil wants to use an LDR in his circuit.

(i) Which of the following is the symbol for an LDR?

Put a tick (✓) in the box next to the correct symbol.



[1]

(ii) A change in which one of the following changes the resistance of an LDR?

Put a **ring** around the correct answer.

height

light

temperature

weight

[1]

(e) Complete the following sentences.

Use words from the list.

atoms conductors electrons insulators negative neutral positive

A current in a metal wire is a flow of, which have
..... charge.

Materials which do not allow charges to move are called
.....

[3]

[Total marks: 10]

2 (a) Anita records how long she uses some electrical devices in a day.

device	power in kW	time used in hours
light bulb	0.1	4
TV	0.5	6
kettle	3	0.5

(i) Which device used the most electrical energy in the day?

.....

[1]

(ii) 1 kWh of electrical energy costs 12p.

A cooker uses 5 kW for 2 hours. How much does this cost?

cost =p

[2]

(b) Scientists usually measure energy in joules.

The electricity companies measure energy in kilowatt hours (kWh).

Which of the following is the best explanation of this?

Put a tick (✓) in the box next to the best explanation.

The electricity company is old fashioned.

Scientists don't measure electrical energy.

A house usually uses millions of joules of electrical energy.

1 kilowatt hour equals 1 joule.

[1]

[Total marks: 4]

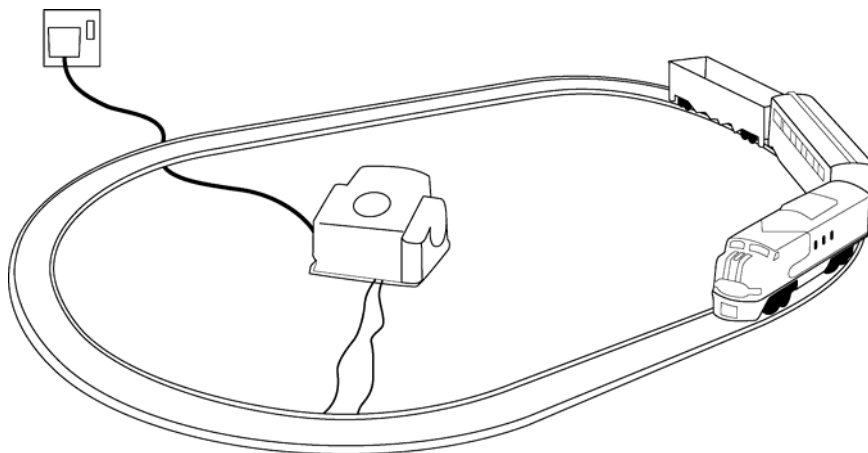
3 How an electric train set works

The electric train set is plugged into the mains electricity, but uses a transformer to reduce the voltage to a safer 11.5 V.

The tracks form part of the circuit. The current flows through the track to the train.

The electric current provides power to the train's motor and to the train's lights.

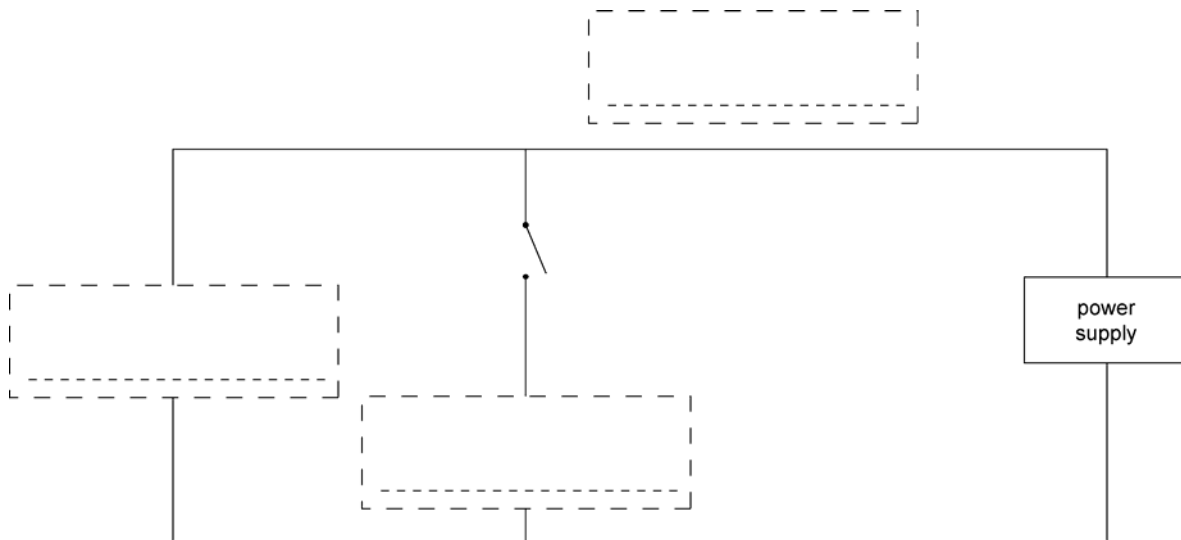
The train's lights can be switched on and off with a switch on the train.



(a) Complete the labels on the circuit diagram for the train set.

Use three words from the list

light motor switch track



[3]

(b) The power supply is connected to the mains electricity supply.

What is the voltage of the mains supply?.

..... volts

[1]

(c) The transformer is made up of two coils of wire, the primary coil and the secondary coil, and an iron core.

Draw a labelled diagram to show the construction of a transformer.

[2]

[Total marks: 6]

[Total marks for the test: 20]

TWENTY FIRST CENTURY
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Practice test

HIGHER

Name:

Form/teaching set:

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Which device used the most electrical energy in the day?

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[1]

(b) 1 kWh of electrical energy costs 12p.

A cooker uses 5 kW for 2 hours. How much does this cost?

cost =p [2]

(c) Scientists usually measure energy in joules.

The electricity companies measure energy in kilowatt hours.

Which of the following is the best explanation of this?

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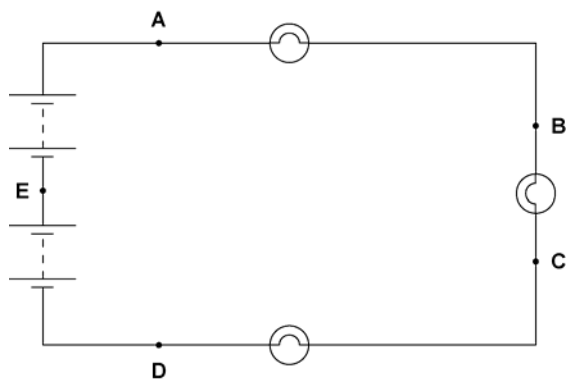
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[1]

[Total marks: 4]

- 2 Neil is building a simple circuit to light his shed.
He is using two 6 V batteries and three identical bulbs.



He measures the voltage between different points in the circuit.

- (a) What is another name for voltage?

.....

[1]

- (b) He makes three voltage measurements.

He connects the voltmeter between two points each time.

Write down two points he could have used for each measurement.

- (i) Neil measures 12 V. [1]

- (ii) Neil measures 6 V. [1]

- (iii) Neil measures 8 V. [1]

- (iv) Neil makes a mistake making one measurement.

He connects both sides of the voltmeter to point B.

What voltage will show on the voltmeter?

..... volts

[1]

(c) He replaces one of the bulbs with a bulb of higher resistance.

The voltage across the bulb increases.

Which sentences give the **best** explanation for this?

Put ticks (✓) in the boxes next to the **two** best explanations.

The total energy transferred to a charge by a battery equals the total energy transferred from the charge by the bulb's resistance.

More energy is transferred when a charge passes through a larger resistance.

Two resistors in parallel provide more resistance to a current.

Two resistors in series provide more resistance to a current.

The bulb with greater resistance shines more brightly.

The voltage is related to the energy transferred from the charge passing through a resistance.

[2]

(d) When Neil joins one bulb to a 6 V battery, the current through the bulb is 0.3 A

Calculate the resistance of the bulb.

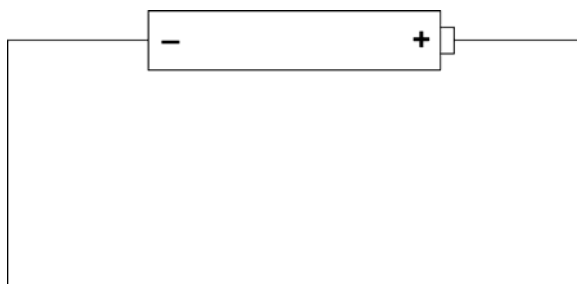
resistance = ohms

[2]

(e) A battery has a positive (+) charge at one end and a negative (–) charge at the other.

If the two ends of the battery are connected by a wire, an electric current is produced.

On the diagram below, draw an arrow to show the direction in which the electrons in the wire will move.



[1]

[Total marks: 10]

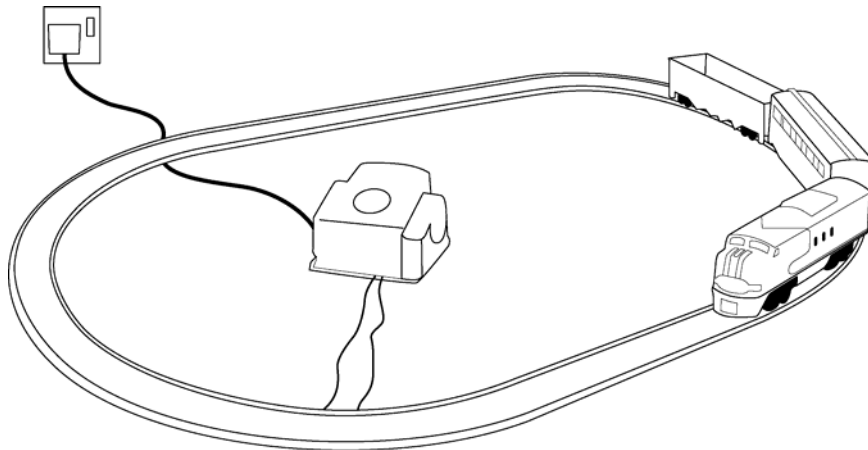
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The tracks form part of the circuit. The current flows through the track to the train.

The electric current provides power to the train's motor and to the train's lights.

The train's lights can be switched on and off with a switch on the train.



- (a) The transformer is made up of two coils of wire, the primary coil and the secondary coil, and an iron core.

Draw a labelled diagram to show the construction of a transformer.

[2]

- (b) The mains electricity has voltage of 230 V. The output from the power supply is 11.5 V.

The primary coil of the transformer has 600 turns. Calculate the number of turns in the secondary coil.

number of turns = [2]

- (c) The train has a maximum power rating of 18.75 watts.

Calculate the maximum current in the train tracks.

current = amps [2]

[Total marks: 6]

[Total marks for the test: 20]