AQA

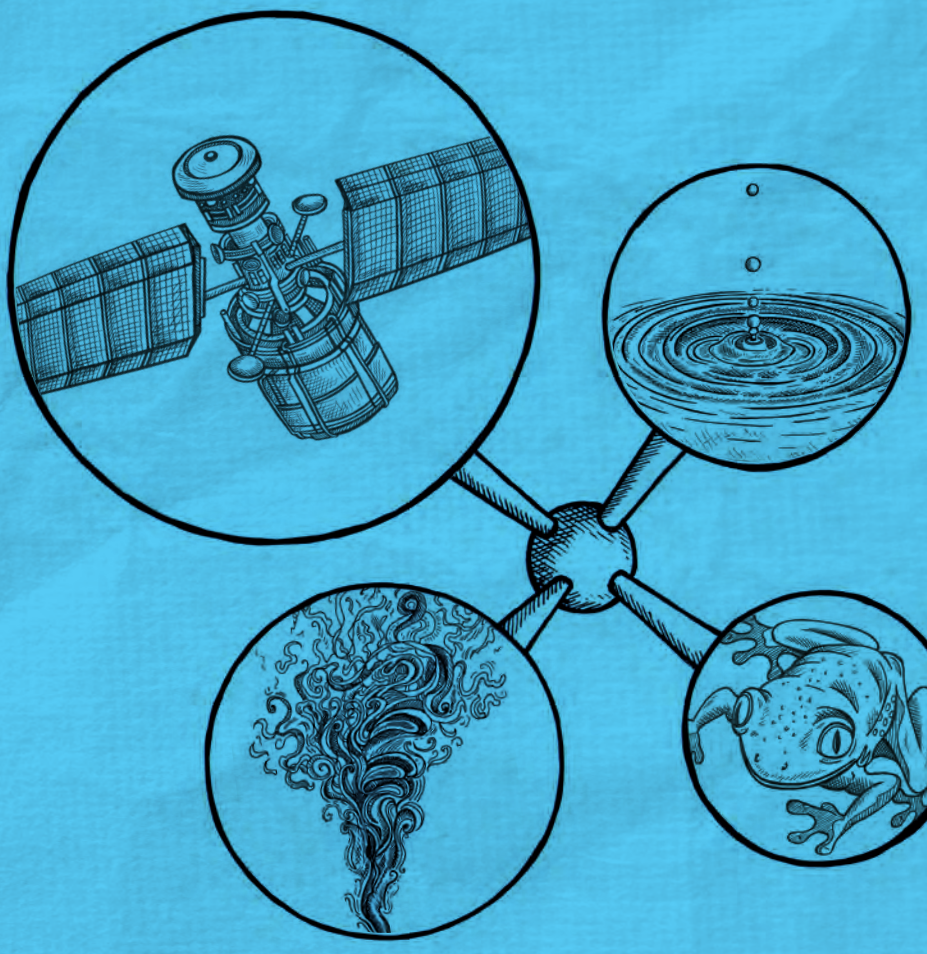
REVISE AQA GCSE (9–1)

Physics

REVISION WORKBOOK

Higher

For the 9–1 exams



Pearson

AQA

REVISE AQA GCSE (9–1)

Physics

REVISION WORKBOOK

Higher

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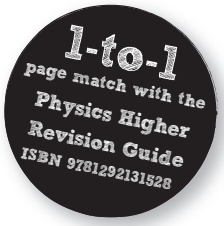

Contents

AQA publishes Sample Assessment Material and the Specification on its website. This is the official content and this book should be used in conjunction with it. The questions have been written to help you practise every topic in the book. Remember: the real exam questions may not look like this.

Had a go ☐ Nearly there ☐ Nailed it! ☐

Paper 1

Energy stores and systems

1 Identify the correct energy stores that occur in the following examples by drawing lines to show your answers. The first one has been done for you.

A	A container box lifted by a crane		chemical
B	Hot water in a saucepan		gravitational
C	Bag of coal		kinetic
D	Moving wind turbine		thermal

(1 mark)

Guided

2 (a) Explain what is meant by a closed system.

A closed system is an isolated system where .....

..... **(1 mark)**

(b) Explain how your answer to (a) relates to the principle of the conservation of energy.

The total energy in a closed system is the same after the transfer .....

.....

..... **(2 marks)**

3 The principle of the conservation of energy states that energy can be usefully transferred to other stores. Complete an energy flow diagram to show the changes in energy stores and transfers for a battery-operated music system, when it is switched on. Write the correct description of energy in each box.

Your answer should include the following terms: 'electrical current', 'heating', 'chemical energy', 'sound'.

(a) Store of .....
.....
.....

→

(b) Energy transfer by
.....
.....

→

(c) Energy transfer to
.....
.....

(3 marks)

4 A basket of apples is lowered to the ground from an apple tree using a rope and pulley. The total energy transferred is 250 J. Identify the energy transfers taking place, including the useful and wasteful energy components that result.

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..... **(4 marks)**

Had a go ☐ Nearly there ☐ Nailed it! ☐

Changes in energy

1 Which is the correct equation for calculating gravitational potential energy? Tick **one** box.

Always answer multiple-choice questions, even if you don't actually know the answer.

☐ $E_p = m\ v\ h$

☐ $E_p = m\ F\ a$

☐ $E_p = \frac{1}{2}\ m\ v^2$

☐ $E_p = m\ g\ h$ **(1 mark)**

2 A cyclist and her bicycle are travelling at 6 m/s.

The mass of the cyclist and bicycle is 70 kg.

Maths skills

Guided

Calculate the kinetic energy of the cyclist. Choose the correct unit from the box.

m/s^2	J	W

Kinetic energy = ...

so .....

Kinetic energy = ... unit ..... **(3 marks)**

3 A spring has a spring constant of 200 N/m.

It is stretched 15 cm when a mass is applied.

Calculate the energy transferred to the spring. Use the correct equation from the Physics Equation Sheet.

.....

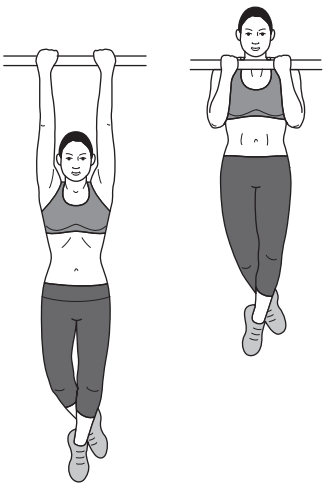
.....

Energy transferred = ... J **(3 marks)**

4 A dancer with a weight of 600 N practises chin-ups during training and raises her body 70 cm.

Calculate the gravitational potential energy gained by the dancer between the bottom and top of the chin-up.

Remember to convert from weight to mass first!



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Gravitational potential energy = ... J **(3 marks)**

Energy changes in systems

1 Give the equation for specific heat capacity.

..... **(1 mark)**

2 Calculate how much energy is needed to heat 0.8 kg of water from 30 °C to 80 °C. The specific heat capacity of water is 4200 J/kg °C. Use the correct equation from the Physics Equation Sheet.

.....

.....

.....

Energy required = ... J **(3 marks)**

Guided

3 A 1.2 kg block of copper is supplied with 20 000 J of electrical energy. Calculate the change in temperature of the copper. The specific heat capacity of copper is 385 J/kg °C. Use the correct equation from the Physics Equation Sheet.

You will need to rearrange the equation you used in Question 2.

$\Delta\theta = \Delta E \ / \ (m\ c)$, so $\Delta\theta = 20\ 000 /$ .....

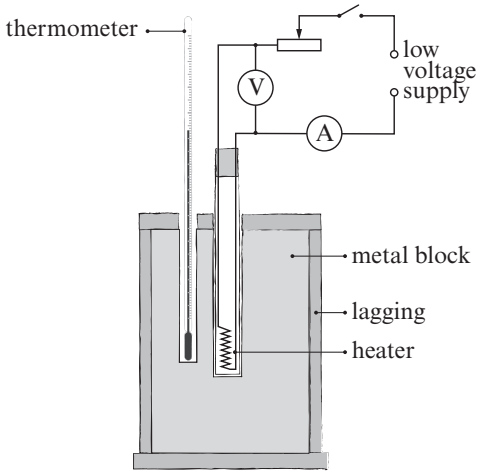
.....

.....

Change in temperature of the copper = ... °C **(3 marks)**

4 A 0.8 kg block of metal is heated for 540 seconds with an electrical power of 30 W. The temperature increase is 25 °C. Calculate the specific heat capacity of the block of metal. Use the correct equation from the Physics Equation Sheet.

You need to recall that $E = P\ t$ to calculate the electrical energy in, before calculating the energy out (energy supplied to the metal block).



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Specific heat capacity = ... J/kg °C **(4 marks)**

Had a go ☐ Nearly there ☐ Nailed it! ☐

Practical skills

Specific heat capacity

1 Water is widely used in cooling systems because of its relatively high specific heat capacity compared with some other liquids.

(a) Write the definition of the term specific heat capacity.

..... **(1 mark)**

(b) Give the three quantities that need to be measured to calculate the specific heat capacity of a substance.

..... **(1 mark)**

2 (a) Describe an experiment that could be set up to measure the specific heat capacity of water using an electric water heater, a beaker and a thermometer.

Remember 'pre-experiment' steps, e.g. zero the balance to eliminate the mass of apparatus before measuring substances, take a starting temperature reading before heating and decide on the range or type of measurements to be taken.

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..... **(5 marks)**

(b) Suggest how you can determine the amount of thermal energy supplied to the heater by the electric current.

.....

.....

..... **(2 marks)**

(c) Explain how this experiment could be improved to give more accurate results.

.....

.....

..... **(2 marks)**

3 A known mass of ice is heated until it becomes steam. The temperature is recorded every minute. Describe how to use the data to identify when there are changes of state.

.....

.....

..... **(2 marks)**

Power

1 A kettle transfers 12 500 J of electrical energy in 5 seconds. What is the power rating of the kettle? Tick **one** box.

☐ 2500 W

☐ 12 500 W

☐ 25 000 W

☐ 62 500 W **(1 mark)**

2 A microwave heats a drink in 20 seconds using 15 000 J of electrical energy. Calculate the power of the microwave.

Guided

Energy transferred = ... J, time taken = ... s

$P = E / t$ = ... W

Power = ... W **(2 marks)**

3 A student with a mass of 60 kg climbs 20 stairs to a physics lab. Each stair is 0.08 m high; g is 10 N/kg.

(a) Calculate the gravitational potential energy gained in climbing the 20 stairs to the lab. Select the correct unit from the box.

watts	newtons	joules

You need to remember that $E_g = m\,g\,h$ because it's not on the Physics Equation Sheet.

.....

.....

Gravitational potential energy = ... unit ..... **(3 marks)**

(b) Calculate the power of the student's muscles to climb the stairs in 12 seconds. Include the unit in your answer.

Power = ... **(1 mark)**

4 Altaf and Cathy investigate the time taken for two different winch motors to transfer energy.

You will need to recall the equation $P = E / t$

(a) Calculate the time taken for a 3 W winch motor to transfer 360 J of energy.

.....

..... **(2 marks)**

(b) Calculate the time taken for a 5 W winch motor to transfer 360 J of energy.

.....

..... **(2 marks)**

Had a go ☐ Nearly there ☐ Nailed it! ☐

Energy transfers and efficiency

1 (a) Identify the most suitable material, from the table below, for building an energy efficient garage.

Material	Relative thermal conductivity
brick	1.06
concrete	1.00
sandstone	2.20
granite	2.75

..... **(1 mark)**

(b) Define the term 'low relative thermal conductivity' of a material.

.....

..... **(2 marks)**

2 (a) Some houses are built with very thick walls. Explain how these walls help to keep the houses warm in the winter.

Guided

Thicker walls provide more material for .....

to travel through from the inside to outside, so the .....

is less, keeping the houses warmer. **(2 marks)**

(b) In hot countries, some traditional houses have thick walls with small windows. Explain why.

Thicker walls provide more material for .....

to travel through from the outside to inside, so the .....

is less, keeping the house cool. **(2 marks)**

3 A box gains 100 J of energy in its gravitational potential energy store when it is lifted from the floor to a lab desk. The motor lifting the box transfers 400 J as kinetic energy.

Remember: $\text{efficiency} = \dfrac{\text{useful energy transferred by the machine}}{\text{total energy supplied to the machine}}$

(a) Calculate the efficiency of the motor.

.....

..... **(2 marks)**

(b) Suggest how the efficiency of the motor could be improved by reducing friction.

.....

..... **(2 marks)**

4 A student uses four beakers containing hot water, each wrapped with different insulating materials, to investigate the transfer of thermal energy. Which factor will **not** affect the rate of transfer of thermal energy? Tick **one** box.

☐ Rate of data collection

☐ Temperature of the room

☐ Starting temperature of water

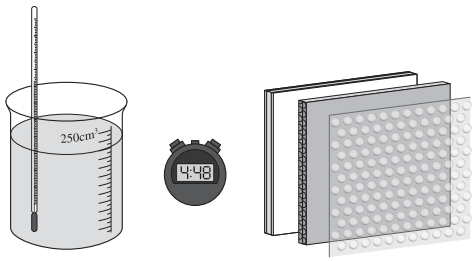
☐ Thickness of the insulators **(1 mark)**

Had a go ☐ Nearly there ☐ Nailed it! ☐

Practical skills

Thermal insulation

1 (a) Describe an experimental method, using the apparatus in the diagram below, to investigate the insulating properties of different materials.



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..... **(5 marks)**

(b) Identify the independent and dependent variables in this experiment.

.....

.....

..... **(2 marks)**

(c) Name **four** control variables in this experiment.

.....

.....

..... **(2 marks)**

2 Identify a hazard with conducting this experiment and explain how the risks to those conducting the experiment may be minimised.

.....

..... **(1 mark)**

3 Suggest an alternative piece of apparatus **not** shown in the diagram that could be used for data collection to improve accuracy.

..... **(1 mark)**

4 Describe the conclusion that you would expect to reach at the end of the experiment which relates the independent and dependent variables.

.....

.....

..... **(2 marks)**

Had a go ☐ Nearly there ☐ Nailed it! ☐

Energy resources

1 A hydroelectric power station is used to produce electricity when demand is high.

(a) Explain why the hydroelectric power station is a reliable producer of electricity.

Hydroelectric power relies on water power; you need to explain why this is reliable.

.....

.....

.....

..... **(2 marks)**

(b) Give **one** reason why we cannot use hydroelectric power stations in more places in the UK.

.....

..... **(1 mark)**

2 For each of the following statements about fossil fuels, describe the negative environmental impacts.

Think about the possible consequences of the statements describing the use of fossil fuels.

(a) Carbon dioxide is released as a result of burning fossil fuels.

.....

.....

.....

..... **(2 marks)**

(b) Burning fossil fuels produces sulfur dioxide and nitrogen oxides.

.....

.....

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..... **(2 marks)**

(c) Fossil fuels need to be extracted from the ground and transported to the power station.

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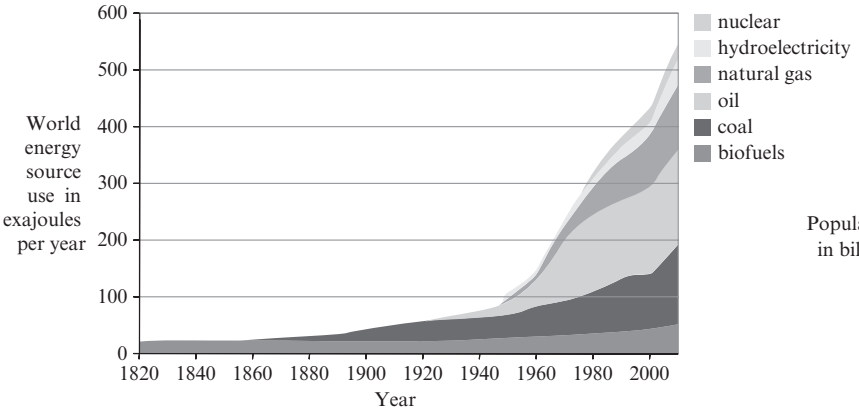
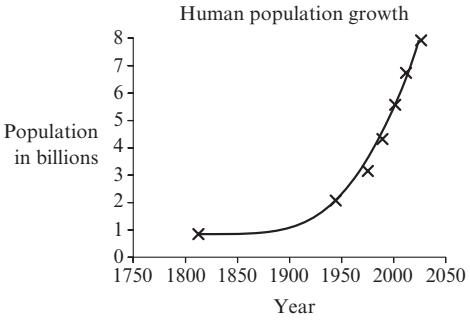
..... **(2 marks)**

Patterns of energy use

1 The graphs show patterns of energy use and human population growth.





(a) Give **three** reasons why energy consumption rose significantly after the year 1900.

Guided

1. After 1900, the world's energy demand ..... as the population grew.

2. There was development in .....

3. The rise of power stations using fossil fuels added to ..... **(3 marks)**

(b) (i) Identify the **three** main energy resources used to provide the world's energy between the years 1000 and 2000.

..... **(1 mark)**

(ii) Suggest **two** reasons why the use of energy resources has increased in the developed world.

1. .....

2. ..... **(2 marks)**

(iii) Give a reason why nuclear energy resources appear only after 1950.

..... **(1 mark)**

(iv) Identify a renewable resource from the graph that makes use of gravitational potential energy.

..... **(1 mark)**

2 In the graph in Q1, the patterns in energy consumption are similar to the pattern in the world's population growth. Describe the issues that may result from the continuing use of energy in the future, at the same rate as shown in the graph.

Consider the finite resources and increasing demand.

.....

.....

.....

.....

..... **(4 marks)**

Had a go ☐ Nearly there ☐ Nailed it! ☐

Extended response – Energy

Millie plays on a swing in the park. The swing seat is initially pulled back by her friend to 30° to the vertical position and then released. Describe the energy changes in the motion of the swing.

Your answer should also explain, in terms of energy, why the swing eventually stops.

You will be more successful in extended response questions if you plan your answer before you start writing.

The question asks you to give a detailed explanation of the energy changes as the swing moves backwards and forwards. Think about:

- How gravitational potential energy changes as the swing is pulled back.
- Points at where gravitational potential energy (E_p) and kinetic energy (E_k) are at maximum and at 0.
- Where some energy may be lost from the system.
- Why the swing will eventually stop.

You should try to use the information given in the question.

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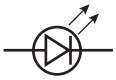
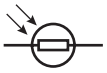
..... **(6 marks)**

Circuit symbols

1 Select the component that is designed to respond to changes in levels of light. Tick **one** box.

☐ Diode 

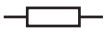
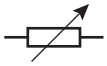
☐ LED 

☐ LDR 

☐ thermistor 

(1 mark)

2 (a) The three symbols below represent three components. Write the name of each component in the corresponding box.

		
1	2	3

(3 marks)

(b) Identify which component in (a) is commonly found in a household plug connected to the live wire.

..... **(1 mark)**

3 Complete the table of circuit symbols below:

Component	Symbol	Purpose
ammeter		
		provides a fixed resistance to the flow of current
		
		allows the current to be switched on / off

(4 marks)

4 Draw a circuit that could be used to measure the resistance of an unknown resistor.

Consider whether each component should be connected in series or in parallel.

.....

.....

.....

.....

.....

..... **(4 marks)**

Had a go ☐ Nearly there ☐ Nailed it! ☐

Electrical charge and current

1 The electric current flowing in a circuit is 4 A.

(a) Explain what is meant by an electric current.

.....

..... **(2 marks)**

(b) The current flows for 8 seconds. Calculate how much charge has flowed.

Choose the correct unit from the box.

You need to recall the equation: charge flow = current × time ($Q = I\,t$)

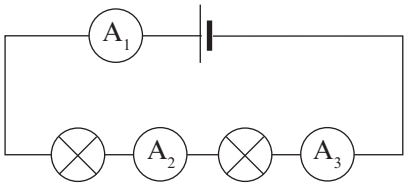
C	J	A

.....

.....

Charge = ... unit..... **(3 marks)**

2 The diagram shows a series circuit.



0.3 A

(a) (i) Explain why the readings on ammeter 1 and ammeter 3 would be 0.3 A.

..... **(1 mark)**

(ii) Describe how you could increase the size of the current flowing through the circuit.

..... **(1 mark)**

(b) Identify the component in the circuit that enables the electrical charge to flow.

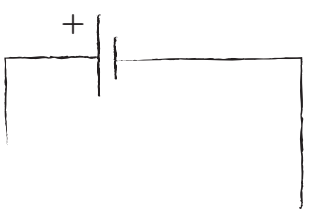
For an electrical charge to flow, the circuit must include a source of potential difference.

..... **(1 mark)**

3 A student is investigating how current carries electrical charge round the circuit.

Guided

(a) Draw a circuit diagram to show how the electrical charge could be measured.



(2 marks)

(b) Give **one** other piece of equipment the student would need to calculate electrical charge.

..... **(1 mark)**

Had a go ☐ Nearly there ☐ Nailed it! ☐

Paper 1

Current, resistance and pd

1 Which quantity is the ohm (Ω) the unit of? Tick **one** box.

- ☐ Current
- ☐ Energy
- ☐ Potential difference
- ☐ Resistance **(1 mark)**

2 Give Ohm's law.

Guided

The current flowing through a ..... at constant temperature is ..... to the potential difference across a resistor. **(2 marks)**

3 Use Ohm's law to calculate the following:

You will need to recall the equation: $R = V / I$

(a) The resistance of a resistor with a potential difference of 12 V across it and a current of 0.20 A passing through it.

.....

.....

.....

Resistance = ... Ω **(2 marks)**

(b) The current passing through a 55 Ω resistor with a potential difference of 22 V across it.

.....

.....

.....

Current = ... A **(2 marks)**

4 (a) Sketch two lines on the graph to show two ohmic conductors of different resistances. Label these A and B.

(2 marks)

(b) From your graph, identify which line represents the resistor with the higher resistance.

.....

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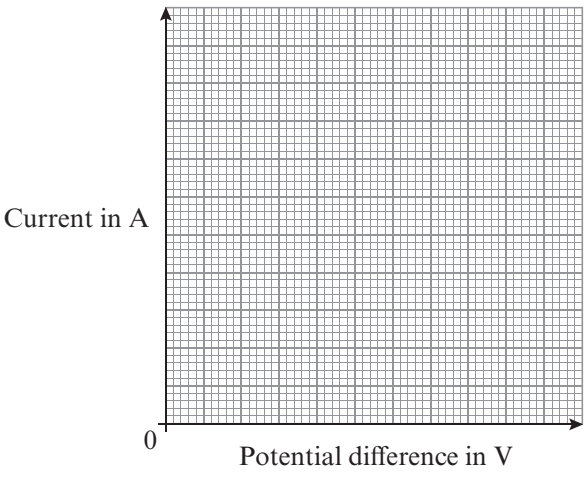
..... **(1 mark)**



Had a go ☐ Nearly there ☐ Nailed it! ☐

Practical skills

Investigating resistance

1 Which of these is the correct method of connecting an ammeter and a voltmeter to determine resistance of a component in a circuit? Tick **one** box.

☐ Ammeter and voltmeter are both connected in series with the component.

☐ Ammeter is connected in series but voltmeter is connected in parallel across the component.

☐ Ammeter and voltmeter are both connected in parallel across the component.

☐ Voltmeter is connected in series but ammeter is connected in parallel across the component.

(1 mark)

2 Calculate the resistance of a lamp supplied with a current of 1.5 A and a potential difference of 90 V.

You need to recall the equation: $R = V / I$

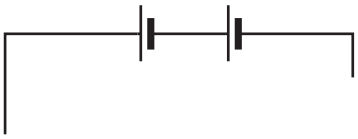
.....

.....

.....

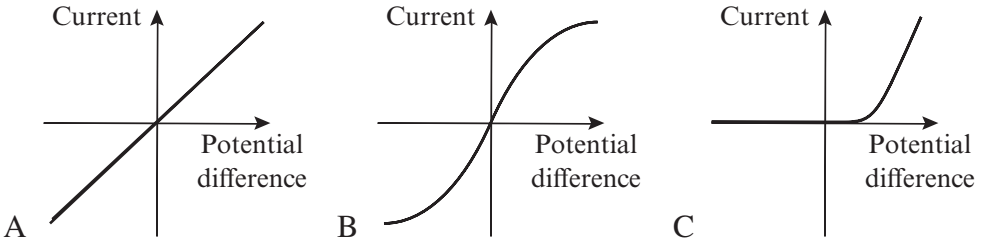
Resistance of lamp = ... Ω **(2 marks)**

3 Complete the circuit diagram to show how the resistance of a lamp may be obtained using an ammeter and a voltmeter.



(3 marks)

4 Explain the shape of each graph shown below for different circuit components.



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Guided

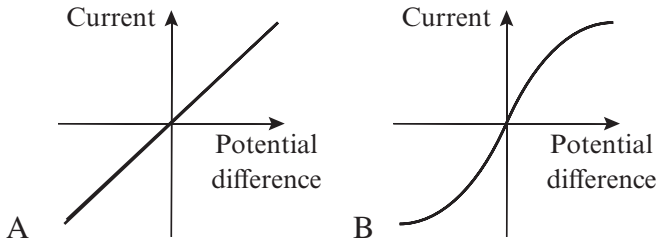
A Fixed resistor: The temperature remains ..... so resistance remains ..... as shown by the straight line on the graph. **(1 mark)**

B Filament lamp: As potential difference increases, the filament gets ..... so resistance ..... as shown by the curved line on the graph. **(1 mark)**

C Diode: The current flows in only ..... and the resistance is ..... as shown by the curved line on the graph. **(1 mark)**

Resistors

1 The graphs below (*I*–*V* graphs) show three types of component.



(a) Describe what happens to the current through the component shown in **graph A** as the potential difference increases.

.....

.....

..... **(2 marks)**

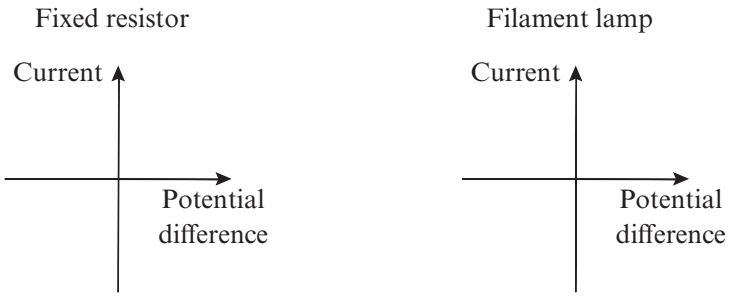
(b) Describe what happens to the current through the component shown in **graph B** as the potential difference increases.

.....

.....

..... **(2 marks)**

2 (a) Complete the *I*–*V* graphs for a fixed resistor and a filament lamp.



(2 marks)

(b) Explain why the filament lamp graph has a different shape to the fixed resistor graph (at constant temperature).

A fixed resistor (at constant temperature) obeys Ohm's Law but a filament lamp does not.

.....

.....

..... **(2 marks)**

3 Describe an experiment to collect data to enable the calculation of the resistance of a wire.

Guided

Data can be collected using an ammeter to measure .....

and a voltmeter to measure .....

A wire should be included and a fixed ..... to prevent overheating. A range of

..... measurements should be made so that resistance can be calculated

using the equation ..... **(5 marks)**

Had a go ☐ Nearly there ☐ Nailed it! ☐

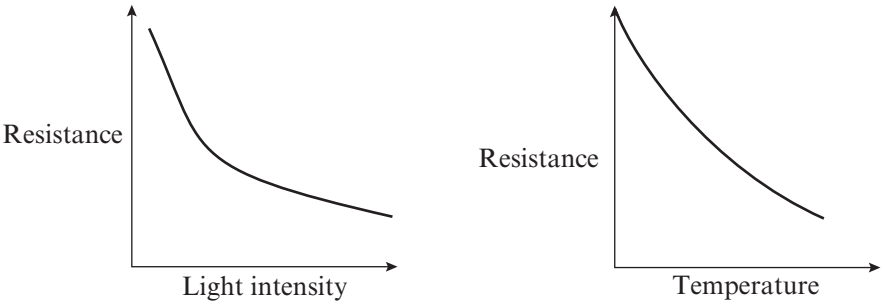
LDRs and thermistors

1 Draw the circuit symbols for the components in the boxes provided.

Light-dependent resistor (LDR)	Thermistor

(2 marks)

2 The sketch graphs below illustrate the relationship between two variables.



(a) Describe how resistance changes with light.

..... **(1 mark)**

(b) Describe how resistance changes with temperature.

..... **(1 mark)**

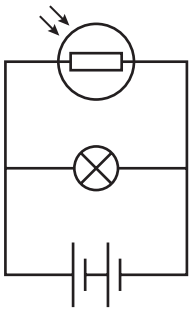
3 A car stops at traffic lights. While the car is stationary, the engine is no longer cooled by moving air. A thermistor forms part of a circuit connected to a cooling fan near the engine. Explain the role of the thermistor in the circuit.

Guided

The thermistor reacts to rise in ..... in the engine. Above a certain temperature, it allows ..... in the circuit to flow to a fan, which ..... the engine. **(3 marks)**

4 The diagram shows a circuit in which a light-dependent resistor makes a night-light turn off in the daytime. Explain how the circuit works.

Resistance goes down as light becomes more intense and more current flows through one component relative to the other, due to the way in which the circuit is wired.



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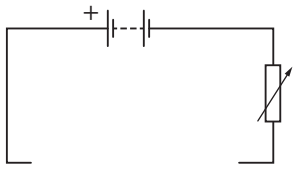
..... **(2 marks)**

Practical skills

Investigating *I–V* characteristics

1 (a) Complete the diagram below to show how the circuit could be used to investigate the *I–V* characteristics of a range of components.



(2 marks)

(b) Suggest the type of data that should be collected using the circuit above by completing headings for the table below.

These are the dependent and independent variables that you are recording in your experiment.

(i)	(ii)
Data	Data

(2 marks)

(c) Explain why the terminal connections should be reversed to collect additional data.

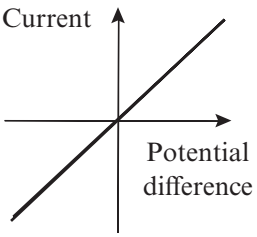
..... **(1 mark)**

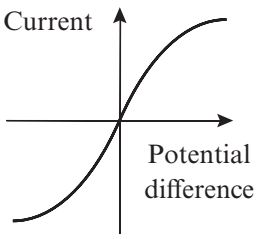
(d) Write the labels you would give to the axes on your graph.

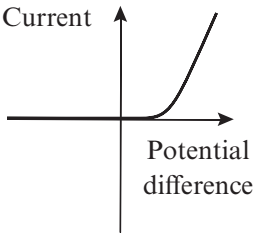
y-axis .....

x-axis ..... **(1 mark)**

2 Suggest the component that has been tested by looking at the graphs of the data collected below.







(a) ..... (b) ..... (c) ..... **(3 marks)**

3 Write Ohm's law in words and symbols, including the units used.

.....

.....

..... **(3 marks)**

4 Identify **one** safety hazard when using resistors in a circuit.

..... **(1 mark)**

Had a go ☐ Nearly there ☐ Nailed it! ☐

Series and parallel circuits

1 (a) Explain the rules for current in series and parallel circuits.

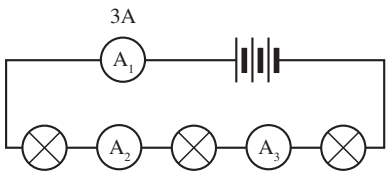
Guided

In a series circuit the current flowing through each component is .....

In a parallel circuit, the current is .....

the components. **(2 marks)**

(b) Each lamp in these circuits is identical. Write the current for each ammeter on the circuit diagrams.



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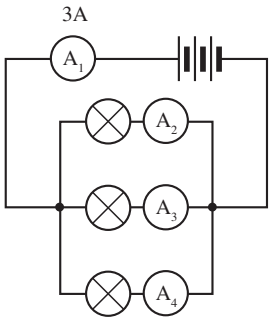


.....

.....

..... **(2 marks)**

2 (a) Explain the rules for potential difference in series and parallel circuits.

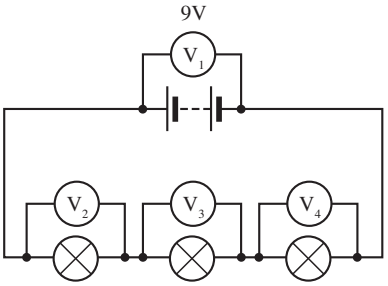
Guided

In a series circuit, the total potential difference supplied is ..... the components.

In a parallel circuit, the potential difference across each component is .....

as the potential difference supplied. **(2 marks)**

(b) Each lamp in these circuits is identical. Write the potential difference for each voltmeter, on the circuit diagrams.



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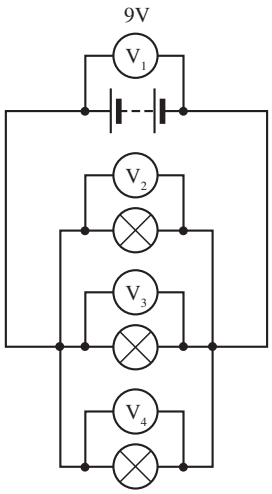


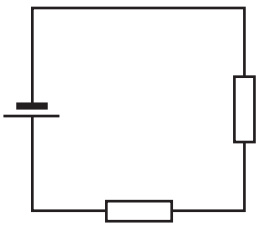
.....

.....

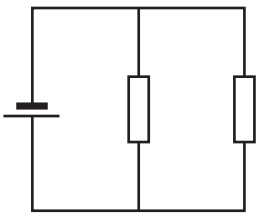
..... **(2 marks)**

3 Describe the difference between the total resistance of a series circuit and the total resistance of a parallel circuit, as illustrated below.

You may find the equation for series circuits $R = R_1 + R_2$ helpful in considering how current flows.



series circuit



parallel circuit

.....

.....

.....

..... **(4 marks)**

ac and dc

1 Circuits can operate using either a direct potential difference and current or an alternating potential difference and current.

(a) Explain what is meant by **direct** potential difference and current.

Guided

Direct potential difference is constant and the current flows in the ..... direction. **(2 marks)**

(b) Explain what is meant by **alternating** potential difference and current.

Alternating potential difference is ..... and the current constantly ..... direction. **(2 marks)**

2 Calculate the energy transferred for each of the following appliances:

Maths skills

Remember to convert units where appropriate.

(a) A fan heater (2000 W) running for 15 minutes.

.....

.....

Energy transferred = ... J **(2 marks)**

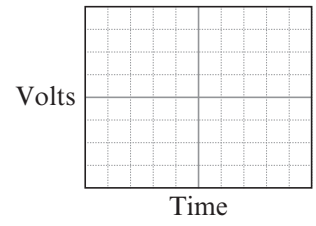
(b) A tablet charger (10 W) running for 6 hours.

.....

.....

Energy transferred = ... J **(2 marks)**

3 Complete the graph to show what the trace of a direct current would look like on an oscilloscope.



(1 mark)

4 Calculate which appliance has the highest power rating:

(a) a toaster transferring 120 000 J in 60 seconds

.....

.....

or

(b) a kettle Transferring 252 000 J in 2 minutes.

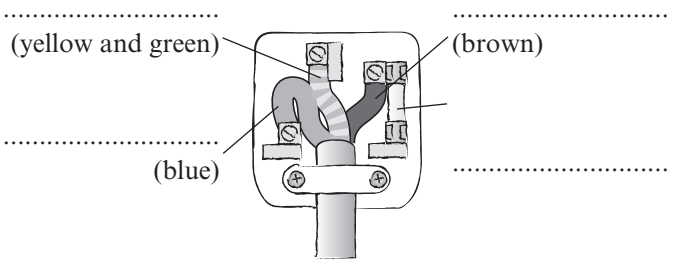
.....

..... **(5 marks)**

Had a go ☐ Nearly there ☐ Nailed it! ☐

Mains electricity

1 Add labels to complete the diagram of a household plug.



(4 marks)

Guided

2 The UK domestic mains electricity supply has certain characteristics.

(a) What type of current is delivered through the mains electricity National Grid?

Mains electricity is delivered through an ..... current. **(1 mark)**

(b) What is the potential difference between the live and neutral wires?

The potential difference between the live wire and neutral wire is about ..... V.

The neutral wire is at, or close to, ... V. **(2 marks)**

(c) What is the potential difference and purpose of the earth wire?

The earth wire is at 0 V and only carries a current if there is a ..... **(2 marks)**

(d) What is the frequency of the domestic electricity supply in the UK?

In the UK, the domestic electricity supply has a frequency of .....Hz. **(1 mark)**

Guided

3 Explain how the fuse in a plug works.

A large current can cause a heating effect in the fuse, which is connected to the live wire.

When a large current enters the live wire, this produces .....

..... which ..... and

the circuit is then ..... **(4 marks)**

4 Describe how the earth wire in a plug protects the user if the live wire becomes loose.

.....

.....

.....

..... **(3 marks)**