

GCSE Physics (9 – 1)

Resistors

Name:

Group:

Instructions

- Read each question carefully before you begin to answer it.
- Use black ink or black ball-point pen for your answers.
- Fill in the boxes at the top of this page with your name and group.
- Attempt to answer every question in the booklet.
- Answer the questions in the spaces provided – there may be more space than you need in some answer spaces.
- Calculators may be used for this booklet.
- For any calculations, you **must** show all your working.
- Any and all drawings or graphs should be completed in pencil.



For markers use	
Question	Mark
1	/4
2	/9
3	/4
4	/9
5	/8
6	/5
7	/6
Total	/45
%	
Grade	

Information

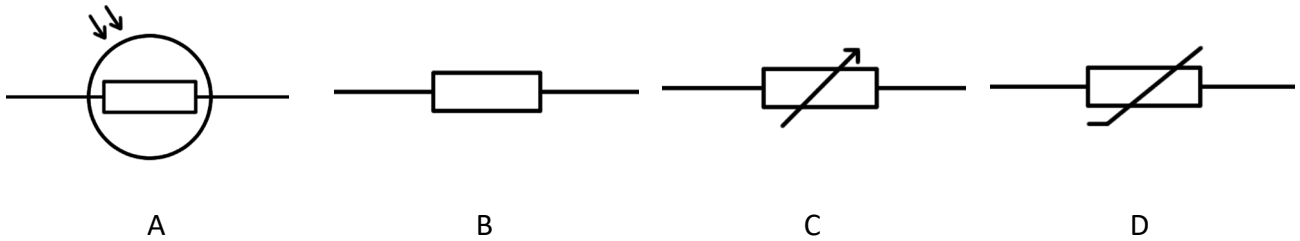
- The maximum mark for this paper is 45 marks.
- The marks for each question are shown in brackets.
- Please be aware that good English and clear presentation are required in your answers.



1. Resistors are electrical components that oppose the flow of charge, allowing us to safely control the current and potential difference within a circuit.

For each of the following questions **circle** the letter of the correct answer.

- a) Look at the four circuit symbols shown below. Which symbol represents a **variable** resistor?



(1 mark)

- b) What is the standard unit of measurement for electrical resistance?

A	B	C	D
Amperes (A)	Joules (J)	Ohms (Ω)	Volts (V)

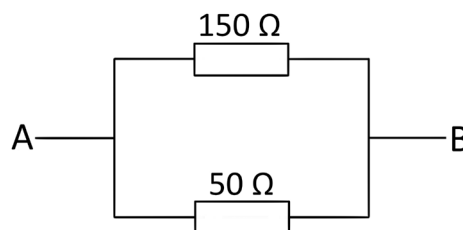
(1 mark)

- c) A potential difference of 12 V is applied across a fixed resistor. A current of 3.0 A flows through it. What is the resistance of the resistor?

A	B	C	D
0.25 Ω	4.0 Ω	15 Ω	36 Ω

(1 mark)

- d) The diagram shows a 150 Ω resistor and a 50 Ω resistor connected in parallel.



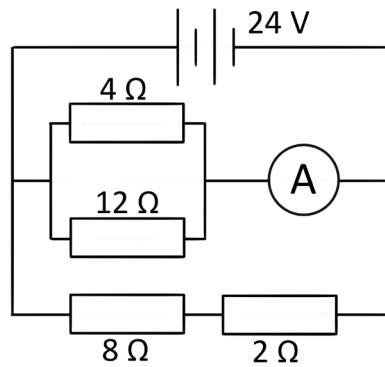
What is the total resistance between points A and B.

A	B	C	D
less than 50 Ω	100 Ω	Between 50 and 150 Ω	200 Ω

(1 mark)

(Total for Question 1 is 4 marks)

2. The figure below shows a circuit containing a 24 V power supply, some resistors and an ammeter.



- a) Determine the potential difference across the $8\ \Omega$ resistor.

Potential difference = ... V
(1 mark)

- b) State the potential difference across the $12\ \Omega$ resistor.

Potential difference = ... V
(1 mark)

- c) Calculate the effective resistance of:

- i. The $8\ \Omega$ and the $4\ \Omega$ resistors connected in series.

Resistance = ... Ω
(1 mark)

- ii. The $12\ \Omega$ and the $4\ \Omega$ resistors connected in parallel.

Resistance = ... Ω
(2 marks)

d) Calculate the reading on the ammeter.

Ammeter reading = ... A
(2 marks)

e) Without further calculation, state what happens, if anything, to the ammeter reading if:

i. the $8\ \Omega$ resistor is shorted out with a thick piece of wire.

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

ii. the thick piece of wire from (e)(i) and the $12\ \Omega$ resistor are both removed.

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

(Total for Question 2 is 9 marks)

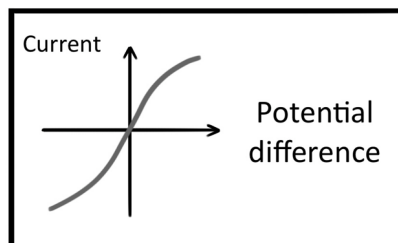
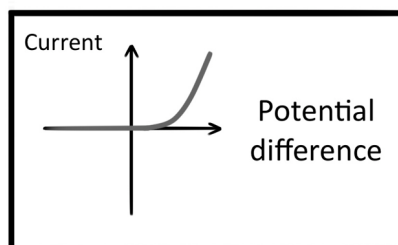
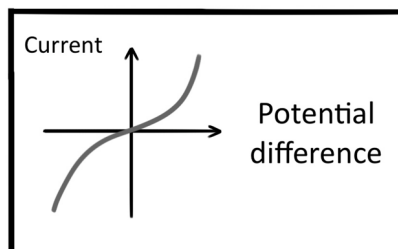
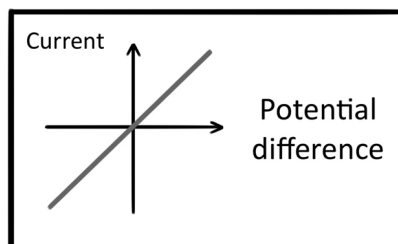
3. A student carries out an experiment to investigate the current-potential difference (I-V) characteristics of three different electrical components. They plot a graph of their results for each component.

a) Draw **one** line from each component to its correct graph.

Resistor

Filament lamp

Diode



(3 marks)

b) What is the function of a diode?

.....

.....

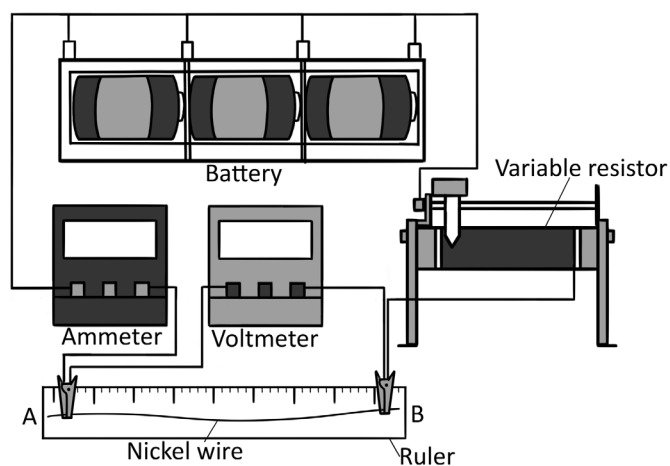
.....

.....

(1 mark)

(Total for Question 3 is 4 marks)

4. A student investigates how the current through a fixed resistor changes when the potential difference across it is varied.



- a) Draw a circuit diagram that the student could use for this investigation.
Your circuit must include:

- a battery.
- the nickel wire.
- a variable resistor.
- an ammeter.
- a voltmeter.

(3 marks)

- b) State the purpose of the variable resistor in this circuit.

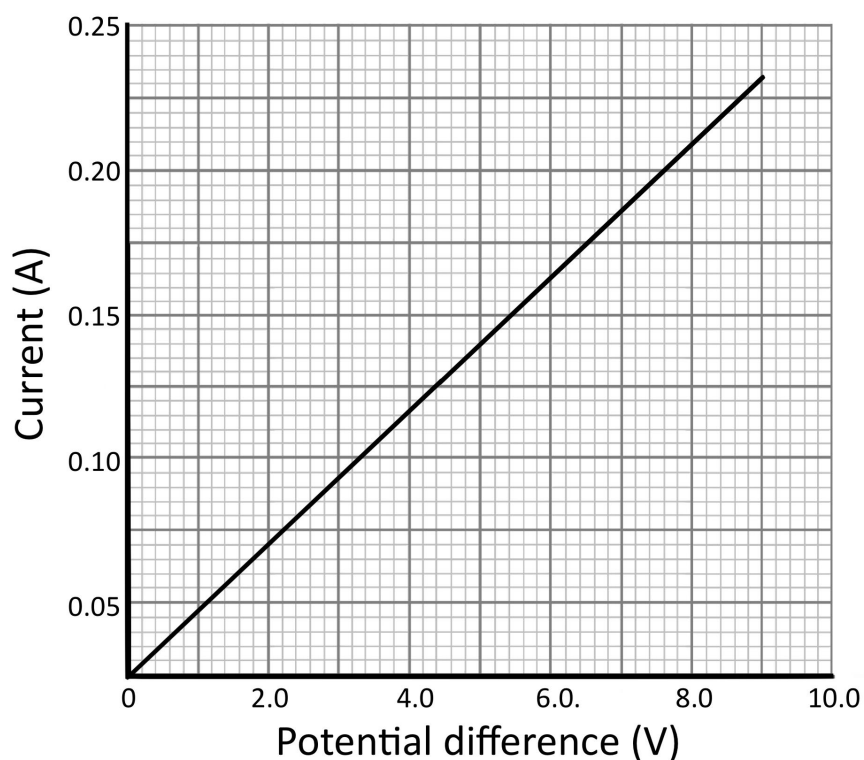
.....

.....

.....

(1 mark)

The student plots their results on the graph shown in the figure below.



- c) State **two** conclusions that can be made from the graph about the relationship between current and potential difference for this resistor.

.....

.....

.....

.....

.....

(2 marks)

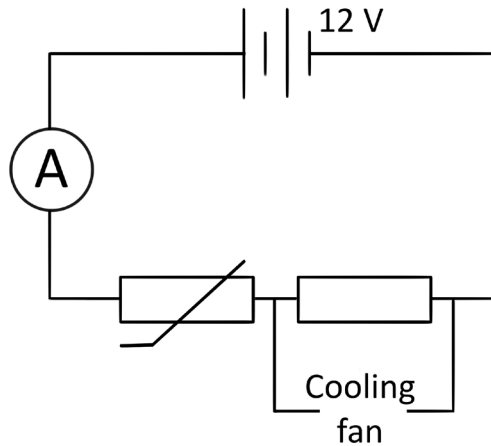
- d) Use the graph in Figure X to determine the resistance of the fixed resistor.
Use the physics equation: $R = V \div I$

Resistance = ... Ω

(3 marks)

(Total for Question 4 is 9 marks)

5. A student builds the temperature-sensing circuit shown in the figure below to control a cooling fan in a greenhouse.



- a) Describe the relationship between the temperature of a thermistor and its resistance.

.....

.....

.....

.....

(1 mark)

The cooling fan is connected in parallel with the fixed resistor. The fan only turns on when the potential difference across the fixed resistor becomes high enough.

- b) Explain how the circuit causes the potential difference across the fixed resistor to increase when the greenhouse gets hot.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(4 marks)

- c) At 20 °C, the thermistor has a resistance of 250 Ω . The fixed resistor has a resistance of 150 Ω .
Calculate the potential difference across the fixed resistor at this temperature.

Potential difference = ... V
(3 marks)

(Total for Question 5 is 8 marks)

6. A student is investigating Light Dependent Resistors (LDRs).

a) State the rule that describes how the resistance of an LDR changes when light intensity changes.

.....

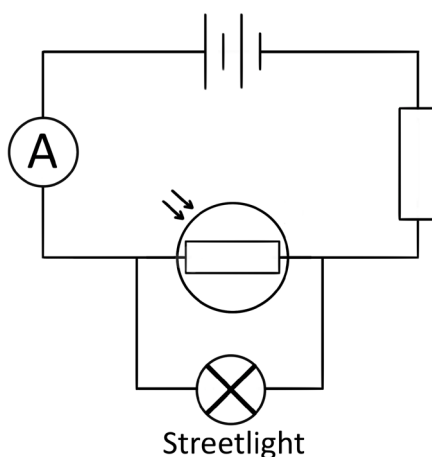
.....

.....

.....

(1 mark)

The student builds the circuit shown in the figure below to model an automatic streetlight.



b) Explain how this circuit ensures that the streetlight turns on when it gets dark.

.....

.....

.....

.....

.....

.....

.....

.....

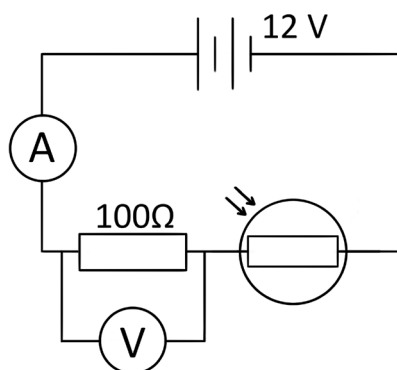
.....

.....

(4 marks)

(Total for Question 6 is 5 marks)

7. A student builds the light-sensing circuit shown in the figure below.



In bright light, the LDR has a resistance of $20\ \Omega$.

When the room goes completely dark, the resistance of the LDR increases by a factor of 10.
Calculate the change in the voltmeter reading when the room goes from bright light to dark.

You must show all your working.

Change in voltmeter reading = ... V

(6 marks)

(Total for Question 7 is 6 marks)