

Current Potential Diff and Resistance

Mark Scheme 1

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.2 Electricity
Sub-Topic	Current Potential Diff and Resistance
Difficulty Level	Silver Level
Booklet	Mark Scheme 1

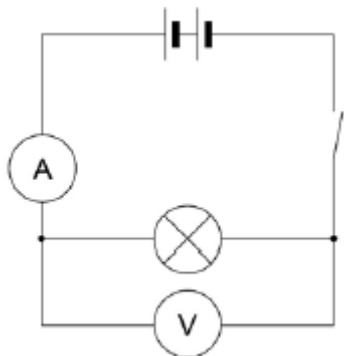
Time Allowed: 17 minutes

Score: /17

Percentage: /100

Grade Boundaries:

M1.(a)



battery connected correct way round

1

ammeter and voltmeter correct way round

1

(b) 6.4 V

1

(c) (the lamp will) get dimmer

1

because increasing the resistance decreases the current

1

(d) potential difference = current \times resistance
allow $V = IR$

1

(e) $3.3 = 0.15 \times R$

1

$$R = 3.3 \div 0.15$$

1

$$= 22(\Omega)$$

1

allow 22 with no working shown for 3 marks

[9]

M2.(a) decreases

1

(b) a filament bulb
allow bulb

1

an LED

1

(c) Marks awarded for this answer will be determined by the Quality of Communication (QoC) as well as the standard of the scientific response.

0 marks

No relevant content.

Level 1 (1–2 marks)

There is a basic description of the method. This is incomplete and would not lead to any useful results.

Level 2 (3–4 marks)

There is a description of the method which is almost complete with a few minor omissions and would lead to some results.

Level 3 (5–6 marks)

There is a detailed description of the method which would lead to valid results. To gain full marks an answer including graph, or another appropriate representation of results, must be given.

examples of the physics points made in the response:

- read V and I
- read temperature
- apply heat
- *allow hot water to cool*
- read V and I at least one other temperature
- determine R from V / I
- range of temperatures above 50 °C

extra detail:

- use thermometer to read temperature at regular intervals of temperature
- remove source of heat and stir before taking readings
- details of attaining 0 °C or 100 °C
- last reading taken while boiling
- graph of R against T
- at least 3 different temperatures

6

(d) (i) Q

1

(ii) (80, 3.18)

1

(iii) any **one** from:

- measurement of V too small
- measurement of I too big
- incorrect calculation of R
- thermometer misread
- *allow misread meter*
- *ignore any references to an error that is systematic*

1

(iv) any **two** from:

- not portable
- *allow requires a lot of equipment allow takes time to set up*
- needs an electrical supply
- cannot be read directly
- *accept it is more difficult to read compared to liquid-in-glass*

2

[14]

M3.(a) (i) to obtain a range of p.d. values

accept increase / decrease current / p.d. / voltage / resistance

accept to change / control the current / p.d. / voltage / resistance

to provide resistance is insufficient

a variable resistor is insufficient

*do **not** accept electricity for current*

1

(ii) temperature of the bulb increases

accept bulb gets hot(ter)

accept answers correctly

expressed in terms of collisions between (free) electrons and ions / atoms

bulb gets brighter is insufficient

1

(iii) 36

*allow **1** mark for correct substitution, ie 12×3 provided no subsequent step shown*

2

watt(s) / W

accept joules per second / J/s

*do **not** accept w*

1

- (b) Marks awarded for this answer will be determined by the Quality of Written Communication (QWC) as well as the standard of the scientific response. Examiners should also refer to the information in the [Marking guidance](#), and apply a 'best-fit' approach to the marking.

0 marksNo relevant content.

Level 1 (1-2 marks)There is a basic comparison of either a cost aspect or an energy efficiency aspect.

Level 2 (3-4 marks) There is a clear comparison of either the cost aspect or energy efficiency aspect **OR** a basic comparison of both cost and energy efficiency aspects.

Level 3 (5-6 marks) There is a detailed comparison of both the cost aspect and the energy efficiency aspect.

For full marks the comparisons made should support a conclusion as to which type of bulb is preferable.

Examples of the points made in the response:

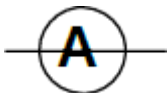
cost

- halogen are cheaper to buy
simply giving cost figures is insufficient
- 6 halogen lamps cost the same as one LED
- LEDs last longer
- need to buy 18 / more halogen lamps to last the same time as one LED
- 18 halogens cost £35.10
- costs more to run a halogen than LED
- LED has lower maintenance cost (where many used, eg large departmental store lighting)

energy efficiency


- LED works using a smaller current
- LED wastes less energy
- LEDs are more efficient
- LED is 22% more energy efficient
- LED produces less heat
- LED requires smaller input (power) for same output (power)

- M4.(a)** (i) ammeter symbol correct and drawn in series


 accept
 do **not** accept lower case a

1

voltmeter symbol correct and drawn in parallel with the material


 do **not** accept

1

- (ii) adjust / use the variable resistor
 accept *change the resistance*

or change the number of cells
 accept *battery for cell*
 accept *change the pd / accept change the voltage*
 accept *increase / decrease for change*

1

- (b) (i) 37.5 (Ω)
 accept *answer between 36 and 39 inclusive*

1

- (ii) 5.6(25) **or** their (b)(i) $\times 0.15$
 allow **1** mark for correct substitution ie 37.5 **or** their (b)(i) $\times 0.15$ provided no subsequent step shown

2

- (c) (i) the thicker the putty the lower the resistance
 answer must be comparative accept the converse

1

- (ii) any **one** from:

- measuring length incorrectly
accept may be different length
- measuring current incorrectly
*do **not** accept different currents*
- measuring voltage incorrectly
*do **not** accept different voltage*
- ammeter / voltmeter incorrectly calibrated
- thickness of putty not uniform
*do **not** accept pieces of putty not the same unless qualified*
- meter has a zero error
*do **not** accept systematic / random error*
accept any sensible source of error eg putty at different temperatures
*do **not** accept human error without an explanation*
*do **not** accept amount of putty not same*

1

[8]

M5. (a) (i) also double
increases is insufficient

1

(ii) variable resistor
accept rheostat / potentiometer

1

(b) (i) the data / results / variables are continuous
accept data / results / variables are not categoric / discrete

1

(ii) misreading the ammeter
*do **not** accept misreading the meter / results*
*do **not** accept misreading the ammeter and / or voltmeter*

reading / human error is insufficient

1

- (iii) straight line from the origin drawn passing close / through points at 1 V, 5 V, 6 V and ignoring anomalous point
*do **not** accept line drawn 'dot-to-dot'*

1

- (iv) yes

mark is for the reason

supports prediction **or** (straight) line passes through the origin
accept a mathematical argument, eg when p.d. went from 2 to 4 the current went from 0.3 to 0.6
it's directly proportional is insufficient

1

[6]

M6. (a) brown

1

- (b) outside / case is plastic / an insulator
accept is double insulated
accept non-conductor for plastic
*do **not** accept it / hairdryer is plastic*

1

- (c) (i) (1) S_1
and no other

1

- (2) S_1 and S_3
both required, either order

1

- (ii) S_1 must be ON (for either heater to work)
*do **not** accept reference to 'fan' switch*

1

S_1 switches the fan on

1

- (d) 1495

*allow **1** mark for correct substitution
ie, 6.5×230*

2

watt(s) or W

*an answer of 1.495 kW gains **3** marks
although the unit is an independent mark for full credit
the unit and numerical value must be consistent
accept joules per second or J/s*

1

[9]