

Name of the Student: _____

Max. Marks : 25 Marks

Time : 25 Minutes

Mark Schemes

Q1.

- (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]

Q2.

(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 marks

No 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)