

Domestic Uses and Safety

Mark Scheme 1

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.2 Electricity
Sub-Topic	Domestic Uses and Safety
Difficulty Level	Silver Level
Booklet	Mark Scheme 1

Time Allowed: 57 minutes

Score: /56

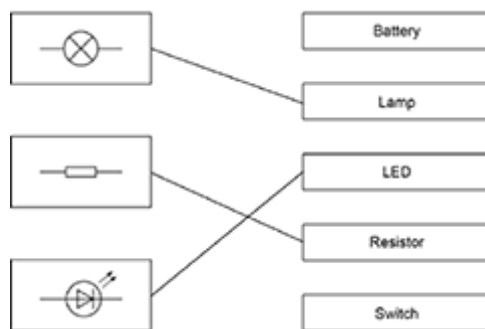
Percentage: /100

Grade Boundaries:

M1.(a) electrons

1

(b)



extra lines from a symbol negate the mark

3

(c) the total power = 7360 watts

1

$$\text{current} = 7360 \div 230$$

1

$$= 32 \text{ A}$$

allow 32 with no working shown for 3 marks

1

so the current is greater than 30 A

1

(d) to increase the voltage (across the cables) or to decrease the current (through the cables)

1

reducing energy losses (in the cables)

*do **not** allow electricity for energy*

*do **not** allow no energy loss*

1

increasing the efficiency of transmission

1

(e) to decrease the potential difference for domestic use

1

- (f) $\text{efficiency} = \frac{\text{useful output energy transfer}}{\text{total input energy transfer}}$ 1
- (g) $405 / 900$ 1
- $=0.45$
- accept 45%* 1
- allow 0.45 or 45% with no working shown for 2 marks*
- [15]

M2.(a) (i) 150 1

(ii) transferred to the surroundings by heating
reference to sound negates mark 1

(iii) 0.75
450 / 600 gains 1 mark
accept 75% for 2 marks
maximum of 1 mark awarded if a unit is given 2

(iv) 20 (s)
correct answer with or without working gains 2 marks
correct substitution of 600 / 30 gains 1 mark 2

(b) (i) to avoid bias 1

(ii) use less power and last longer 1

1 LED costs £16, 40 filament bulbs cost £80

or

filament costs (5 times) more in energy consumption

1

(iii) any **one** from:

- availability of bulbs
- colour output
- temperature of bulb surface

1

[10]

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 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)

6
[11]

M4. (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

S₁ 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]

M5. (a) transferred to surroundings / surrounding molecules / atmosphere
'it escapes' is insufficient

or

becomes dissipated / spread out

accept warms the surroundings

accept degraded / diluted

accept a correct description for

surroundings eg to the washing machine

*do **not** accept transformed into heat on its own*

1

(b) a smaller proportion / percentage of the energy supplied is wasted
owtte

accept a statement such as 'less energy is wasted' for 1 mark

*do **not** accept costs less to run*

ignore references to uses less energy

2

(c) (i) 2.4 (p)

accept 2 p if it is clear from the working out this is rounded from 2.4 p

allow 1 mark for correct substitution of correct values

ie 0.2×12

allow 1 mark for calculating cost at 40 °C (13.2 p)

or

cost at 30 °C (10.8 p)

2

(ii) any **one** from:

- less electricity needed
ignore answers in terms of the washing machine releasing less energy
an answer in terms of the washing machine releasing CO₂ negates the mark
*do **not** accept less energy is produced*
- fewer power stations needed
- less fuel is burned
accept a correctly named fuel
*do **not** accept less fuel is needed*

1

[6]

M6. (a) (rate of) flow of charge / electrons / ions

accept movement for flow

*do **not** accept flow of electricity*

1

(b) 7(.0)

accept 6.96 / 6.95 or an answer that would approximate to 6.96 if rounded

allow 1 mark for obtaining correct power and changing to watts ie 1600

or

*allow 2 marks for correct substitution and transformation
ie $1600 \div 230$*

an answer $0.00696 / 0.007$ gains 2 marks

allow 1 mark for $1.6 / 230$ or $1.7 / 230$

an answer 7.39 or 7.4 gains 2 marks

3

amp (ere)

accept A

1

[5]