AQA GCSE PHYSICS (HIGHER) · 8463

PHYSICS



MARK SCHEME

4.2.3 DOMESTIC USES AND SAFETY (PACK 3)

SCORE	PERCENTAGE
/115	%

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Q1.

(a) (casing is) not made of metal

allow (casing is) made of plastic
allow they are double insulated

1

little / no chance of electric shock

1

(b) charge flow = current × time

allow the equation given in symbols

1

(c) Q = 2.95 × 60

*an answer of 177 scores **2** marks*

1

Q = 177 (C)

allow 180 (C)

1

(d) straight line with a different positive gradient

must go through the first and third quadrant

1

straight line with positive gradient through the origin

1

(e)



1

(f) the particles vibrate about a fixed position regular arrangement

allow the particles are in a regular arrangement

1

(the particles change) to being free to move around

allow correct description of translational kinetic energy

1

(g) L = 200 000 (J/kg)

1

E = 500 × 200 000

allow 1 × 10^8 (J)

1

E = 100 000 000 (J)

*allow correct calculation for incorrect conversion or no conversion of L for **2** marks*

1

*an answer of 100 000 000 scores **3** marks*

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[13]

Q2.

(a) earth

1

(b) it can prevent an electric shock from the toaster

1

(c) 230 V

1

(d) (the potential difference) for the alternating supply changes direction

allow current

1

(the potential difference) for the alternating supply changes magnitude

allow current

allow converse

allow potential difference of alternating supply is greater

1

(e) there is an overall decrease

allow there is an decrease in percentage energy loss until 2013

1

but there is a (small) increase since 2013

1

(f) 1.92, 1.72, 1.70, 1.74, 1.77

1

(1.92 + 1.72 + 1.70 + 1.74 + 1.77)/5

1

1.77(%)

*an answer of 1.77(%) scores **3** marks*

1

[10]

Q3.

(a) 80

1

E = 5.0 × 4200 × 80

1

E = 1 700 000 (J)

an answer of 1 700 000 (J) or

*1 680 000 (J) scores **3** marks*

allow 1 680 000

1

(b) in part **A** the increase in internal energy raises the temperature of the water

1

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in part **B** the increase in internal energy changes the state

1

without changing the temperature

1

(c) the heater would continue to transfer energy which would not be transferred to the water

1

so would raise the temperature of the device

1

causing it to be damaged

1

(d) brown

blue

green and yellow stripes

*allow **1** mark for 2 correct*

2

(e) it stops the casing of the appliance becoming live

1

(f) $P = I^2R$

$I = \sqrt{(P/R)}$

1

P = 2 500 (W)

1

$I = \sqrt{(2\ 500 / 17)}$

1

I = 12.1267812

1

I = 12 (A)

*an answer of 12 (A) scores **5** marks*

1

[17]

Q4.

(a) 2100 W

1

(b) power = potential difference × current

1

(c) 50 (Hz)

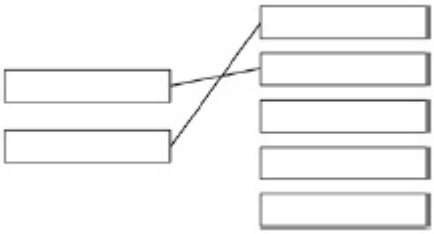
1

(d) direct current (dc) only

1

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(e)



1
1

(f) green **and** yellow

both colours required

1

(g) any **two** from:

- good conductor
- hard
- corrosion resistant

2

(h)

Level 2: Scientifically relevant facts, events or processes are identified and given in detail to form an accurate account.	3-4
Level 1: Facts, events or processes are identified and simply stated but their relevance is not clear.	1-2
No relevant content	0
Indicative content allow voltage / volts / pd for potential difference • cables transmit electricity at very high potential differences • transformers change the potential difference • step up transformer increases potential difference • overhead cables transfer electricity at a higher potential difference • step down transformer decreases potential difference • the potential difference to the consumers is much lower than the potential difference from the power station • the potential difference to the consumers is much lower than the potential difference in the cables	

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4

[13]

Q5.

(a) mains electricity is an alternating current (ac) which is constantly changing direction

1

a battery supplies a direct current (dc) which flows in one direction only

1

(b) one watt = one volt × one amp

1

(c) green and yellow - brown - blue

1

(d) the potential of the live wire is 230 V

1

a person's potential is 0 V

1

(so) there is a large potential difference between live wire and a person

1

and so the charge / current passes through the person's body

allow would result in an electric shock

1

[8]

Q6.

(a) renewable resources are replenished

allow the converse

1

(at least) as fast as they are used up

1

(b) (step-up) transformer between power station and grid increases p.d.

1

giving lower current
or
more efficient transmission

1

(step-down) transformer between grid and domestic users decreases pd

1

(c) $9.135 \times 10^6 = (8700)^2 \times R$

1

$$R = \frac{9.135 \times 10^6}{8700^2}$$

1

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0.12 (Ω)

*an answer 0.12 (Ω) scores **3** marks*

allow correct rounding of 0.1206897

1

(d) any **three** from:

- seasonal variation in production/imports – more gas required in winter than summer
- year to year variation − some years total demand is higher than others (due to variation in weather conditions etc)
- (allowing for seasonal variation) overall trend in production across the 5-year period is decreasing
- (allowing for seasonal variation) overall trend in imports across the 5-year period is increasing (with exception of 2009)
- production varies over a wider range than imports.

3

(e) (energy required to break bonds = [4 × 413] + [2 × 498]) = 2648 (kJ/mol)

1

(energy from forming bonds = [2 × 805] + [4 × 464]) = 3466 (kJ/mol)

1

(overall energy change = 2648 − 3466) = (−) 818 (kJ/mol)

allow ecf from step 1 and/or step 2

1

$$\text{number of moles} = \frac{2.29 \times 10^6}{818}$$

allow ecf from step 3

1

= 2800 (mol)

allow 2799.5... (mol)

allow ecf from step 4

1

[16]

Q7.

(a) 230 V

1

(b) Earth

must be in the correct order

1

Neutral

1

(c) It is easy to identify each wire.

1

(d) current

must be in the correct order

1

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shock

1

(e) 50 Hz

1

(f) output = 25 × 16

1

400 (kV)

1

*allow 400 (kV) with no working shown for **2** marks*

(g) It reduces the energy lost due to heating

1

(h) It is safer for consumers

1

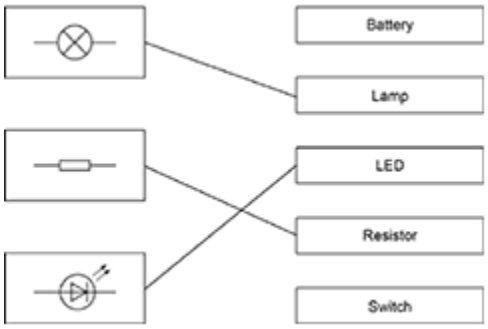
[11]

Q8.

(a) electrons

1

(b)



extra lines from a symbol negate the mark

3

(c) the total power = 7360 watts

1

current = 7360 ÷ 230

1

= 32 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*

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

1

increasing the efficiency of transmission

1

(e) to decrease the potential difference for domestic use

1

(f) $$efficiency = \frac{useful\ output\ energy\ transfer}{total\ input\ energy\ transfer}$$

1

(g) 405 / 900

1

=0.45

accept 45%

1

*allow 0.45 **or** 45% with no working shown for **2** marks*

[15]

Q9.

(a) 50 Hz

1

(b) Top: Earth

1

Bottom: Neutral

1

(c) potential difference

1

current

1

(d) energy = 2500 × 180

1

= 450 000

1

= 450 kJ

1

*allow 450 with no working shown for **3** marks*

(e) energy transferred = charge flow × potential difference

allow E = QV

1

(f) 4 200 = Q × 230

1

Q = 4 200 ÷ 230

1

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= 18.3 (C)

1

*allow 18.3 with no working shown for **3** marks*

[12]

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Q1.

(a) Very few students demonstrated an understanding of the purpose of the earth wire. The most common error was mentioning the insulation on the wires. There was a widespread misconception that earth wires are only found in 13A sockets. Many students commented that the light was on the ceiling and therefore was not near the earth.

(b) 56% of the students correctly recalled the equation. Some presented a symbol equation using incorrect letters.

(c) 67% of students obtained both marks for this item, although almost a tenth did not attempt it. The most common mistake was dividing rather than multiplying the quantities.

(d) The majority of students scored zero on this question. Quite a number of students drew the characteristic graph for a filament bulb or a diode. Another common error was drawing a straight line with a negative gradient through the origin or a line drawn as a mirror reflection. Some drew lines parallel to the one given or drew curves.

(e) Only 22% of students scored on this question and 11% did not attempt it. Many students put the symbol for a resistor or thermistor instead of the fuse. Some tried to draw a fuse rather than its circuit symbol.

(f) Less than a fifth of students scored on this question. Many students had the idea of more energy/movement as the copper melted, but not adequate detail of the movement or arrangement before and after. Getting the ‘moving freely’ mark was more common than getting the ‘fixed position/regular arrangement’ mark.

(g) 75% of students scored at least two marks but only 1% scored three marks. In this calculation, students were required to choose the correct equation from the Physics Equations Sheet but a significant minority did not do this. Most students multiplied 200 × 500 and gained 2 of the 3 marks. Very few students performed the necessary unit conversion of 200 kJ/kg first while some converted incorrectly. Students should be aware that kg is the SI unit so does not need converting but in many other scenarios, any unit preceded by kilo will need converting by multiplying by one thousand. Another common mistake was getting the number of zeros incorrect.

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