

# MARK SCHEME

# GCSE

## PHYSICS

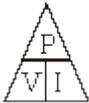
## AQA - COMBINED SCIENCE

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P2 - TEST 5  
ELECTRICITY  
Advanced

## Mark schemes

- 1.** (i) power = potential difference  $\times$  current  
*accept voltage for potential difference*  
*accept  $P = V \times I$*   
*or correct transposition*

accept  *provided subsequent method correct*

1

- (ii) 8

*allow 1 mark for correct substitution or transformation or an answer*  
*2.67 / 2.7*

2

[3]

- 2.** (a) d.c. flows in (only) one direction

1

a.c. changes direction (twice every cycle)  
*accept a.c. constantly changing direction*  
*ignore references to frequency*

1

- (b) a current flows through from the live wire / metal case to the earth wire  
*accept a current flows from live to earth*  
*do **not** accept on its own if the current is too high*

1

this current causes the fuse to melt  
*accept blow for melt*  
*do **not** accept break / snap / blow up for melt*

1

[4]

- 3.** (a) diode

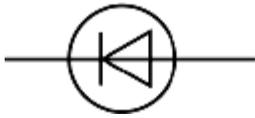
*accept LED*

1

- (b) all symbols correct

*must include at least voltmeter and diode*

1



diode

*allow ecf from part (a) if the component is not identified as a diode*  
*allow symbol without the line through triangle*  
*ignore polarity of diode*

voltmeter in parallel with component added in series

*any additional components must not affect the ability to measure V and I for the diode / their (a)*

1

(c) (i) 0.05

*accept 50 mA*

*accept between 0.048 and 0.050 inclusive*

1

(ii) 16

0.8

*their (c)(i) correctly calculated gains both marks*

*allow 1 mark for correct transformation and substitution*

$\frac{0.8}{0.05}$  or  $\frac{0.8}{\text{their (c)(i)}}$

*allow 17 if using 0.048*

2

[6]

4.

(a) (i) 2

*allow 1 mark for correct substitution i.e.  $0.8 \times 2.5$  provided no further step shown*

2

(ii) straight line drawn from origin to 2, 0.8

**or**

their (a)(i), 0.8

1

curve from 2, 0.8 to 12,2

**or**

their (a)(i) 0.8 to 12,2

*accept curve from 2, 0.9 to 12,2*

**or**

*their (a)(i) 0.9 to 12,2*

*'convex' curve required*

*accept a curve that flattens between 10 and 12V*

1

(iii) filament / lamp gets hot

*accept temperature increases*

1

(b) 108

*allow 1 mark for correct substitution i.e.  $1.5 \times 72$  provided no further step shown*

2

[7]

5.

(a) 35

*an answer with more than 2 sig figs that rounds to 35 gains 2 marks  
allow 2 marks for correct method, ie  $\frac{230}{6.5}$*

*allow 1 mark for  $I = 6.5$  (A) or  $R = \frac{230}{26}$*

*an answer 8.8 gains 2 marks*

*an answer with more than 2 sig figs that rounds to 8.8 gains 1 mark*

3

(b) (maximum) current exceeds maximum safe current for a 2.5 mm<sup>2</sup> wire

*accept power exceeds maximum safe power for a 2.5 mm<sup>2</sup> wire*

**or**

(maximum) current exceeds 20 (A)

*(maximum) current = 26 (A) is insufficient*

1

a 2.5 mm<sup>2</sup> wire would overheat / melt

*accept socket for wire*

*do **not** accept plug for wire*

1

(c) a.c. is constantly changing direction

*accept a.c. flows in two directions*

*accept a.c. changes direction*

*a.c. travels in different directions is insufficient*

1

d.c. flows in one direction only

1

[7]

6.

(a) electric current

(rate of) flow of (electric) charge / electrons

*accept  $I = \frac{Q}{t}$*

*with Q and t correctly named*

1

potential difference

work done / energy transferred per coulomb of charge  
(that passes between two points in a circuit)

$$\text{accept } V = \frac{W}{Q}$$

with  $W$  and  $Q$  correctly named

1

(b) metals contain free electrons (and ions)

accept mobile for free

1

as temperature of filament increases ions vibrate faster /  
with a bigger amplitude

accept atoms for ions

accept ions/atoms gain energy

accept vibrate more for vibrate faster

do not accept start to vibrate

1

electrons collide more (frequently) with the ions

or

(drift) velocity of electrons decreases

do not accept start to collide

accept increasing the p.d. increases the temperature (1 mark)

and

(and) resistance increases with temperature (1 mark) if no other  
marks scored

1

(c) 7.8

allow 1 mark for obtaining value 1.3 from graph

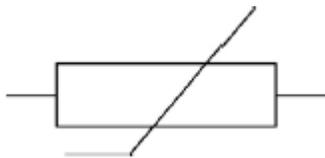
or allow 1 mark for a correct calculation using an incorrect current  
in the range 1.2-1.6 inclusive

2

[7]

7.

(a) (i)



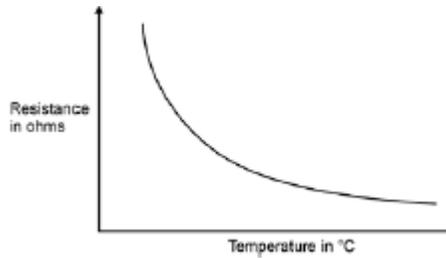
1

(ii) 360

allow 1 mark for correct substitution, ie  $9 = 0.025 \times R$

2

(iii) sketch graph of correct shape, ie



1

(iv) An automatic circuit to switch a heating system on and off.

1

(b) so ammeter reduces / affects current as little as possible

*accept so does not reduce / change the current (it is measuring)*

*accurate reading is insufficient*

*not change the resistance is insufficient*

1

(c) gives a common understanding

*accept is easier to share results*

*accept can compare results*

*do not need to be converted is insufficient*

*prevent errors is insufficient*

1

(d) replace Bunsen (and water) with a lamp

*accept any way of changing light level*

1

replace thermometer with light sensor

*accept any way of measuring a change in light level*

*datalogger alone is insufficient*

1

[9]

8.

(a) Current = 0.4A (1)

R = V/I or 240/0.4 (1)

R = 600 ohm (1)

3

(b) Doubles

*gets 2 marks*

OR gets bigger

*gets 1 mark*

2

(c)  $P = V.I$  or  $240 \times 0.4$   
 $P = 96W$

*for 1 mark each*

2

(d)  $I = 0.2A$   
 $P = 48W$

*for 1 mark each*

*BUT may get equation mark here if not in (c)*

2

(e)  $P = V.I.t$  (1)  
 $P = 240 \times 0.2 \times 6 \times 3600$   
**OR**  $P = 48 \times 6 \times 3600$

*gets 1 mark*

$P = 1036800 W$

*gets 1 mark*

3

[12]

9.

(a) a curve in the first and third quadrants only, passing through origin

1

decreasing gradient

1

(b) any **two** from:

- $I_1 = I_2 + I_3$
- $I_2 = I_3$
- $I_1 = 2I_2$
- $I_1 = 2I_3$

*allow 1 mark for each correct description given in words*

2

(c)  $3 = I^2 \times 12$

1

$$I = \sqrt{\left(\frac{3}{12}\right)}$$

1

$I = 0.5 \text{ (A)}$

1

$Q = 0.5 \times 60 = 30$

*allow Q =  
their calculated  $I \times 60$*

1

$Q_{\text{total}} = 60$

*allow an answer that is consistent with their calculated  
value of I*

1

**or**

$3 = I^2 \times 12 \text{ (1)}$

$$I = \sqrt{\left(\frac{3}{12}\right)}$$

$I = 0.5 \text{ (A) (1)}$

$I_{\text{total}} = 1.0 \text{ (A) (1)}$

*allow  $I_{\text{total}} = \text{their } I \times 2$*

$Q = 1.0 \times 60 = 60 \text{ (1)}$

*allow an answer that is consistent with their calculated  
value of I*

coulombs **or** C

1

*an answer of 60 scores 5 calculation marks*

(d) **Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.

5–6

**Level 2:** Relevant points (reasons / causes) are identified, and there are attempts at logically linking. The resulting account is not fully clear.

3–4

**Level 1:** Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.

1–2

**No relevant content**

0

**Indicative content**

- resistance of LDR changes when light intensity changes
- when light intensity increase resistance of LDR decreases
  
- overall resistance of circuit decreases
- potential difference across total resistance remains unchanged
- current in ammeter increases
  
- potential difference across fixed resistor increases
- potential difference across LDR decreases
- reading on the voltmeter decreases
  
- potential difference is shared between the components in series
- the lower the resistance of the LDR the smaller the share of the potential difference
- reading on the voltmeter decreases

[16]