MARK SCHEME

GCSE

PHYSICS

AQA - TRIPLE SCIENCE

P2 - TEST 6

ELECTRICITY

Advanced

Mark schemes

1.

(a) 125

*allow **1** mark for obtaining time period = 0.008 (s)*

or

frequency = 1 / time period (or their calculated time period)

2

hertz
or
Hz

*do **not** accept hz*

1

(b) 50 (hertz)

1

[4]

2.

(a) potential difference

allow p.d.
allow voltage

1

temperature

1

in this order only

(b) the current increases (when the potential difference increases)

1

(which) causes the temperature of the filament to increase

1

(so) the resistance increases

*do **not** accept resistance increases and then levels off*

1

(c) a higher proportion / percentage of the (total) power / energy input is usefully transferred

wastes less energy is insufficient

or
higher (useful) power / energy output for the same (total) power / energy input

1

(d) potential difference increases

1

current decreases

1

(e) 1000 (Ω)

reason only scores if R = 1000 (Ω)

1

potential difference is shared in proportion to the resistance

allow a justification using a correct calculation

1

(f) 12 = I × 7000

1

$$I = \frac{12}{7000}$$

1

I = 1.71 × 10^{-3} (A)

*an answer that rounds to 1.7 × 10^{-3} (A) scores **3** marks*

1

I = 1.7 × 10^{-3} (A)

this answer only

or

I = 0.0017 (A)

*an answer of 2.4 × 10^{-3} (A) scores **2** marks*

*if no other marks scored allow **1** mark for calculation of total resistance (7000 Ω)*

1

*an answer of 1.7 × 10^{-3} (A) scores **4** marks*

[14]

3. (a) current

1

(b) 4.2 = 3.5 × 10^{-3} × R

1

R = 4.2 / 3.5 × 10^{-3}

1

R = 1200 (Ω)

*an answer of 1200 (Ω) scores **3** marks*

*an answer of 1.2 scores **2** marks*

1

(c) conversion from minutes to seconds (300 s)

1

Q = 0.0035 × (5 × 60)

1

Q = 1.05 C

*an answer of 1.05 (C) scores **3** marks*
*an answer of 17.5 scores **1** mark*
*an answer of 1050 or 0.0175 scores **2** marks*

1

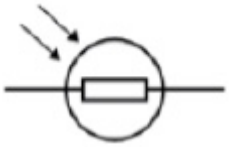
(d) (potential difference) increases

1

(because thermistor) resistance increases

2nd mark dependent on scoring 1st mark

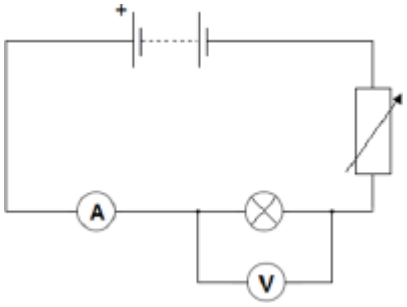
1

(e) 

1

[10]

4. (a)



battery in series with bulb and ammeter

1

voltmeter in parallel with bulb

1

variable resistor
or
variable power pack
or
potentiometer

1

(b) A is brighter because it has a higher current (than lamp B at any p.d.)

1

(therefore A has a) higher power output (than bulb B)

accept higher energy output per second

1

(c) lower current (than lamp A) for the same potential difference

accept answer in terms of R = V / I

allow reference to a comparison of the gradients

1

this is true for all values (of p.d. on the graph)

1

(d) 0 – 2 Volts

allow a range from 0 V up to any value between 1 and 2 V.

1

(for an ohmic conductor) current is directly proportional to potential difference

allow lines (of best fit) are straight and pass through the origin

1

(so) resistance is constant

1

[10]

5. (a) current at 0.5 V = 0.91 (A)

1

P = 0.91 × 0.5

1

P = 0.455 (W)

*an answer of 0.455 (W) scores **3** marks*

1

(b) straight line with positive gradient

*allow for **1** mark a straight line that passes through (0.1, 0)*

1

positive y-axis intercept

ignore any values on y-axis

1

(c) $0.15 = \frac{0.52}{\text{total P}}$

1

total P = 3.47 (W)

1

$\text{area} = \frac{3.47}{450}$

1

area = 7.7×10^{-3} (m^2)

*an answer of 7.7×10^{-3} (m^2) scores **4** marks*

allow use of student's calculated incorrect total power for last 2 marking points

1

(d) connect the solar cells in parallel

1

(so that) the current has multiple paths it can take

or

the total resistance is less than the resistance of one solar cell

1

[11]

6. (a) (i) 1.7

1

(ii) 51

or

30 × their (i) correctly calculated

*allow **1** mark for correct substitution i.e.* $1.7 = \frac{Q}{30}$

or their (i) $= \frac{Q}{30}$

2

coulomb / C

*do **not** accept c*

1

(iii) 612

or

their (ii) × 12 correctly calculated

or

their (i) × 360 correctly calculated

*allow **1** mark for correct substitution i.e. E = 12 × 51*

or 12 × their (ii)

or their (i) × 360

2

(b) ions vibrate faster

or

ions vibrate with a bigger amplitude

accept atoms for ions throughout

accept ions gain energy

accept ions vibrate more

ions start to vibrate is insufficient

1

electrons collide more (frequently) with the ions

or

(drift) velocity of electrons decreases

electrons start to collide is insufficient

there are more collisions is insufficient, unless both electrons and ions are implied

1

[8]

7. (a) (i) 2

*allow **1** mark for correct substitution i.e. 0.8 × 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

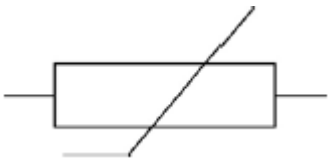
(b) 108

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

2

[7]

8. (a) (i)



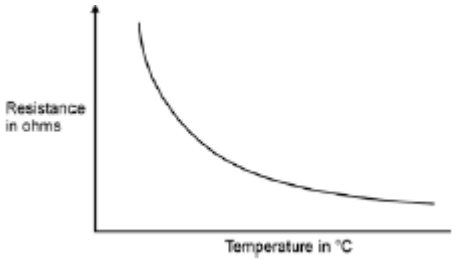
1

(ii) 360

*allow **1** mark for correct substitution, ie 9 = 0.025 × 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]

9. (a) diode

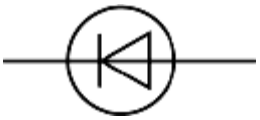
accept LED

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

$\frac{0.8}{}$

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]

10. (a) (i) 50(Hz)

ignore any unit given

1

(ii) any **two** from:

- (some) current flows to Earth

  accept ground for Earth

- current flows through copper braid

  accept current flows through the earth wire

  accept electricity for current in either the first or second marking point but not both

- RCCB detects difference between current in live and neutral wire

2

(iii) can be reset

accept does not need replacing

or

faster acting

accept switches circuit off faster

1

(b) (i) 79 200

*allow **1** mark for correct substitution, ie* $11 = \frac{Q}{2 \times 3600}$

*an answer 22 gains **1** mark*

2

coulombs / C

*do **not** accept c*

1

(ii) 18 216 000

*accept for **2** marks 18 216 kJ **or** 18.216 MJ*

or

230 × their (b)(i) correctly calculated

*allow **1** mark for correct substitution, ie 230 × their (b)(i) **or***
*allow **1** mark for power calculated as 2530(W)*

2

(c) increases temperature of thermistor

1

changes resistance (of thermistor)

*do **not** accept increases resistance (of thermistor)*

*an answer decreases resistance (of thermistor) gains **2** marks*

1

[11]