Current Potential Diff and Resistance

Mark Scheme 1

Level	GCSE (9-1)
Subject	Combined Science: Trilogy - Physics
Exam Board	AQA
Topic	6.2 Electricity
Sub-Topic	Current Potential Diff and Resistance
Difficulty Level	Gold Level
Booklet	Mark Scheme 1

Time Allowed: **59 minutes**

Score: **/57**

Percentage: **/100**

Grade Boundaries:

M1.(a) 1 950 / 2 500 × 100

1

78 (%)

1

(b) expected mass of aluminium

1950 × 54 / 102

1

= 1032.35

1

mass not collected

1032.35 − 1 000

= 32.4

*allow 32.4 with no working shown for **3** marks*

*incorrect number of sig. figs max **2** marks*

1

(c) because oxygen is formed at the anode

1

which reacts with the carbon anode to produce carbon dioxide

1

and wears it away

1

(d) power = $1.5 \times 10^5 \times 4$

1

= 6.0×10^5 W

1

24 hours = $24 \times 60 \times 60 = 8.64 \times 10^4$ seconds

1

energy transferred = $6.0 \times 10^5 \times 8.64 \times 10^4$

allow ecf from power calculation

1

= 5.184×10^{10}

*allow 5.184×10^{10} with no working for **5** marks*

1

(e) 3 moles of electrons are needed to produce 27 g or 0.027 kg aluminium

1

so moles of electrons to produce 1 000 kg = 1 000 / 0.027 × 3

1

= 111 000

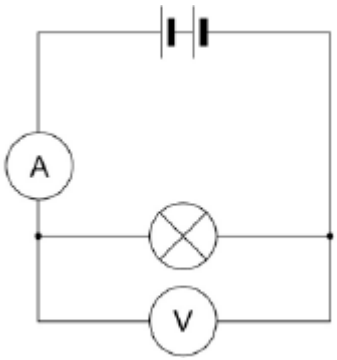
*allow 111 000 with no working shown for **3** marks*

1

*incorrect no. of sig. figs max **2** marks*

[16]

M2.(a)



ammeter connected in series

1

voltmeter connected in parallel

1

measure the potential difference across the lamp at known current

1

calculate resistance from measured values using V = IR

1

(b) for ohmic conductors the current is directly proportional to the potential difference applied across it

1

this graph is curved so it is not an ohmic conductor

1

(c) diode

1

because it has a high resistance with negative potential differences

1

and a low resistance for positive potential differences.

1

allow answers in terms of current

(d) tangent to the curve drawn at 2.3 V

1

correct reading of Δy and Δx from graph

1

either

substitution of values into $V = IR$ (1)

1

value of R calculated (1)

accept values in the range 0.50 to 0.65

1

or

calculation of gradient (1)

allow ecf from incorrect readings of Δy and Δx

calculation of R = 1 / gradient (1)

accept values in the range 0.50 to 0.65

[13]

M3.(a) (i)

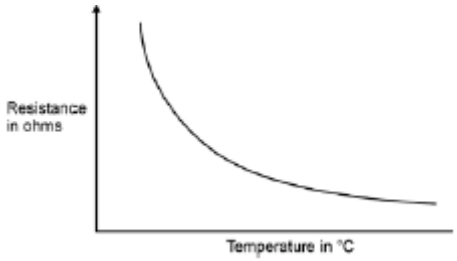
1

(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]

M4.(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^2 wire

accept power exceeds maximum safe power for a 2.5 mm^2 wire

or(maximum) current exceeds 20 (A)

(maximum) current = 26 (A) is insufficient

1

a 2.5 mm^2 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

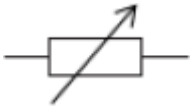
1

[7]

M5.(a) (i) symbol for a diode 

accept 

1

symbol for a variable resistor 

1

(ii) voltmeter is in series **or** voltmeter is not in parallel

1

ammeter is in parallel **or** ammeter is not in series

accept an answer in terms of how the circuit should be corrected

voltmeter and ammeter are wrong way around is insufficient

1

(b) (i) 0.2 (V)

accept any value between 0.20 and 0.21 inclusive

1

(ii) 37.5

*allow **1** mark for I = 0.008*

or
*allow **2** marks for correct substitution, ie 0.3 = 0.008 × R*
or
*allow **1** mark for a correct substitution using I = 0.8 **or** I = 0.08**or** I = 0.009*
or
*allow **2** marks for answers of 0.375 **or** 3.75 **or** 33(.3)*

3

(c) (i) 25

*allow **1** mark for obtaining period = 0.04(s)*

2

(ii) diode has large resistance in reverse / one direction

1

so stops current flow in that / one direction

allow diodes only let current flow one way / direction

*allow **1** mark for the diode has half-rectified the (a.c. power) supply*

1

[12]