

MARK SCHEME

GCSE

PHYSICS

AQA - TRIPLE SCIENCE

P2 - TEST 5

ELECTRICITY

Intermediate

Mark schemes

- 1.** (i) power = current \times voltage
or any correctly transposed version
accept watts = amps \times volts
accept $P = IV$
do not credit $P = CV$
accept p.d. for voltage triangle acceptable only if used correctly in (ii)
1
- (ii) 2 000 000 (1)
2000 kilowatts/kW (2)
accept KW

watts/W (1)
2 megawatts/MW (2)
*do not credit mW (1) if correct method is clearly shown but answer is numerically incorrect **or** unit is absent **or** incorrect*
do not credit any working from an incorrect equation in (d)(i) but an appropriate unit should be credited
2
- [3]**
- 2.** (a) transfer of electrons
mention of positive charge moving negates both marks
1
- from the carpet to the student
1
- (b) three arrows perpendicular to sphere's surface with all arrows directed inwards and distributed evenly around sphere
1
- (c) there is a potential difference between the student and the tap
*do **not** accept the tap / sink is charged*
1
- which causes electrons / charges to transfer from the student
or
which causes electrons / charges to transfer to the tap
1
- which earths the charge
allow the tap is earthed
1

- (d) carpet / copper has a low resistance
allow carpet is a conductor
or
copper is a conductor

1

lower / no build-up of charge (on the student)
or
(so there is a) smaller / no potential difference between student and tap / earth

1

[8]

3.

- (a) (i) p.d. is (directly) proportional to current
or
gradient / slope is constant
or
the lines show constant resistance
accept lines are straight / diagonal

1

- (ii) C
reason only scores if C is chosen

1

for the same p.d. the current is the smallest
*accept lowest gradient **and** the gradient = $1/R$*

1

- (b) (i) ohm
accept correct symbol Ω
accept an answer written in the table if not given in answer space

1

- (ii) K and L
reason only scores if both K and L are chosen

1

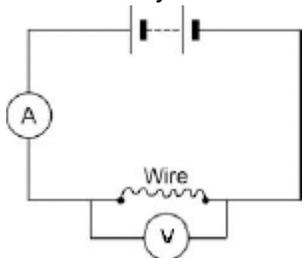
only length varies
accept type of metal and the diameter are the same

1

- (iii) measure the resistance of more wires made from different metals
accept test more (types of) metals
measure the resistance of more wires is insufficient
they only use two metals is insufficient

1

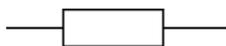
- (c) (i) voltmeter symbol correct and drawn in parallel with the wire



accept voltmeter symbol correct and drawn in parallel with the battery

1

- (ii) correct symbol drawn



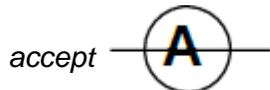
symbol must be rectangular

1

[9]

4.

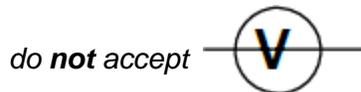
- (a) (i) ammeter symbol correct and drawn in series



do not accept lower case a

1

voltmeter symbol correct and drawn in parallel with the material



1

- (ii) adjust / use the variable resistor
accept change the resistance

or

change the number of cells

accept battery for cell

accept change the pd / accept change the voltage

accept increase / decrease for change

1

- (b) (i) 37.5 (Ω)

accept answer between 36 and 39 inclusive

1

- (ii) 5.6(25) **or** their (b)(i) $\times 0.15$

*allow 1 mark for correct substitution ie 37.5 **or** their (b)(i) $\times 0.15$ provided no subsequent step shown*

2

(c) (i) the thicker the putty the lower the resistance

*answer must be comparative
accept the converse*

1

(ii) any **one** from:

- measuring length incorrectly
accept may be different length
- measuring current incorrectly
*do **not** accept different currents*
- measuring voltage incorrectly
*do **not** accept different voltage*
- ammeter / voltmeter incorrectly calibrated
- thickness of putty not uniform
*do **not** accept pieces of putty not the same unless qualified*
- meter has a zero error
*do **not** accept systematic / random error
accept any sensible source of error eg putty at different temperatures
do **not** accept human error without an explanation
do **not** accept amount of putty not same*

1

[8]

5.

(a) (i) also double

increases is insufficient

1

(ii) variable resistor

accept rheostat / potentiometer

1

(b) (i) the data / results / variables are continuous

accept data / results / variables are not categoric / discrete

1

(ii) misreading the ammeter

*do **not** accept misreading the meter / results*

*do **not** accept misreading the ammeter and / or voltmeter
reading / human error is insufficient*

1

(iii) straight line from the origin drawn passing close / through
points at 1 V, 5 V, 6 V and ignoring anomalous point

*do **not** accept line drawn 'dot-to-dot'*

1

(iv) yes

mark is for the reason

supports prediction

or

(straight) line passes through the origin

accept a mathematical argument, eg when p.d. went from 2 to 4 the current went from 0.3 to 0.6

it's directly proportional is insufficient

1

[6]

6.

(a) 3rd box

The negative charge in the water is repelled by the rod and the positive charge is attracted.

1

(b) (i) friction between bottles and conveyor belt / (plastic) guides

accept bottles rub against conveyor belt / (plastic) guides

1

charge transfers between bottles and conveyor belt / (plastic) guides

accept specific reference

eg electrons move onto / off the bottles

reference to positive electrons / protons negates this mark

1

(ii) an atom that has lost / gained electron(s)

*do **not** accept a charged particle*

1

(iii) charge will not (easily) flow off the conveyor belt

accept the conveyor belt / bottle is an insulator / not a conductor

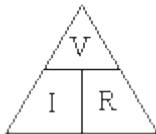
accept conveyor belt is rubber

1

[5]

7.	(i)	30	<i>allow 1 mark for showing correct method i.e. 5×6 or $12 \div 0.4$</i>	2	
	(ii)	connected in <u>series</u>	<i>insufficient they are not connected in parallel</i>	1	
	(iii)	0.4		1	
	(iv)	equally/ evenly	<i>the same is insufficient allow credit for candidates that correctly mention pd across the connecting wires accept (nearly) 2 V (each)</i>	1	[5]
8.	(a)	(i)	4 (V)	<i>allow 1 mark for correct substitution</i>	2
		(ii)	5 (V) or (9 – their (a)(i)) correctly calculated e.c.f do not allow a negative answer	1	
	(b)	(i)	<u>thermistor</u> c.a.o	1	
		(ii)	0°C to 20°C	1	[5]
9.	(a)	(i)	$A_1 = 0.5$ <i>ignore any units</i>	1	
			$A_4 = 0.5$ <i>allow 1 mark for $A_1 = A_4 \neq 0.5$</i>	1	
		(ii)	the resistance of P is more than 20 Ω	1	
			a smaller current goes through P / A_2 (than 20 Ω) <i>dependent on getting 1st mark correct accept converse</i>	1	

- (b) (i) potential difference = current \times resistance
accept pd / voltage for potential difference
accept $V = I \times R$, correct symbols and correct case only
accept volts = amps \times ohms
accept



provided subsequent method is correct
allow combination of
physical quantities and named units
allow voltage = $I \times R$

1

- (ii) 6

allow 1 mark for correct substitution

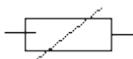
2

- (iii) 6

accept their (b)(ii)

1

- (c) thermistor or



accept correct circuit symbol
allow phonetic spelling

1

resistance goes down (as temperature of thermistor goes up)

*do **not** accept changes for goes down*
*do **not** accept an answer in terms of current only*
answers in terms of other components are incorrect

1

[10]

10.

- (a) to switch on/off
 independently OWTTE

for 1 mark each

2

- (b) 9

for 1 mark

1

- (c) B and E

for 1 mark

1

(d) 1

Two/least number of LED used
for 1 mark each

2

[6]

11.

(a) 0.9

1

1.1

accept the value of $A_4 + 0.2$

1

(b) $V = I R$ or $12 = 0.6 R$ or $\frac{12}{0.6} = ?$

accept $V = A R$
 $V = I \times \text{ohm's sign}$
do not credit Ohm's law triangle

2

$R = 20$

correct numerical answer earns both marks

ohms

1

(c) $A_3 = 0.3$

$A_4 = 0.3$

accept the same numeric value as A_3

$A_5 = 0.5$

accept the value of $A_4 + 0.2$

3

[8]