
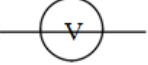


# CURRENT, POTENTIAL DIFFERENCE, AND RESISTANCE 1

## MARK SCHEMES

### QUESTION 1

QUESTIONS	ANSWER	EXTRA INFORMATION	MARKS
a)i)	ammeter symbol correct and drawn in series  voltmeter symbol correct and drawn in parallel with the material	accept   do not accept lower case a  do not accept 	1  1
a)ii)	adjust / use the variable resistor or change the number of cells	accept change the resistance  accept battery for cell accept change the p.d / accept change the voltage accept increase / decrease for change	1
b)i)	data is continuous (variable)		1
b)ii)	36 ( $\Omega$ )	Correct answer only	1
b)iii)	5.4 or their (b)(ii) $\times$ 0.15	allow 1 mark for correct substitution	2
c)i)	the thicker the putty the lower the resistance	answer must be comparative accept the converse	1
c)ii)	any one from: <input type="checkbox"/> measuring length incorrectly <input type="checkbox"/> measuring current incorrectly <input type="checkbox"/> measuring voltage incorrectly <input type="checkbox"/> ammeter / voltmeter	accept may be different length do not accept different currents do not accept different voltage  accept any sensible source of error	1

	incorrectly calibrated <input type="checkbox"/> thickness of putty not uniform <input type="checkbox"/> meter has a zero error	eg putty at different temperatures do not accept human error without an explanation do not accept pieces of putty not the same unless qualified do not accept amount of putty not same do not accept systematic / random error	
c)iii)	repeat readings	accept check results again accept do experiment again accept do it again	1
Total marks			10

### QUESTION 2

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)i)	4(V)	allow 1 mark for correct substitution	2
a)ii)	5(V) or (9 – their (a)(i)) correctly calculated	e.c.f do not allow a negative answer	1
b)i)	thermistor	c.a.o	1
b)ii)	0°C to 20°C		1
Total marks			5

### QUESTION 3

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)	(rate of) flow of charge / electrons / ions		1
b)	7.0	accept 6.96 / 6.95 or an answer that would approximate to 6.96 if rounded allow 1 mark for obtaining correct power and changing to watts ie 1600	3


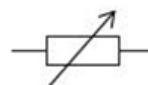

	Amperes	<p>or allow 2 marks for correct substitution and transformation ie <math>1600 \div 230</math> an answer 0.00696 / 0.007 gains 2 marks allow 1 mark for 1.6 / 230 or 1.7 / 230 an answer 7.39 or 7.4 gains 2 marks accept A</p>	1
Total marks			4

#### QUESTION 4

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)i)	ammeter and battery in series with the gauge  voltmeter in parallel with the gauge	<p>symbols must be correct ignore a voltmeter drawn in series <b>accept</b></p> <p><b>not</b></p> <p>or cells reversed to cancel out</p> <p>symbol must be correct accept a freestanding circuit diagram provided strain gauge is labelled or a resistor symbol used for the strain gauge</p>	1  1
a)ii)	d.c. flows only in one direction	a.c. changes direction is insufficient	1
b)i)	75	this answer only allow 1 mark for correct substitution and transformation, ie resistance = $3.0 / 0.040$	2

b)ii)	increases		1
b)iii)	elastic / strain potential	do not accept potential	1
Total marks			7

### QUESTION 5

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)i)	<p>symbol for a diode</p>  <p>symbol for a variable resistor</p> 	<p>accept</p> 	<p>1</p> <p>1</p>
a)ii)	voltmeter is in series or voltmeter is not in parallel 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	<p>1</p> <p>1</p>
b)i)	0.2(V)	accept any value between 0.20 and 0.21 inclusive	1
b)ii)	37.5	allow 1 mark for $I = 0.008$ or allow 2 marks for correct substitution, ie $0.3 = 0.008 \times R$ 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
Total marks			8

**QUESTION 6**

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)	<p>electric current (rate of) flow of (electric) charge / electrons</p> <p>potential difference</p> <p>work done / energy transferred per coulomb of charge (that passes between two points in a circuit)</p>	<p>accept <math>I = Q/t</math> with Q and t correctly named</p> <p>accept <math>V = W/Q</math> with W and Q correctly named</p>	<p>1</p> <p>1</p>
b)	<p>metals contain free electrons (and ions)</p> <p>as temperature of filament increases ions vibrate faster / with a bigger amplitude</p> <p>electrons collide more (frequently) with the ions</p> <p>or (drift) velocity of electrons decreases</p>	<p>accept mobile for free</p> <p>accept atoms for ions</p> <p>accept ions/atoms gain energy accept vibrate more for vibrate faster</p> <p>do not accept start to vibrate do not accept start to collide accept</p> <p>increasing the p.d. increases the temperature (1 mark) and (and) resistance increases with temperature (1 mark) if no other marks scored</p>	<p>1</p> <p>1</p> <p>1</p>
c)	7.8	<p>allow 1 mark for obtaining value</p> <p>1.3 from graph or allow 1 mark for a correct calculation using an incorrect current in the range 1.2-1.6 inclusive</p>	2
Total marks			7