

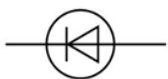
CIRCUIT DEVICES AND RESISTANCE MARK SCHEMES 1

QUESTION 1

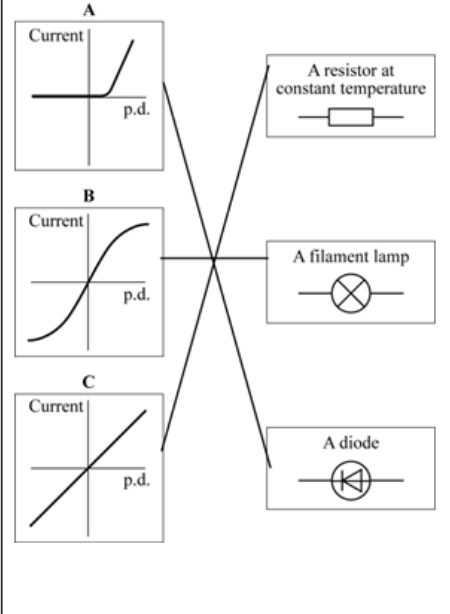
QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)i)	light dependent resistor / LDR	accept ldr	1
a)ii)	25 (kilohms)	accept 24 - 26 inclusive accept 25 000 Ω	1
a)iii)	5 (V) or their (a)(ii) correctly converted to ohms $\times 0.0002$ correctly calculated	allow 1 mark for converting 25k Ω / their (a)(ii) to ohms or allow 1 mark for correct substitution ie 0.0002 \times 25(000) or 0.0002 \times their (a)(ii) allow an incorrect conversion from kilohms providing this is clearly shown	2
b)i)	linear scale	using all of the available axis must cover the range 4 - 6 v or their (a)(iii) - 6 v and lie within the range 0 - 15 inc	1
b)ii)	. negative gradient line passing through 20 lux and their	do not allow lines with both positive and negative gradients only scores if the first mark is awarded only scores if line does not go above 6 volts	1 1
c)i)	37.5 (k Ω) or their (a)(ii) + 50 % (a)(ii) correctly calculated		1
c)ii)	light intensity value would be unreliable / not accurate due to variation in resistance value	accept because resistance varies by \pm 50 % accept tolerance of resistor is too great	1 1

		do not accept results are not accurate	
Total marks			10

QUESTION 2

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)	diode	accept LED	1
b)	<p>all symbols correct</p>  <p>voltmeter in parallel with component added in series</p>	<p>must include at least voltmeter and diode</p> <p>allow ecf from part (a) if the component is not identified as a diode</p> <p>allow symbol without the line through triangle</p> <p>ignore polarity of diode</p> <p>any additional components must not affect the ability to measure V and I for the diode / their (a)</p>	<p>1</p> <p>1</p>
c)i)	0.05	accept 50 mA accept between 0.048 and 0.050 inclusive	1
c)ii)	16	<p>0.8</p> <p>correctly calculated their (c)(i) gains both marks</p> <p>allow 1 mark for correct transformation and substitution</p> <p>ie 0.8 or 0.8 0.05</p> <p>their (c)(i)</p> <p>allow 17 if using 0.048</p>	2
Total marks			6

QUESTION 3

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)	 <p>three lines drawn correctly</p>	allow 1 mark for 1 correct line if more than one line goes from a graph, both are incorrect	2
b)	J		1
Total marks			3

QUESTION 4

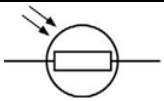
QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)	a light-dependent resistor		1
b)	any three from: resistance starts at 500 (kilohms) ☒ (resistance) falls rapidly as intensity increases from 0 ☒ (resistance) halves between 10 and 20 lux (resistance) falls slightly between 20 and 50 lux or ☒ (resistance) almost constant / levels out between 20 and 50 lux ☒ at 50 lux, resistance = 10 (kilohms)	for full credit the word resistance must be used correctly at least once accept resistance falls accept brightness for intensity an answer resistance falls as intensity increases gains 2 marks - this may be combined with one of the bullet point marks for full credit	3

c)i)	decrease		1
c)ii)	resistance increases	this can score without (c)(i)	1
d)	A circuit to switch on security lighting when it gets dark.		1
Total marks			7

QUESTION 5

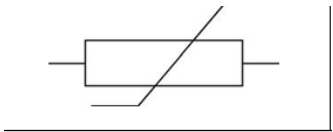
QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)i)	to obtain a range of p.d. values	accept increase / decrease current / p.d. / voltage / resistance accept to change / control the current / p.d. / voltage / resistance to provide resistance is insufficient a variable resistor is insufficient do not accept electricity for current	1
a)ii)	temperature of the bulb increases	accept bulb gets hot(ter) accept answers correctly expressed in terms of collisions between (free) electrons and ions / atoms bulb gets brighter is insufficient	1
a)iii)	36 WATTS	allow 1 mark for correct substitution, ie 12×3 provided no subsequent step shown accept joules per second / J/s do not accept w	2 1
Total marks			5

QUESTION 6

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)i)	correct symbol ringed 		1

a)ii)	accept any suggestion that would change light intensity, eg: <ul style="list-style-type: none"> • torch on or off • distance between torch and LDR • lights in room on or off • shadow over the LDR 	accept power of torch do not accept watts/wattage of torch	1
b)	resistance decreases from 600 k Ω to 200 k Ω	accept by 400 k Ω	1 1
c)i)	no numbers for light intensity or light intensity is categoric / a description/not continuous	not enough results is insufficient	1
c)ii)	YES both show that resistance increases with decreasing (light) intensity / brightness	mark is for the reason accept they both get the same results/pattern	1
d)	A circuit that automatically switches outside lights on when it gets dark.		1
Total marks			7

QUESTION 7

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)i)			1
a)ii)	360	allow 1 mark for correct substitution, ie $9=0.025 \times R$	2

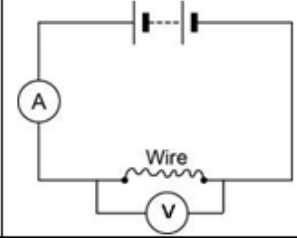

a)iii)	<p>sketch graph of correct shape, ie</p>		1
a)iv)	An automatic circuit to switch a heating system on and off.		1
b)	so ammeter reduces / affects current as little as possible	<p>accept so does not reduce / change the current (it is measuring)</p> <p>accurate reading is insufficient</p> <p>not change the resistance is insufficient</p>	1
c)	gives a common understanding	<p>accept is easier to share results</p> <p>accept can compare results</p> <p>do not need to be converted is insufficient</p> <p>prevent errors is insufficient</p>	1
d)	<p>replace Bunsen (and water) with a lamp</p> <p>replace thermometer with light sensor</p>	<p>accept any way of changing light level</p> <p>accept any way of measuring a change in light level</p> <p>datalogger alone is insufficient</p>	1 1
Total marks			7

QUESTION 8

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)	<p>Circuit symbol</p> <p>Name</p> <p>Diode</p> <p>Light-dependent Resistor (LDR)</p> <p>Lamp</p> <p>Light-emitting diode (LED)</p> <p>three lines drawn correctly</p>	allow 1 mark for 1 correct line if more than one line goes from a graph, both are incorrect	3
Total marks			3

QUESTION 9

QUESTION	ANSWER	EXTRA INFORMATION	MARKS
a)i)	p.d. is (directly) proportional to current or gradient/slope is constant or the lines show constant resistance	accept lines are straight	1
a)ii)	C for the same p.d. the current is the smallest	reason only scores if C is chosen accept lowest gradient and the gradient = $1/R$	1 1
b)i)	ohm	accept correct symbol Ω accept an answer written in Table 1 if not given in answer space	1
b)ii)	K and L only length varies	reason only scores if both K and L are chosen accept type of metal and the diameter are the same	1 1
b)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	accept voltmeter symbol correct	1

	<p>drawn in parallel with the wire</p> 	<p>and drawn in parallel with the battery</p>	
c)ii)	<p>correct symbol drawn</p> 	<p>symbol must be rectangular</p>	1
Total marks			9