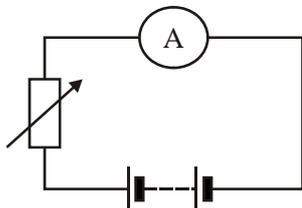


Currents in electric circuits

1. (a)

3



one mark for each symbol; allow more than 2 cells joined
max. 2 marks if symbols incorrectly
allow rheostat arrow in either direction

(b) current will decrease 1
since resistance greater 1

[5]

2. (a) (i) gained electrons 1

(ii) see if it exerts a force on another (charged) object
accept repels another negative(ly charged) object
accept attracts a positive(ly charged) object
accept attracts or repels a charged object

or see if it will pick up (small) pieces of paper 1
accept any correct way of showing an electrostatic effect i.e. bend a (slow moving) stream of water (from a tap)
do not accept see if you get an electric shock on its own

(b) (i) plastic is an insulator 1
accept plastic is a poor conductor;
any mention of heat negates this mark

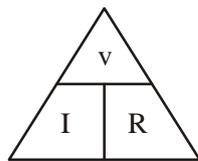
stop them discharging
or stop them being earthed 1
accept keeps the charge on the person
accept stop them being grounded
accept electricity cannot go to earth
do not accept so don't get an electric shock

(ii) type of clothing could affect (build up of) charge/data 1
accept it is a variable/ factor (that needs to be controlled)
do not accept fair test on its own

(iii) there is a clear pattern
or enough precision to tell difference (between the materials)
or accept none of the results are within 0.1kV of the shock line or each other 1
accept there is a wide range of results

(iv) any **two** from:
• the material normally used has a value above the p.d likely to cause a shock
• use a material that reduces pd (below 3.6 kV)
accept use a material that reduces charge (on the person)

	<ul style="list-style-type: none"> • so people are less likely to be shocked <i>accept so people will not feel a shock</i> • can put 'non-shock' seating in adverts <i>owtte</i> • may sell more seats/ cars 	2	[8]
3.	(a) (i) 4 (V) <i>allow 1 mark for correct substitution</i>	2	
	(ii) 5 (V) or (9 – their (a)(i)) correctly calculated <i>e.c.f; do not allow a negative answer</i>	1	
	(b) (i) thermistor <i>c.a.o</i>	1	
	(ii) 0°C to 20°C	1	[5]
4.	(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 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 <i>accept pd / voltage for potential difference</i> <i>accept $V = I \times R$, correct symbols and correct case only</i> <i>accept volts = amps \times ohms</i> <i>accept</i>	1	
			
	<i>provided subsequent method is correct</i> <i>allow combination of physical quantities and named units</i> <i>allow voltage = $I \times R$</i>		
	(ii) 6 <i>allow 1 mark for correct substitution</i>	2	
	(iii) 6 <i>accept their (b)(ii)</i>	1	
	(c) <u>thermistor</u> or 	1	
	<i>accept correct circuit symbol; allow phonetic spelling</i>		
	<u>resistance</u> goes down (as temperature of thermistor goes up) <i>do not accept changes for goes down</i> <i>do not accept an answer in terms of current only</i> <i>answers in terms of other components are incorrect</i>	1	[10]
5.	(a) battery, ammeter and voltmeter correctly joined all circuit symbols correct	1	
	(b) (i) potential difference = current \times resistance <i>accept pd or voltage for potential difference</i> <i>accept $V = I \times R$</i> <i>accept</i>	1	



provided subsequent method is correct

(ii) 120 (Ω) 2

allow 1 mark for correct substitution and transformation

(iii) resistance has increased 1

(c) any feasible practical reason, for example: allows continuous monitoring
all data is (automatically) recorded 1

allow, without data logger and computer John may miss some lorries

data can be taken over a long period of time John could make mistakes when take readings

allow John would only be able to take readings for a few hours

[6]

6. (a) (i) potential difference = current \times resistance 1

accept voltage or pd for potential difference

accept $V = I \times R$

accept correct transformation

do not accept $V = C \times R$

do not accept $V = A \times R$



subsequent use of Δ correct

do not accept an equation expressed in units

(ii) 46 3

credit correct transformation for 1 mark

allow 1 mark for use of 11.5 V or division of final resistance by 20

a final answer of 920 gains 2 marks only

ohm(s) 1

accept symbol Ω

do not accept Ω s

unit / symbol mark can be awarded in (iii) provided unit / symbol is omitted in (ii)

(iii) 920 (ohms) or their (a)(ii) \times 20 1

(b) as temperature increases, resistance increases 1

accept hotter for temperature increase

do not accept a reference to resistance only i.e. it / resistance goes up

[7]