

# Electric circuits

## Mark Scheme 1

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	Electricity and Magnetism
Sub-Topic	Electric circuits
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 1

**Time Allowed:** 62 minutes

**Score:** /51

**Percentage:** /100

Question	Answer	Mark
1(a)(i)	$12\ \Omega$	<b>B1</b>
(a) (ii)	$1/R = 1/R_1 + 1/R_2$ OR $1/R = 1/12 + 1/6$ OR $(R = ) R_1R_2/(R_1 + R_2)$ OR $(12 \times 6)/(12 + 6)$ $4\ \Omega$	<b>C1</b> <b>A1</b>
(a)(iii)	$4 + 6 = 10\ \Omega$	<b>B1</b>
(b)(i)	$(I = 12/10 = ) 1.2\text{A}$	<b>B1</b>
(b)(ii)	$(E = ) IVt$ OR $1.2 \times 12 \times 50$ OR $I^2Rt$ OR $1.2^2 \times 10 \times 50$ OR $V^2t/R$ OR $12^2 \times 50/10$ $720\text{J}$	<b>C1</b> <b>A1</b>
		<b>Total: 7</b>

- 2 (a) (i)  $P = IV$  OR  $40 = 220 \times I$  OR  $(I =) P/V$  OR  $40/220$   
0.18 A A1
- (ii)  $[3 \times 0.18(2)] = 0.54 \text{ A}$  OR  $0.55 \text{ A}$  B
- (iii)  $2/0.182 = 10.99$  OR  $2/0.18 = 11.1$  C1  
10 lamps OR 11 lamps A1
- (b) (i) Resistance increases B1
- (ii) Power (of lamp) decreases B1  
 $P = IV$  and current in lamp decreases. OR  $P = V^2/R$  B1

[Total: 8]

- 3 (a) rheostat/variable resistor AND control/vary/change/ limit the current /resistance/power/ voltage across heater [1]
- (b)  $(I =) P/V$  any form, words or numbers [1]  
 $(I =) 1.25 \text{ (A)}$  seen anywhere [1]  
 $(V =) 6.0 - 3.6$  OR  $2.4$  seen anywhere [1]  
 $(R =) VI$  in any form words or numbers [1]  
 $1.92 \Omega$  (2 or 3 sig. figs.) [1]  
note: credit will also be given for alternative approaches
- (c) battery running down/going flat/energy of battery used up OR  $V$  or e.m.f. less OR more/increasing resistance (of heater) NOT resistance of X increases [1]  
use of relationship between  $I$  and  $V$  or  $R$  OR the current decreases [1]

- 4 (a) (i)  $1/R = 1/R_1 + 1/R_2$  OR  $R = R_1R_2/(R_1 + R_2)$  OR with numbers  
(R =)  $500\Omega$  C1  
A1
- (ii)  $I = (12 \div 1000) = 0.012\text{A}$  ecf (i) B1
- (iii) (V =)  $IR$  OR  $0.012 \times 500$  OR  $12 \times 500 \div 1000$   
=  $6.0\text{V}$  ecf (i)(ii) C1  
A1
- (b) (more current in circuit so) current (in  $500\Omega$  resistor) increases B1
- resistance of parallel combination decreases  
OR total resistance (of circuit) decreases B1
- [Total: 7]
- 5 (a) (i) ammeter symbol in series with wire B1
- (ii) different results OR graph can be plotted OR to ensure wire does not overheat B1
- (b) (i) (P =)  $VI$  OR  $V=IR$  OR  $250 \times 1.2$  OR  $300\text{ (V)}$   
(P =)  $I^2R$  OR  $250^2 \times 1.2$  OR  $300 \times 250$  C1  
 $75\,000\text{W}$  OR  $75\text{ kW}$
- (ii) power loss reduced C1  
resistance reduced C1  
power lost decreases to a quarter OR (P =)  $19\text{ kW}$  /  $18.75\text{ kW}$
- [Total: 8]

- 6 (a) tick for thermistor under: heat detector B1  
tick for transistor under: switch B1
- (b) increase light intensity / brightness / illuminate B  
resistance (of B) decreases B1  
voltage at mid-point increases OR greater (share of) voltage M1  
(more) current flows (through lamp) A1

[Total: 6]

- 7 (a) (i) diode B1
- (ii) 1. 0.7V B1  
2.  $I = V \div R$  in any form OR  $(I =) V \div R$  OR  $11.3 \div 4$  C1  
2.8A A1
- (b) (i) 1.  $(12 \div 8 =) 1.5A$  B  
2.  $(1.5 + 2.825 =) 4.3A$  ecf (a)(ii)2. and (b)(i)1. B1
- (ii) 1.5A ecf (b)(i)1. B1

[Total: 7]