

Electric circuits

Mark Scheme 2

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	Electricity and Magnetism
Sub-Topic	Electric circuits
Paper Type	(Extended) Theory Paper
Booklet	Mark Scheme 2

Time Allowed: 60 minutes

Score: /50

Percentage: /100

- 1 (a) (i) $(I =) V/R$ OR $6/(12 + 4)$ OR $6/16$
0.38 A/0.37 A A1
- (ii) $1/R = 1/R_1 + 1/R_2$
OR $(R =) R_1 R_2 / (R_1 + R_2)$
OR above with numbers substituted C1
- $R = 3 (\Omega)$ C1
- $(I = 6/3 =) 2(.0) A$ A1
- OR ALTERNATIVE METHOD:
 $6/12$ (C1)
 $+ 6/4$ (C1)
 $2(.0) A$ (A1)
- (b) (i) $R \propto l$ (in words or symbols)
OR directly proportional OR e.g. R doubles when l doubles B1
- (ii) $R \propto 1/A$ (or with words)
OR inversely proportional OR e.g. R doubles when A halves B1
- (c) $4/12$ OR $4:12$ OR $1/3$ OR $1:3$ OR 0.33 B1

[Total: 8]

- 2 (a) 4.5V ignore sign B1
- (b) $1/R_p = 1/R_1 + 1/R_2$
 OR $(R_p =) R_1 R_2 / (R_1 + R_2)$ words, symbols or numbers C1
- $R = (1/(1/1 + 1/5)) = 0.83 \Omega$ A1
- (c) $V = IR$ in any form OR V/R words, symbols or numbers C1
- use of total e.m.f. as V AND series resistance as R
 OR 4/5 of total emf seen OR 1/6 of total current seen C1
- $(I = 4.5/5 =) 0.90A$ accept 0.9 e.c.f. from (a) A1
- (d) 1.5V ignore sign B1
- [Total: 7]**

- 3 (a) $(P =) VI$ OR 230×3.5 C1
- 805/810 W A1
- (b) $(I_V =) 7.0$ (A)
 alternative method: $(R_X =) V/I$ OR $230/3.5$ OR $66/65.7(1429)$ C1
- $(I_{Tot} =) 10.5$ (A)
 alternative method: $((R_Y =) 230/7.0$ OR $66/2$ OR $65.7(1429)/2$ OR $33/32.9/32.85714)$ C1
- $(R =) V/I$ OR $230/10.5$
 alternative method: $(R =) R_1 R_2 / (R_1 + R_2)$ OR $2159/98.57$
 OR $1/R = 1/R_1 + 1/R_2$ OR $1/R = 1/65.7 + 1/32.9$ C1
- 22/21.9(0476) Ω A1
- [Total: 6]**

- 4 (a) (lamps) stay on/have same brightness as before/nothing happens B1
 (lamps) still connected to supply/have same voltage as before/are connected in parallel B1

- (b) line 1: on line 2: off I B2
 deduct one mark for e.e.o.e.

- (ii) when either switch is operated, the state of the lamp changes. B1

[Total: 5]

- 5 (a) one mark for each correct entry in table: B3

resistor	res	current	potential difference	power
			IR	
		I		$2I^2R$

- (b) (i) ($P = IV = 750 \times 11000 =$) $8.3 \times 10^6 \text{W}$ (8300 kW) B1

- (ii) ($V = IR = 750 \times 1.5 =$) 1100V B1

- (iii) (voltage to factory = 11 000 – 1125 =) 9875V C1
 (power supplied to factory =) 9875×750 A1
 $7.4 \times 10^6 \text{W}$ OR 7400 kW A1

OR
power loss in cables = I^2R OR $750^2 \times 1.5$ (C1)

(=) $8.44 \times 10^5 \text{ (W)}$ (A1)

(power to factory = $8.25 \times 10^6 - 8.44 \times 10^5 =$) $7.4 \times 10^6 \text{W}$ OR 7400 kW (A1)

[Total: 8]

- 6 (a) 6.0V B1
- (b) (i) coulomb (IGNORE C) B1
- (ii) $(Q =) It$
 OR $0.25 \times 12 \times 60$ OR 0.25×720 OR 0.25×12 OR 3.0 OR 0.25×60 OR 15
 180(C) C1
 A1
- (iii) $(R =) V/I$ or $6.0/0.25$ or 24.0 e.c.f. from (a)
 OR
 $(V =) IR$ OR 0.25×16 OR 4.0 e.c.f. from (a) C1
- 8.0 Ω A1
- (c) $R \propto l$ OR 8.0 OR 16/2 C
 $R_1 R_2 / (R_1 + R_2)$ OR $1/R = 1/R_1 + 1/R_2$ OR 64/16 OR $1/R = 1/8 + 1/8$ C
 4.0 Ω A1

[Total: 9]

- 7 (a) (i) all lamps off
- (ii) 12 Ω lamps (only) on B1
- (iii) 4 Ω lamps (only) on
- (b) 12 V B1
- (ii) $I = V/R$ in any form OR V/R OR 12/12 C1
 1.0 A OR 1 A A1
 e.c.f. from (b)(i)
- (c) current in 4 Ω lamp = 3 (A) (current in 12 Ω lamp is in (b)(ii)) C
 $(P =) IV$ OR $I^2 R$ C1
 $(P =) 36$ W for 4 Ω lamp; $P = 12$ W for 12 Ω lamp A1
 e.c.f. from (b)(ii)
 OR
 $(P =) V^2/R$ (C1)
 $(P =) 12^2/4 = 36$ W for 4 Ω lamp OR $12^2/12 = 12$ W for 12 Ω lamp (C1)
 $(P =) 12^2/4 = 36$ W for 4 Ω lamp AND $12^2/12 = 12$ W for 12 Ω lamp (A1)
 OR
 $(P =) V^2/R$ (B1)
 Same V for all lamps (M1)
 4 Ω lamp has higher power / 12 Ω has lower power (A1)

[Total 7]