

Electric circuits

Question Paper 3

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	Electricity and Magnetism
Sub-Topic	Electric circuits
Paper Type	(Extended) Theory Paper
Booklet	Question Paper 3

Time Allowed: 51 minutes

Score: /42

Percentage: /100

1 This question refers to quantities and data shown on the circuit diagram of Fig. 9.1.

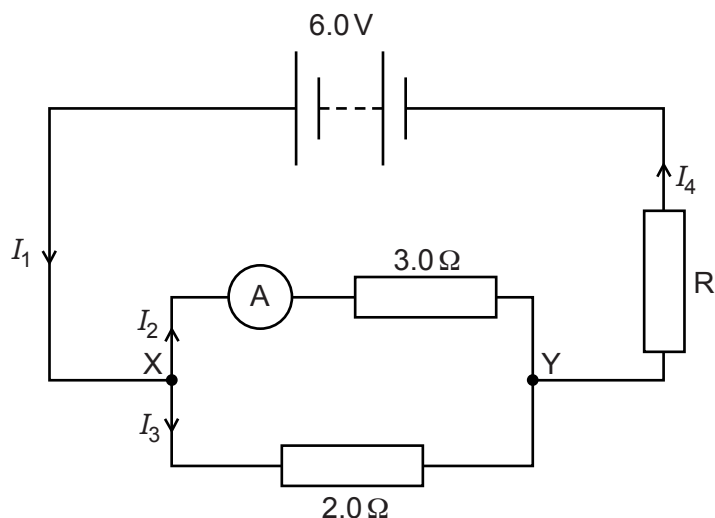


Fig. 9.1

(a) State the relationship between

(i) the currents I_1 , I_2 and I_3 , [1]

(ii) the currents I_1 and I_4 [1]

(b) The ammeter reads 0.80 A. Assume it has zero resistance.

Calculate

(i) the potential difference between X and Y,

p.d. = [1]

(ii) the current I_3 ,

current = [2]

(iii) the resistance of R.

resistance = [4]

[Total: 9]

2 Fig. 11.1 shows part of a circuit designed to switch on a security lamp when it gets dark.

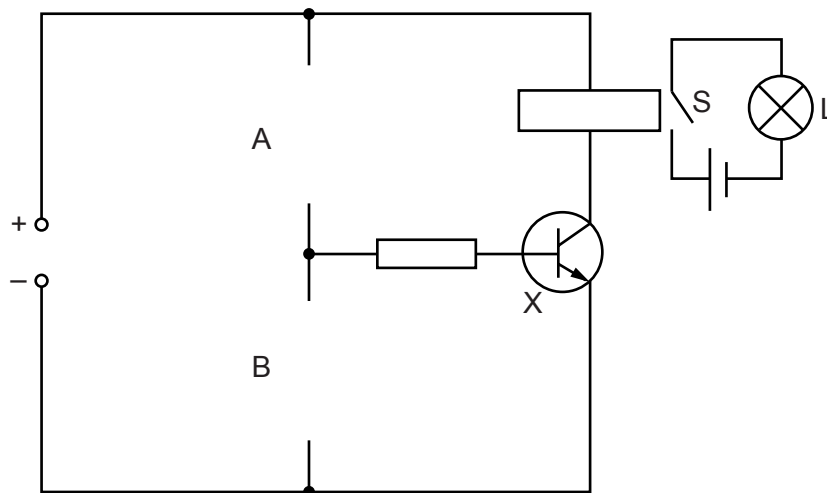


Fig. 11.1

When there is a current in the relay coil, switch S closes and the lamp L comes on.

(a) Write down the name of the component X. [1]

(b) The circuit has gaps at A and at B.

State the components that need to be connected into these gaps for the circuit to perform its required function.

gap A

gap B

[3]

(c) The circuit in Fig. 11.1 is modified. The function of lamp L is now to give a warning when the temperature becomes too high.

State any necessary changes of components in the circuit.

.....

..... [2]

[Total: 6]

3 40 lamps, each of resistance 8.0Ω , are connected in series to a 240 V supply in order to decorate a tree.

(a) Calculate

(i) the current in each lamp,

current = [2]

(ii) the power dissipated in each lamp.

power = [2]

(b) The lamps are designed to “fail-short”. If a filament fails, the lamp shorts so that it has no resistance. The other lamps continue to light and the current increases.

The lamps are connected through a fuse that blows when the current rises above 0.9A. At this current, the resistance of each lamp is 5% greater than its normal working resistance.

Calculate the maximum number of lamps that can fail before the fuse blows.

number of lamps = [4]

[Total: 8]

- 4 (a) Determine which **one** of the following resistors, connected in parallel with a ~~24.0~~ resistor, would give a total resistance of $8.0\ \Omega$. Show your working.

Available resistors: $2.0\ \Omega$, $4.0\ \Omega$, $6.0\ \Omega$, $8.0\ \Omega$, $12.0\ \Omega$, $16.0\ \Omega$, $18.0\ \Omega$, $32.0\ \Omega$

value of resistor = [3]

- (b) (i) In the space below, draw the parallel combination of resistors from (a) connected in a circuit with a 6.0V battery. The circuit should also include an ammeter to measure the current in the $24.0\ \Omega$ resistor.

[2]

- (ii) Calculate the current in each of the resistors when connected as in (b)(i). Show your working.

current in $24.0\ \Omega$ resistor = [3]

current in the other resistor = [Total: 8]

- 5 An electric heater is connected to a 230V mains supply. The heater circuit includes two resistors R_1 and R_2 , and two switches S_1 and S_2 . Fig. 8.1 is the circuit diagram.

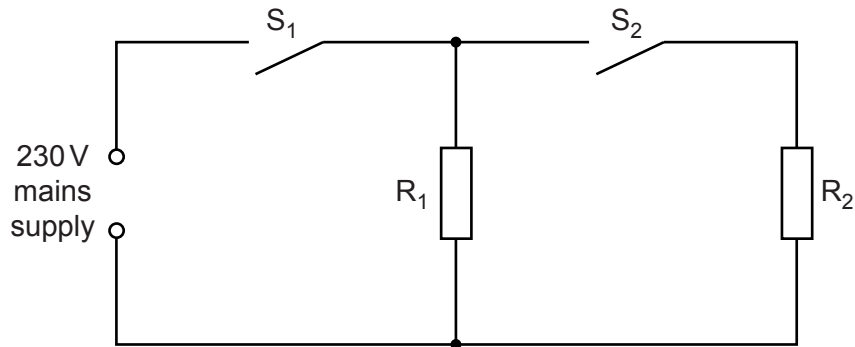


Fig. 8.1

The resistance of R_1 is 46Ω and the resistance of R_2 is also 46Ω .

Switch S_1 is closed and switch S_2 remains open.

(a) Calculate

- (i) the current from the mains supply,

current = [2]

- (ii) the power dissipated in the heater.

power = [2]

(b) Switch S_2 is now closed.

State the current in R_2 .

current = [1]

[Total: 5]

- 6 A warning bell is fitted in a photographic dark room. In the dark, the bell is silent but in bright light, it rings. Two circuits linked by a relay R control the bell B. Fig. 10.1 is the circuit diagram for the arrangement.

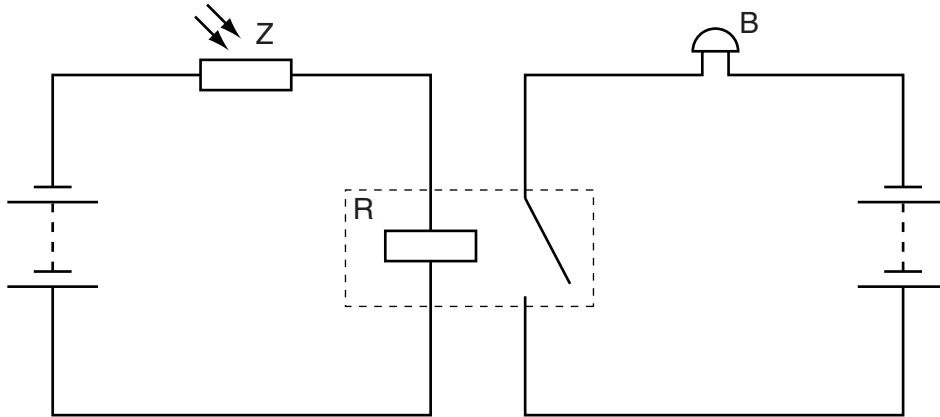


Fig. 10.1

- (a) (i) State the name of component Z.

..... [1]

- (ii) Explain why B rings in bright light.

.....

 [4]

- (b) A change is made to one of the circuits so that B starts to ring when the temperature in the room rises.

State the change made.

.....
 [1]

[Total: 6]