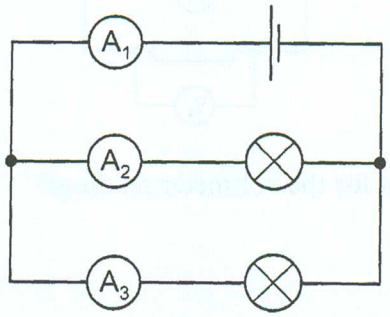
Topic 15 D.C. Circuits

PAPER 1

MULTIPLE-CHOICE QUESTIONS

For each question, there are four possible answers. Choose the one you consider correct and record your choice (A, B, C or D) in the brackets provided.

1. The circuit shows two lamps of equal resistance and three identical ammeters.

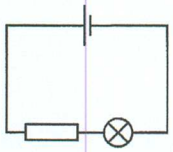


Which ammeters give the same reading? (2011/P1/Q17)

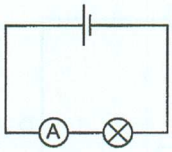
A A_1, A_2 and A_3 **B** A_1 and A_2 only
C A_2 and A_3 only **D** A_3 and A_1 only ( )

2. Which circuit is used to vary the brightness of the lamp? (2012/P1/Q19)

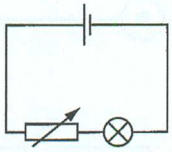
A



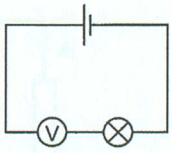
B



C



D



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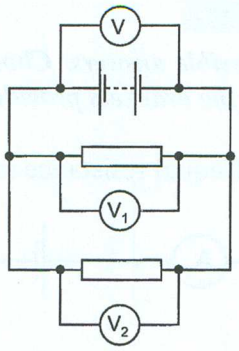
3. Two resistors are connected to a battery.

Voltmeters are connected in different parts of the circuit.



Which equation is correct for the voltmeter readings? (2013/P1/Q17)

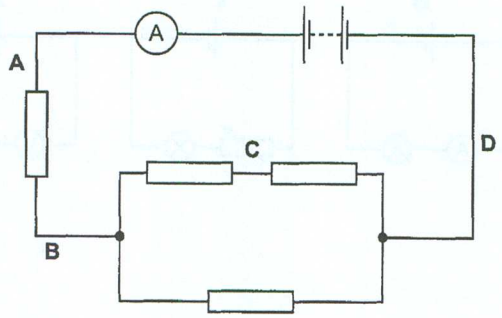
A $V = V_1 = V_2$
B $V = V_1 \times V_2$
C $V = V_1 + V_2$
D $V = V_2 - V_1$

( )

4. Four resistors and an ammeter are connected to a battery.

The ammeter reads 2 A.

At which point in the circuit is the current less than 2 A? (2014/P1/Q18)



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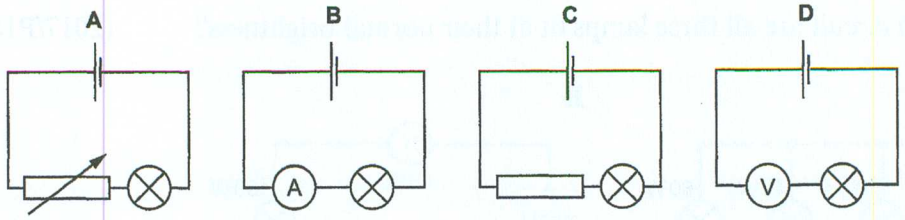
5. Which circuit is used to vary the brightness of a lamp? (2015/P1/Q18)



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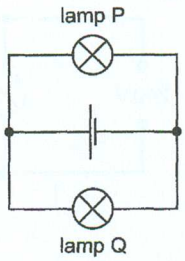
6. The diagram shows two lamps in parallel with a cell.



Which row shows the direction of conventional current in lamp P and the direction of electron flow in lamp Q? (2016/P1/Q16)

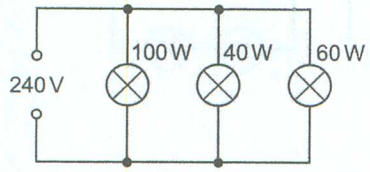
	conventional current in lamp P	electron flow in lamp Q
A	→	→
B	→	←
C	←	→
D	←	←

( )

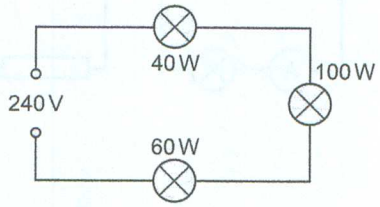
7. Three 240 V lamps, of different power ratings, are connected as shown.

In which circuit are all three lamps lit at their normal brightness? (2017/P1/Q19)

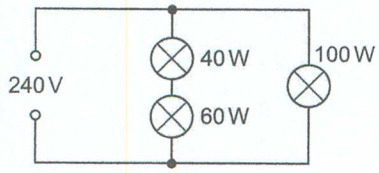
A



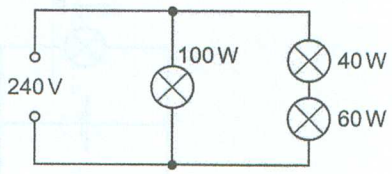
B



C



D



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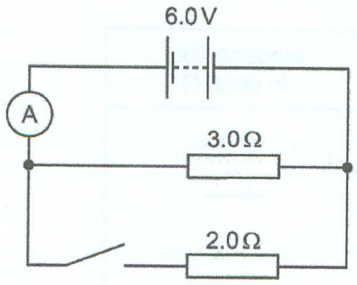
8. The diagram shows a circuit with a 3.0 Ω resistor and a 2.0 Ω resistor connected in parallel.



The switch is open, and the ammeter reads 2.0 A.

When the switch is closed, the ammeter reads the total current through both resistors.

What is the ammeter reading when the switch is closed? (2018/P1/Q16)

A 1.2 A
B 3.0 A
C 4.0 A
D 5.0 A

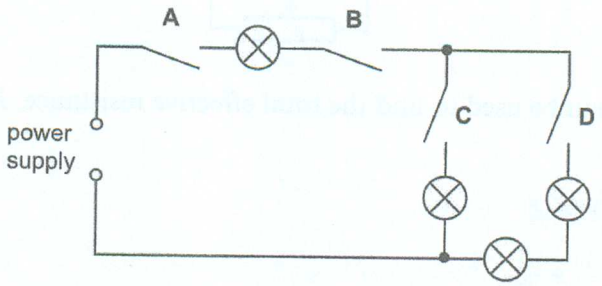
( )

9. Four lamps and four switches are connected to a power supply as shown in the circuit diagram.

When all the switches are closed, all the lamps are lit.

When one of the switches is then opened, only **one** lamp goes out.

Which switch is opened? (2018/P1/Q18)



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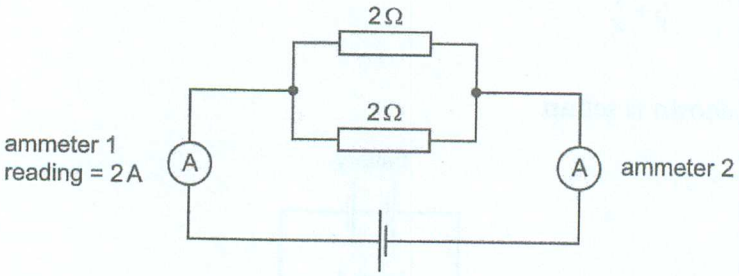
10. In the circuit shown, the reading on ammeter 1 is 2 A.

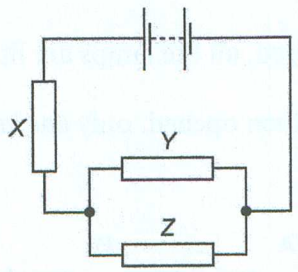


What is the reading on ammeter 2? (2018/P1/Q19)

A 0 A
B 1 A
C 2 A
D 4 A

( )

11. A circuit containing three resistors with resistances, X, Y and Z, is set up.



Which formula can be used to find the total effective resistance, R_{total}, of the three resistors? (2019/P1/Q17)

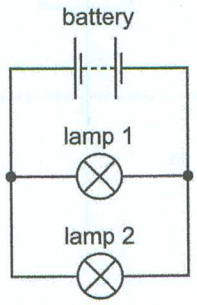
A $R_{total} = X + Y + Z$

B $R_{total} = \frac{1}{X} + \frac{1}{Y} + \frac{1}{Z}$

C $R_{total} = X + \frac{1}{Y} + \frac{1}{Z}$

D $R_{total} = X + \frac{1}{\frac{1}{Y} + \frac{1}{Z}}$ ( )

12. The circuit shown is set up.



Which statement is correct? (2019/P1/Q18)

A voltage across lamp 2 is higher than the voltage across lamp 1
B voltage across lamp 1 is higher than the voltage across lamp 2
C voltage of battery = voltage across lamp 1 + voltage across lamp 2
D voltage of battery = voltage across lamp 1 = voltage across lamp 2 ( )

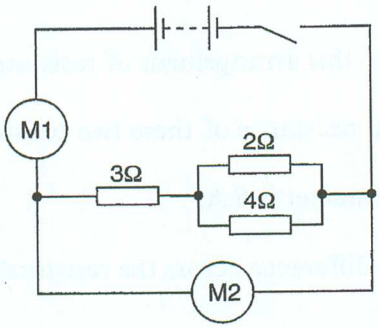
PAPER 2

STRUCTURED QUESTIONS

Section A

Answer the following questions.

1. A student sets up the circuit below.



(a) In which position, M1 or M2, is a voltmeter connected? [1]

(b) (i) How are the 2 Ω and the 4 Ω resistors connected together? [1]

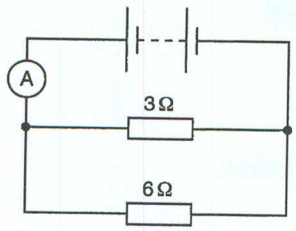
(ii) Calculate the combined resistance of the 2 Ω and 4 Ω resistors.

Show your working. [2]

(iii) Calculate the total resistance of all three resistors in the circuit. [1]

(2011/P2/A2)

2. A 3 Ω and a 6 Ω resistor are connected in a circuit as shown.



(a) What name is given to this arrangement of resistors? [1]

(b) What is the combined resistance of these two resistors? Show your working. [2]

(c) The reading on the ammeter is 6 A.

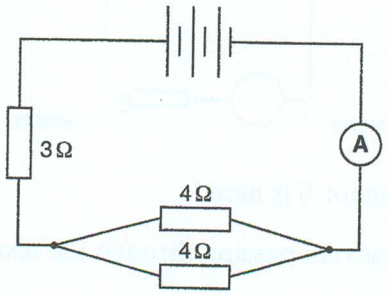
What is the potential difference across the resistors? Show your working. [2]

(2013/P2/A2)

Section B

Answer the following questions.

1. In the circuit shown, the battery consists of three cells. Each cell has an e.m.f. of 2 V.



(a) Electrical components in a circuit may be connected in series or in parallel.

In the diagram, how are

(i) the three cells connected,

(ii) the two 4 Ω resistors connected? [1]

(b) What is the total voltage of this battery? [1]

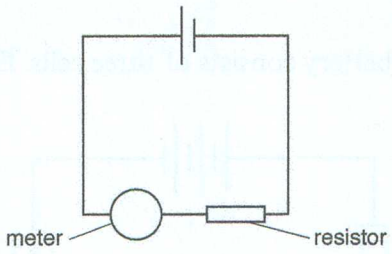
(c) (i) Calculate the combined resistance of the two 4 Ω resistors. [2]

(ii) What is the total combined resistance of all three resistors in this circuit? [1]

(d) Calculate the current flowing in the circuit. [2]

(2015/P2/B6a, b, c, d)

2. A circuit is set up as shown.



In the first experiment resistor S is used.

The meter measures the current passing through the resistor.

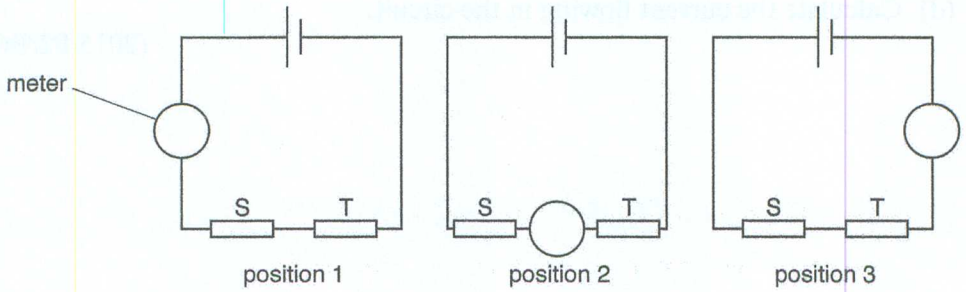
Resistor S is then replaced by resistor T.

The results obtained are shown in the table.

resistor	current/mA
S	290
T	520

(a) In a second experiment the student connects both resistors with the same cell as used in the first experiment.

The meter is then connected in turn in the positions shown in the following three circuit diagrams.



(i) Explain why the meter readings are the same in all three positions. [1]

(ii) Deduce how the readings on the meter in **(a)(i)** compare to the readings in the table shown.

Explain your answer. [2]

(b) In a third experiment, the student measures the **total** current in the circuit when resistors S and T are connected in parallel.

Draw the circuit diagram for this experiment. [2]

(2019/P2/B8b, c)