# Ohm's Law and Resistance in circuits

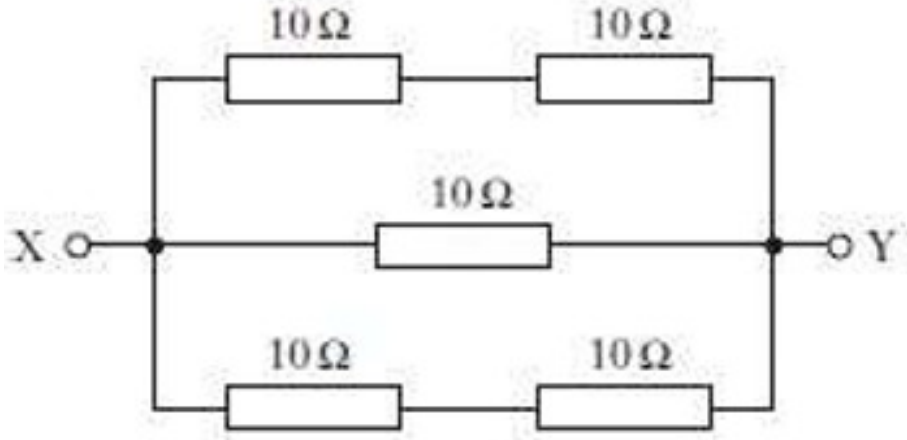
1. Measurements of the p.d. across a resistor and the current in the resistor give the following results.

p.d. = (30·00 ± 0·03) V
current = (2·00 ± 0·01) A

Use these results to calculate the resistance of the resistor and express your answer in the form

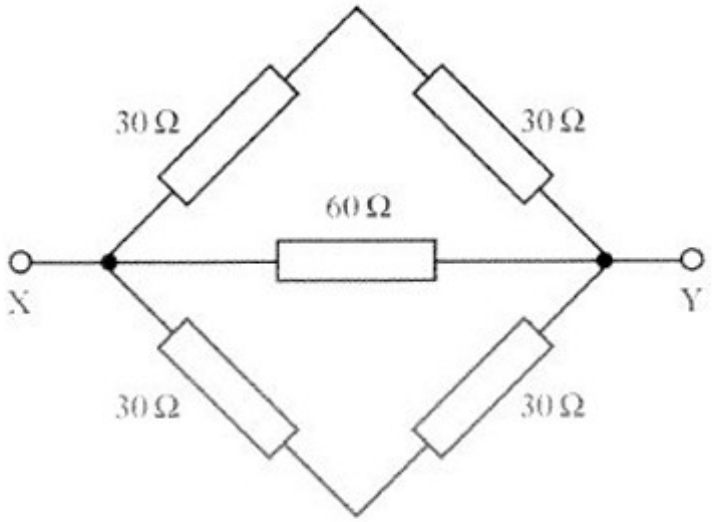
resistance ± uncertainty 6

2 The diagram shows part of an electrical circuit.




What is the resistance between X and Y?

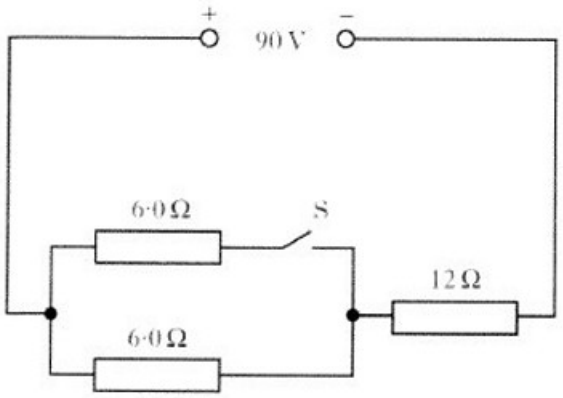
3 Five resistors are connected as shown.




The resistance between X and Y is

2

4 A circuit is set up as shown.




The internal resistance of the supply is negligible.

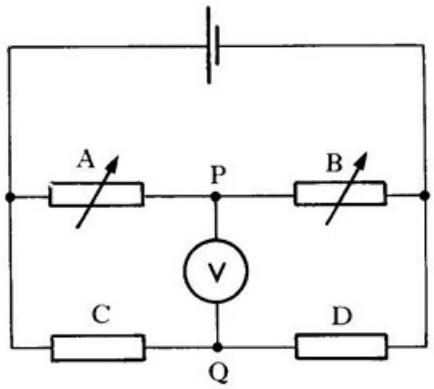
Which row in the table shows the potential difference (p.d.) across the 12 Ω resistor when switch S is open and when S is closed?

| | *p.d. across 12 Ω resistor when S is open/V* | *p.d. across 12 Ω resistor when S is closed/V* |
|---|---|---|
| A | 30 | 18 |
| B | 45 | 45 |
| C | 60 | 45 |
| D | 60 | 72 |
| E | 72 | 60 |

2

# Potential Dividers and Wheatstone Bridges

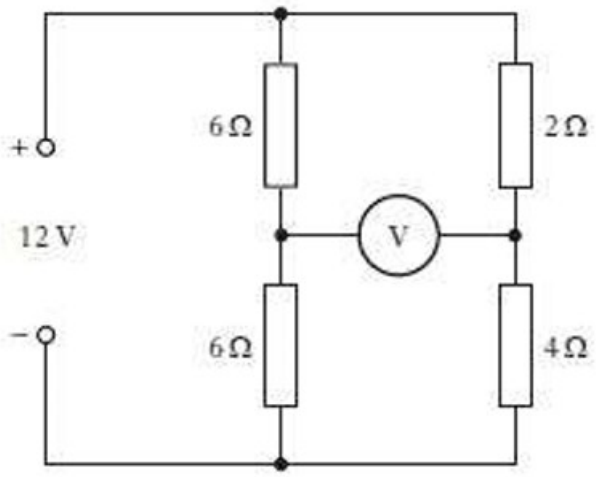
5 Two potential dividers are connected in parallel to form the Wheatstone bridge circuit shown below.




The reading on the voltmeter is 0 V.

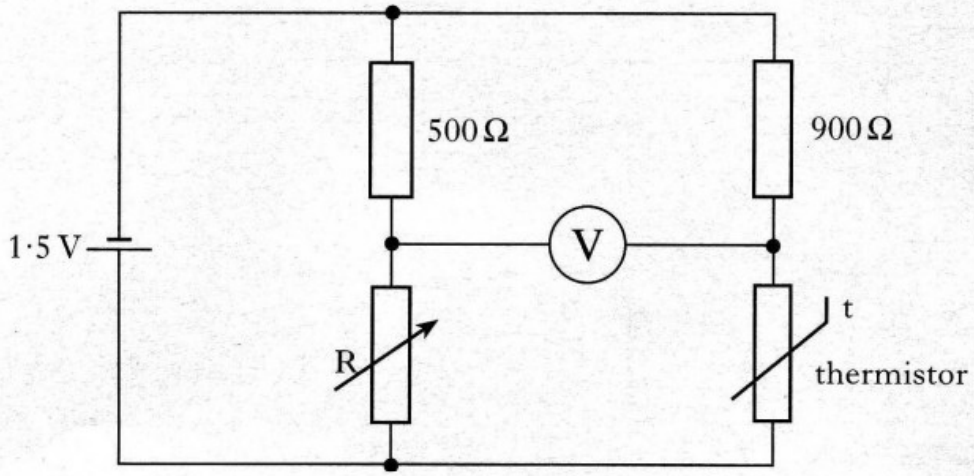
Describe how the resistances of A, B, C and D are related. 1

6. The following circuit is set up.




What is the reading on the voltmeter?

7 A pupil uses a Wheatstone bridge to investigate how the resistance of a thermistor is affected by its temperature. The circuit is shown below.




(*a*) The thermistor is placed in water at a temperature of 20 °C and the resistance of the variable resistor, R, is adjusted to 450 Ω to balance the bridge.

Calculate the resistance of the thermistor at this temperature. 2

(*b*) Several pupils use the circuit to find the resistance of the thermistor when the water temperature is 30 °C. The values they obtain are as follows.

852 Ω 854 Ω 848 Ω 851 Ω 853 Ω

Calculate:

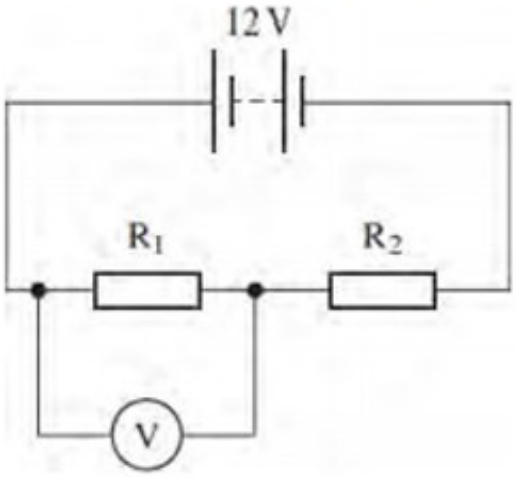
i) The **mean** of the values. 1

ii) The **random uncertainty** in the **mean**. 1

(c) Their teacher says that there may have been a systematic uncertainty in the investigation.

**Describe** what is meant by a **systematic uncertainty**. 1

8 The figure below shows two resistors, $R_1$ and $R_2$, connected in series with a battery of emf 12 V and negligible internal resistance.




(a) The reading on the voltmeter is 8.0 V and the resistance of $R_2$ is 60 Ω.

(i) Calculate the current in the circuit.

answer = ..... A

**(2)**

(ii) Calculate the resistance of $R_1$.

answer = ..... Ω

**(1)**

(iii) Calculate the charge passing through the battery in 2.0 minutes. Give an appropriate unit for your answer.

answer = ..... unit = .....

**(2)**

(b) In the circuit shown in the figure above $R_2$ is replaced with a thermistor. State and explain what will happen to the reading on the voltmeter as the temperature of the thermistor increases.

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**(3)**

**(Total 8 marks)**