Combinations of Resistors 1

A Level

Essential Pre-Uni Physics C1.1

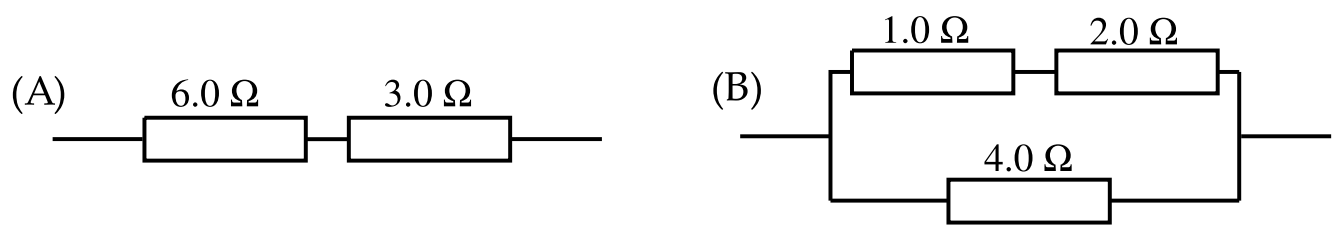

Figure 1: Two different resistor arrangements

Part A Combination (A)

What is the resistance of combination (A)? Answer to 2 significant figures.

Part B Combination (B)

What is the resistance of combination (B)? Answer to 2 significant figures.

Combinations of Resistors 2

A Level

Essential Pre-Uni Physics C1.2

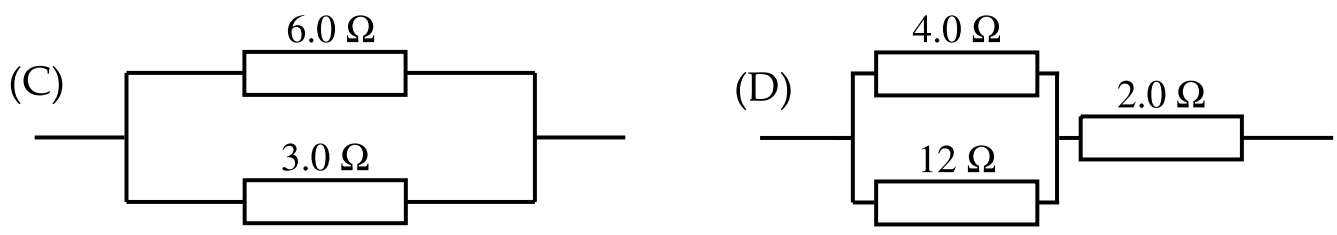

Figure 1: Two different resistor arrangements

Part A Combination (C)

What is the resistance of combination (C)? Answer to 2 significant figures.

Part B Combination (D)

What is the resistance of combination (D)? Answer to 2 significant figures.

Gameboard:

STEM SMART Physics Week 3 - Resistance

Combinations of Resistors 3

A Level

Essential Pre-Uni Physics C1.3

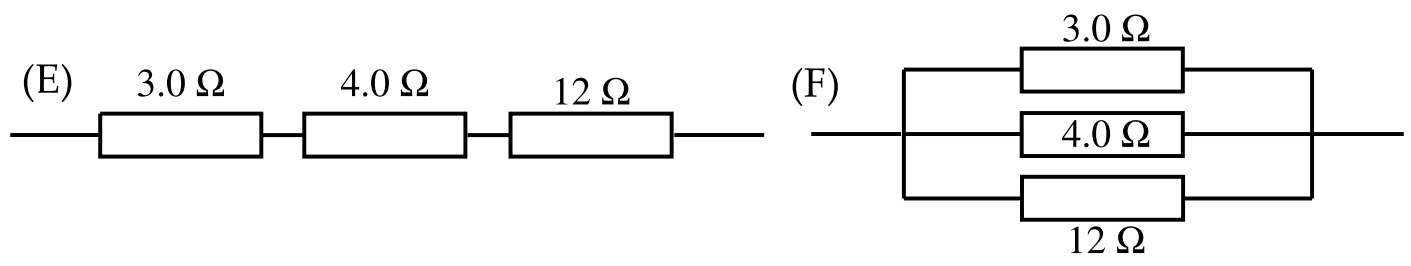

Figure 1: Two different resistor arrangements

Part A Combination (E)

What is the resistance of combination (E)? Answer to 2 significant figures.

Part B Combination (F)

What is the resistance of combination (F)? Answer to 2 significant figures.

Gameboard:

STEM SMART Physics Week 3 - Resistance

Combinations of Resistors 4

A Level

P P P

Essential Pre-Uni Physics C1.4

Complete the questions in the table.

Length / m	**Wire thickness**	**Resistivity** / $\Omega\,\mathrm{m}$	**Resistance** / Ω
68	cross sectional area: $2.1 \times 10^{-6}\,\mathrm{m}^2$	1.5×10^{-8}	R

What is the resistance R?

Gameboard:

STEM SMART Physics Week 3 - Resistance

Combinations of Resistors 8

A Level

Essential Pre-Uni Physics C1.8

Conventional domestic $13\,\mathrm{A}$ sockets are connected with copper cables with a cross sectional area of $2.5\,\mathrm{mm}^2$. Copper has a resistivity of $1.5\ \times 10^{-8}\,\Omega\,\mathrm{m}$. What is the resistance of $20\,\mathrm{m}$ of cable to 2 significant figures?

Gameboard:

STEM SMART Physics Week 3 - Resistance

Resistance Loop

A Level

C C C

A circular loop of radius $15\,\mathrm{cm}$ is made of wire with a uniform circular cross-section of diameter $3.0\,\mathrm{mm}$ and resistivity $1.5 \times 10^{-4}\,\Omega\,\mathrm{m}$. A $12\,\mathrm{V}$ battery of negligible internal resistance is connected to two diametrically opposite points A and B on the loop. The same type of wire and a switch S are used to connect points C and D, such that the lengths AC, CB, BD, DA are equal. Assume that the switch is small and ideal such that when the switch is closed the resistance between C and D is solely due to wire between C and D.

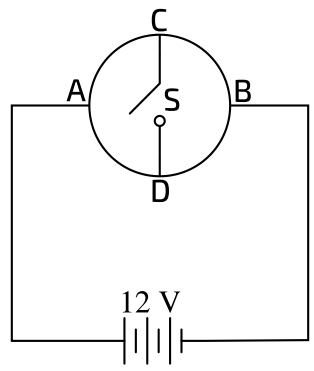

Figure 1: Circuit diagram showing the loop of resistive wire and how it is connected using the switch and the cell.

Part A Open switch current

What is the current I through the battery when S is open?

Part B Closed switch current

What is the current I through the battery when S is closed?

Adapted with permission from UCLES, A Level Physical Science, 1980, Paper 1, Question 10

Gameboard:

STEM SMART Physics Week 3 - Resistance

Combinations of Resistors 9

A Level

C C C

Essential Pre-Uni Physics C1.9

A high voltage wire for transmission of electricity across the country is made of 10 aluminium wires (resistivity of $2.5 \times 10^{-8}\,\Omega\,\mathrm{m}$) wound together with 15 copper wires (resistivity of $1.5 \times 10^{-8}\,\Omega\,\mathrm{m}$). If all of the wires have a radius of $2.0\,\mathrm{mm}$, calculate the overall resistance of $20\,\mathrm{km}$ of cable to two significant figures. (The aluminium is there to give strength to the cable.)

Gameboard:

STEM SMART Physics Week 3 - Resistance

Measuring Resistances

A Level

C C C

The unknown resistance R of a resistor can be measured by comparing with a $100\,\Omega$ standard. A potentiometer slide-wire, which consists of a bare wire with constant resistivity, so that contact can be made at any point along its length, is used to find two balance points where the current through the ammeter is zero, when A is connected to B or C.

When A is connected to B, the balance point was found to be when $l = 400\,\text{mm}$.

When A is connected to C, the balance point was found to be when $l = 588\,\text{mm}$.

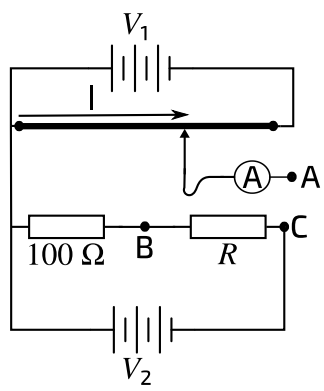

Figure 1: Circuit diagram showing the points A, B and C, the length l, and the resistances of the two resistors.

What is the value of R?

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