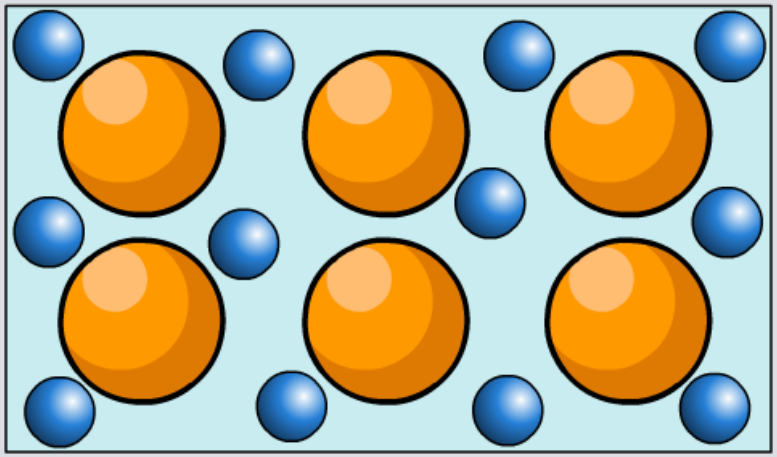
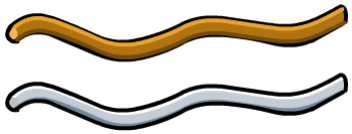
Factors Affecting Resistance 1



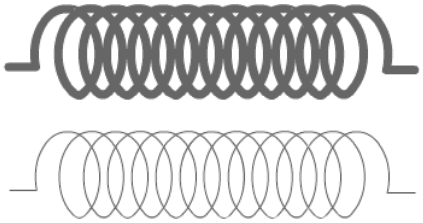
What affects resistance?

The resistance of a wire depends on several factors:

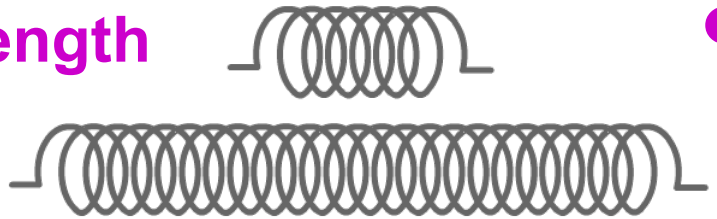
- **material**



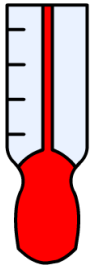
- **thickness**



- **length**



- **temperature**

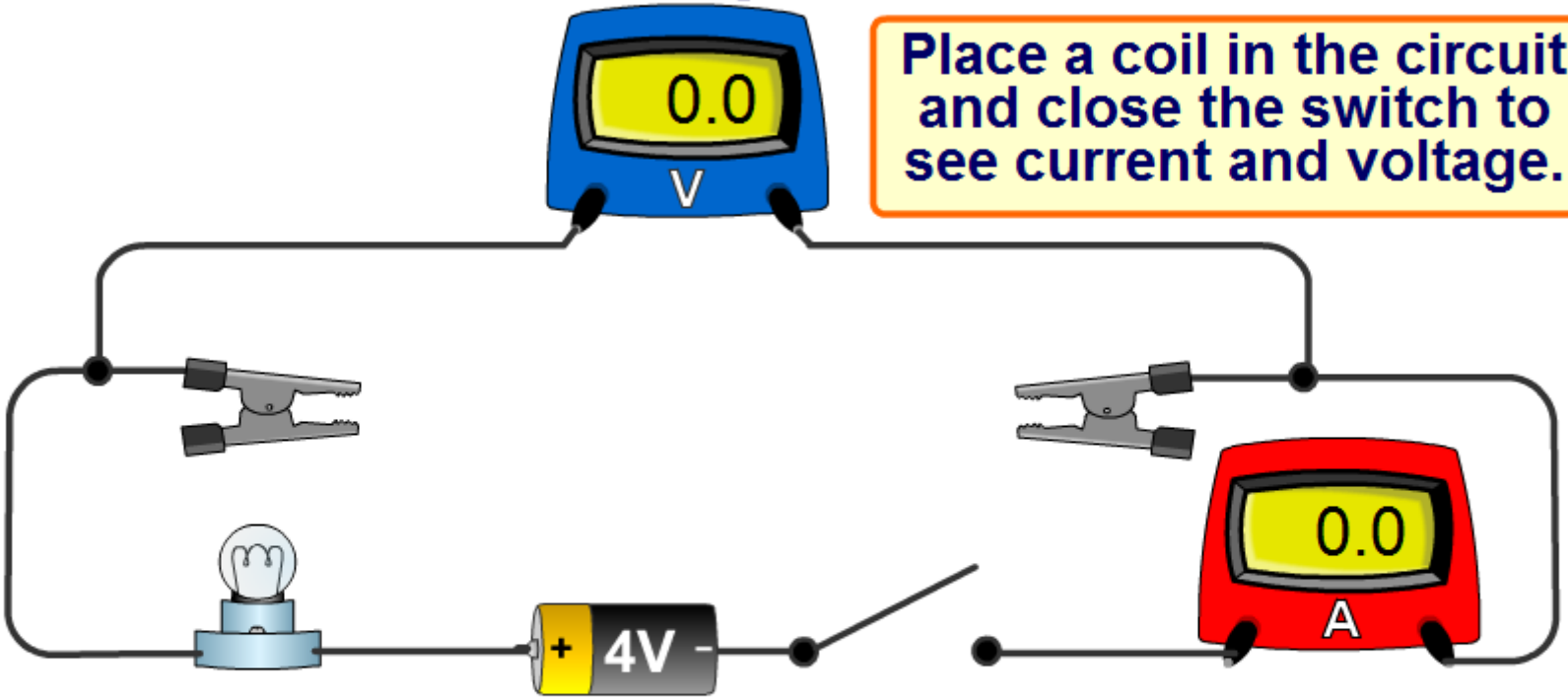


For example, a copper wire has a lower resistance than a nichrome wire of the same size. Copper's excellent ability to conduct electricity means it is often used in wiring.

What experiments could be used to test how length and thickness affect resistance?

Investigating resistance and length

What effect does length have on resistance?



How does length affect resistance?

The table shows the resistance of different lengths of wire.

What general pattern do these results show?

length (cm)	voltage (V)	current (A)	resistance (Ω)
5	2.6	5.0	0.52
10	2.9	4.3	0.67
20	3.1	2.1	1.48

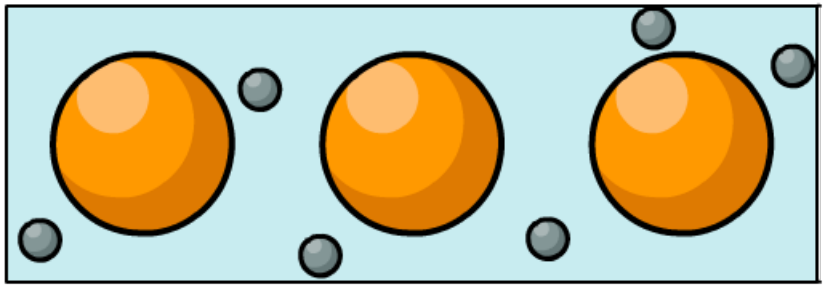
When the length of the wire increases, resistance increases.

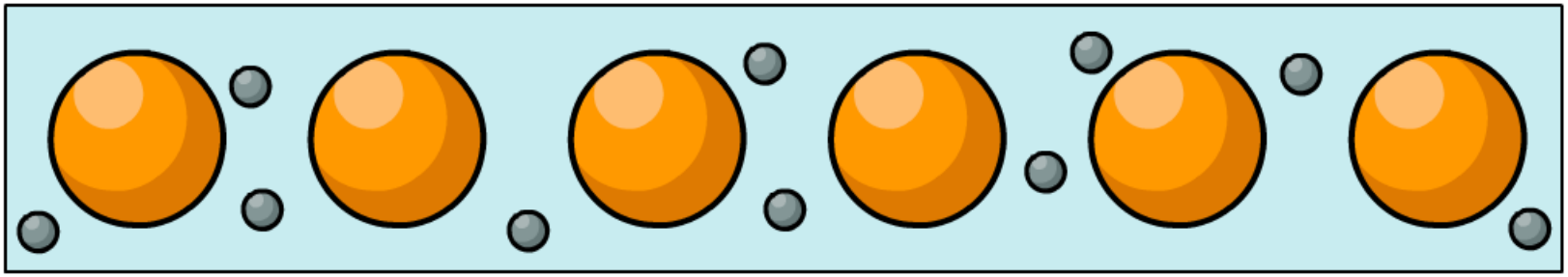
Why would increasing the length of the wire result in an increase in resistance?

Why does length affect resistance?

The effect of the length of a wire on its resistance can be understood by looking at its atomic structure.

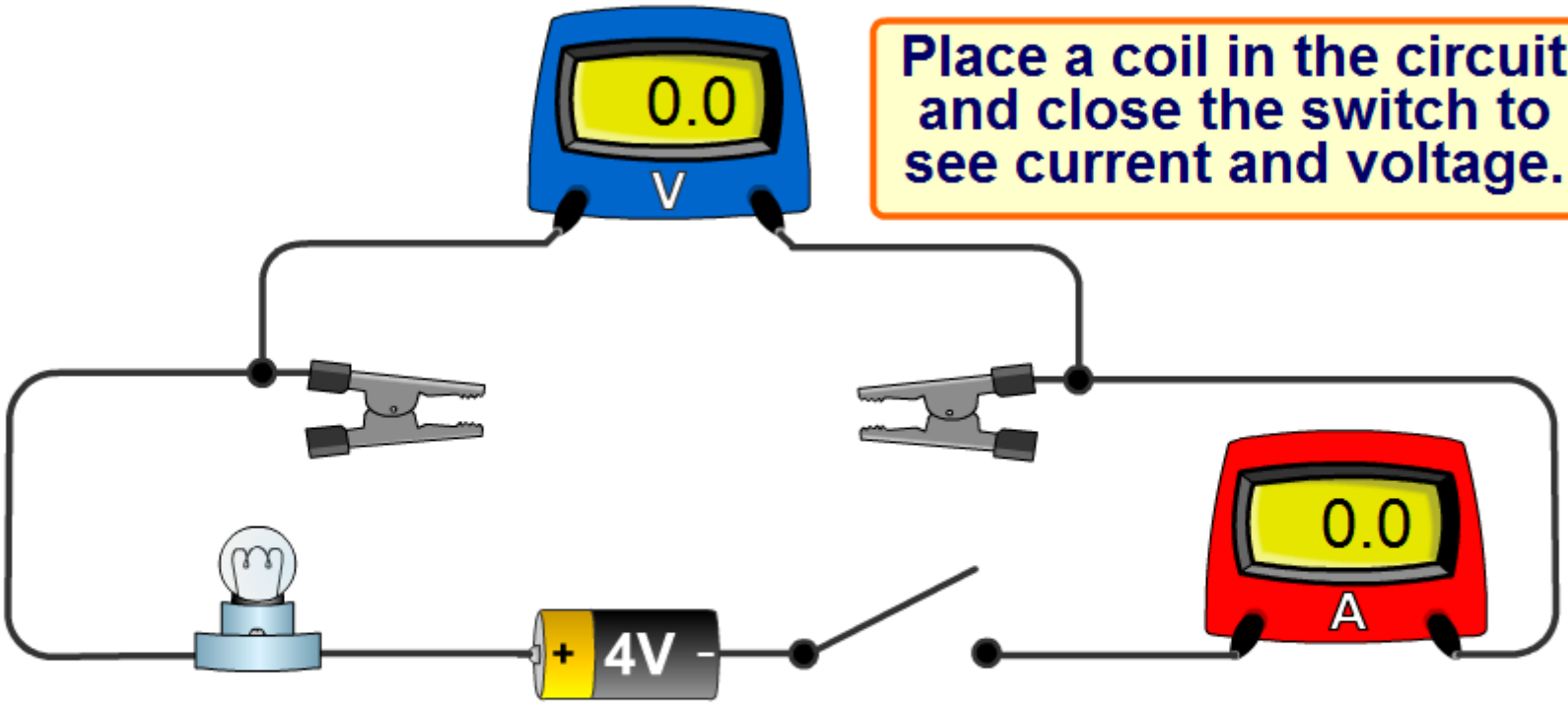
Resistance is caused by electrons colliding with metal ions. When the length of the wire is increased, the electrons have to travel further. This increases the chance of collisions, so the resistance will also increase.





Investigating resistance and thickness

What effect does thickness have on resistance?



How does thickness affect resistance?

The table shows the resistance of different thicknesses of wire.

What general pattern do these results show?

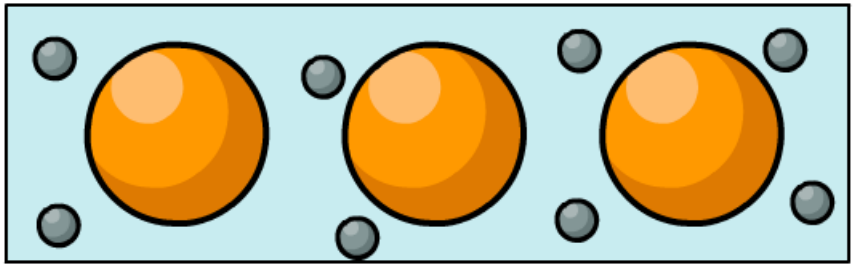
thickness (mm)	voltage (V)	current (A)	resistance (Ω)
1	3.1	2.1	1.48
2	2.9	4.3	0.67
4	2.6	5.0	0.52

When the thickness of the wire increases, resistance decreases.

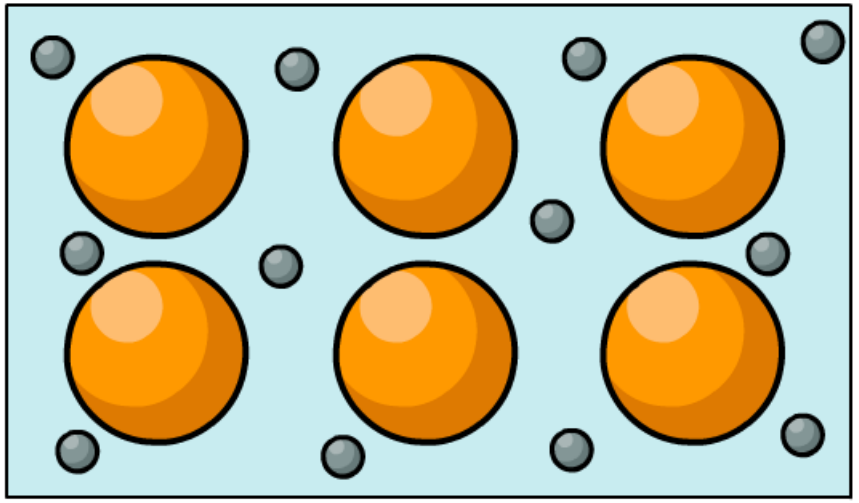
Why would increasing the thickness of the wire result in a decrease in resistance?

Why does thickness affect resistance?

Increasing the thickness of a wire increases the surface area through which the electrons can flow.



This decreases the chance of collisions with metal ions.



In thick materials, the charge-carrying particles are able to move through the conductor more easily, reducing resistance.

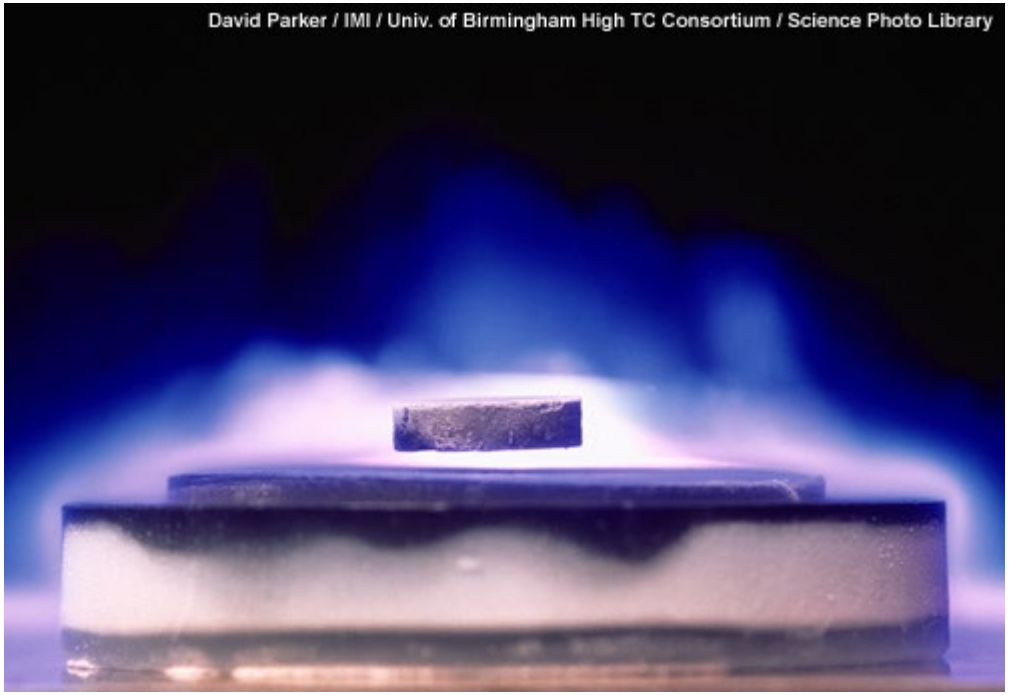
How does temperature affect resistance?

If a component obeys Ohm's law, then decreasing the temperature decreases the resistance of the material.

This is because the positively-charged ions in the metal do not vibrate as fast, and the electrons can flow more easily.

A **superconductor** is a material that conducts electricity with very little resistance at very low temperatures.

Superconductors can be used to make very fast circuits and to make magnets levitate.



Resistance – true or false?

Are these statements about resistance true or false?

1.	Resistance is caused by electrons colliding with metal ions as they flow through the metal.	
2.	The resistance of a wire depends on the material used to make the wire.	
3.	Copper wire has a higher resistance than nichrome wire.	
4.	A thick wire has a higher resistance than a thin wire.	
5.	A short wire has a lower resistance than a long wire.	
6.	Resistance is not affected by temperature.	

true false

? solve