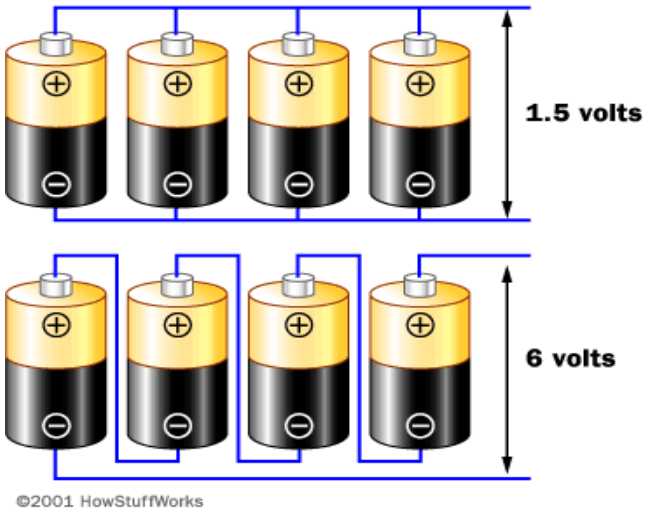
Complex Circuits

The two type of complex circuits are called series circuits and parallel circuits. In series circuits, the current flowing through a circuit can only take one path. In parallel circuits, the circuit has branching points and the current has multiple paths.



Series Circuits

A. In a series circuit, the current can only take one path. All the current flows through every part of the circuit. What we have studied so far have been series circuits. For example, if you have a battery, a light bulb, and one switch, everything is connected in series because there is only one path through the circuit.

B. To find the voltage, current, or resistance in a series circuit, you would use Ohm's law

C. However, finding resistance in a series circuit is a little different because there are multiple resistors in a series circuit.

D. To find the resistance in a series circuit, you must add all the resistance together.

$R_{total} = R_1 + R_2 \ldots$

This means that the total resistance in a series circuit is the sum of all resistance.

Parallel Circuits

A. A parallel circuit has at least one point where the circuit divides, creating more than one path for current to flow. Each path in the circuit is called a branch.

B. To find the voltage, current, or resistance in a parallel circuit, you would use Ohm's law $I = \frac{V}{R}$

C. However, finding resistance in a parallel circuit is a little different because there are multiple resistors in a parallel circuit.

D. To find resistance in a parallel circuit, you must use the formula

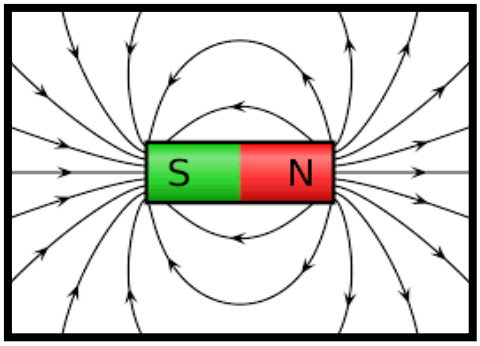
$$R_{total} = \frac{1}{R_1} + \frac{1}{R_2}$$

Magnetism

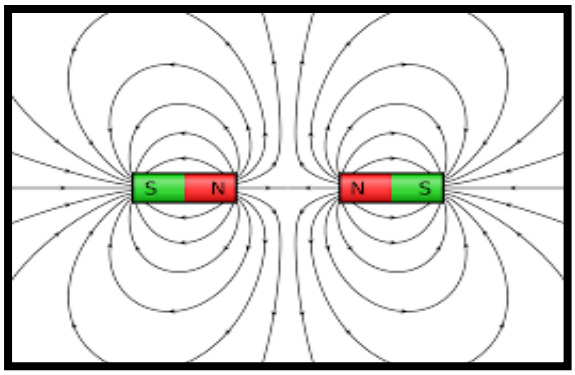
Magnetism – refers to the properties and interactions of magnets in which there is a force of attraction or repulsion between like or unlike poles.

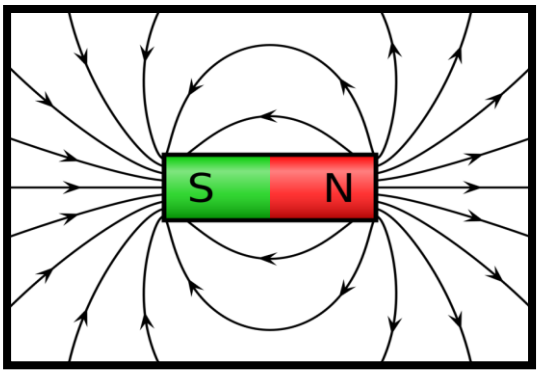
Strength of force between two magnets depends on the distance between them.

Magnetic field – exerts a force on other magnets and objects made of magnetic materials (strongest closed to magnet)



All magnets have a north pole and a south pole.





MAGNETIC MATERIALS

Only few metals, such as iron, cobalt, and nickel are attracted to magnets or can be made into permanent magnets.

Magnetic domains – group of atoms with aligned magnetic poles (too small to be seen with eye)

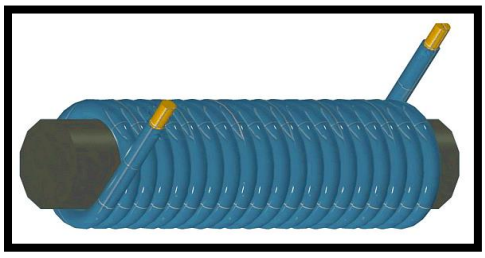
Permanent magnets are made by placing a magnetic material in a strong magnetic field, forcing magnetic domains to line up.

Magnetism and Electricity

When electric current flows through a wire, a magnetic field forms around the wire.

Strength of magnetic field depends on the amount of current flowing in the wire.

Electromagnets – a temporary magnet made by wrapping a wire coil carrying a current around an iron core.



Increases strength of the magnetic field by adding more turns to wire coil (solenoid) or increasing the current passing through the wire

Electric motor – a device that changes electrical energy into mechanical energy

In a simple electric motor, an electromagnet rotates between the poles of a permanent magnet.