Ohm's Law

Ohm's Law describes the relationship between potential difference, current and resistance.

The current flowing through a conductor at constant temperature is directly proportional to the potential difference across it and inversely proportional to the resistance of it.

Let us break this down further:

The **current flowing through** a conductor at constant temperature is directly proportional to the potential difference across it and inversely proportional to the resistance of it.

- Remember, current flows through components, so ammeters must be connected in series.

The current flowing through a conductor **at constant temperature** is directly proportional to the potential difference across it and inversely proportional to the resistance of it.

- If the temperature changes, Ohm's Law is no longer applicable.

The current flowing through a conductor at constant temperature is **directly proportional** to the potential difference across it and inversely proportional to the resistance of it.

- Directly proportional describes a relationship when the independent variable doubles, the dependent variable doubles and when the independent variable trebles, the dependent variable trebles, and so on.

The current flowing through a conductor at constant temperature is directly proportional to the **potential difference across** it and inversely proportional to the resistance of it.

- Remember, potential difference is the difference in energy at different points in the circuit, so voltmeters must be connected in parallel.

The current flowing through a conductor at constant temperature is directly proportional to the potential difference across it and **inversely proportional** to the resistance of it.

- Inversely proportional describes a relationship when the independent variable doubles, the dependent variable halves and when the independent variable trebles, the dependent variable thirds, and so on.

Hooke's Law (The Law of Elasticity) and The Limit of Proportionality

Hooke's Law describes the relationship between the force applied to an object and the resulting extension.

The extension of an elastic object is directly proportional to the force applied, provided that the limit of proportionality is not exceeded

Let us break this down further:

The **extension** of an elastic object is directly proportional to the force applied, provided that the limit of proportionality is not exceeded

- The extension is the change in length. So, it is the difference between the deformed length and the original length:

$$extension = deformed\ length - original\ length$$

- Extension is the difference in length in something being extended or compressed, it is just the difference in length and is always positive (compressed objects do not have a negative extension).

The extension of an **elastic object** is directly proportional to the force applied, provided that the limit of proportionality is not exceeded

- Hooke's Law does not apply to inelastic objects.

The extension of an elastic object is **directly proportional** to the force applied, provided that the limit of proportionality is not exceeded

- Directly proportional describes a relationship when the independent variable doubles, the dependent variable doubles and when the independent variable trebles, the dependent variable trebles, and so on.

The extension of an elastic object is directly proportional to the **force applied**, provided that the limit of proportionality is not exceeded

- When hanging a mass on a spring, it is the force that is extending it, not the mass. Remember, weight is the force and can be calculated using:

$$weight = mass\ x\ gravitiational\ field\ strength$$

$$W = mg$$

The extension of an elastic object is directly proportional to the force applied, **provided that the limit of proportionality is not exceeded**

- The limit of proportionality (or elastic limit) is the point at which Hooke's Law breaks down. If an elastic band or a spring is over-extended, it no longer returns to the original shape. The limit of proportionality has been exceeded and the extension is no longer directly proportional to the force applied. Before the limit of proportionality is exceeded, there is a linear relationship between force and extension. Beyond the limit of proportionality, there is a non-linear relationship between force and extension.