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Key ideas in GCSE Physics

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As you start a new school year, learning and revising for Physics can be daunting at first. But help is at hand! A small number of **key ideas** run through GCSE Physics. Keeping these in mind helps you link different parts of the course. In turn, that will help you make sense of Physics, understand each topic in context and push up your marks in the exams!



Key idea 1: Models and theories

Scientific models and theories can be used to explain natural processes. For example, the particle model of matter can be used to explain why an ice cube which is heated enough will melt, but it can also explain where air pressure comes from, and why a balloon will burst if we pump it up too much. The law of conservation of energy allows us to calculate the speed at which a rollercoaster car will hit a loop-the-loop, but it can also be used to explain why the Moon is (very) gradually drifting further from the Earth.

Key idea 2: Cause and effect

Every effect has at least one cause. Perhaps the best-known example of this comes from Newton's third law of motion, which states that *for every (action) force there is an equal and opposite (reaction) force* – if I push the ground with my feet, the ground pushes me back. The effect of this interaction of forces is what we call a *jump*. A wave will travel down a Slinky spring when we move it at one end, and a change in the nucleus of an atom will lead to the emission of ionising radiation.

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Key idea 3: Difference and change

Differences between things are what cause changes to occur. A cell (or battery) can be used to apply a potential difference across a circuit, which can allow charges to flow around the circuit. Differences in air pressure are what cause winds to blow, and they allow animals (including us) to breathe. Differences in temperature cause a warm building to transfer thermal energy to its surroundings on a cold day.

Key idea 4: Action at a distance

Some forces can act between two objects without physical contact. We call these non-contact forces. The gravitational force allows the Earth to orbit the Sun, a bar magnet can be used to pick up a steel paperclip from a distance of several centimetres, and a running Van de Graaff generator can give us an electric shock when we move a finger close to its dome.

Key idea 5: The scientific method

Scientific ideas develop by making hypotheses, carrying out experiments, and developing or modifying theories as a result of these experiments. We'll talk more about the scientific method and planning practical investigations in a later blog.

Key idea 6: The language of science

Laws and models which represent the world around us can be represented by using mathematics. This is what allows us to use science to predict things that we think might happen, such as by how many degrees the average global temperature will rise over the coming decades. Newton's second law ($F = ma$) allows us to explain why it is much more difficult to bring a lorry travelling at 60 mph to rest than a car which is travelling at the same speed. The mathematics which describe science also help us develop new technologies and build things such as smartphones and MRI scanners.

