



Key Stage 4 Physics National Curriculum Overview

Students should be taught about:

Energy

- energy changes in a system involving heating, doing work using forces, or doing work using an electric current: calculating the stored energies and energy changes involved
- power as the rate of transfer of energy
- conservation of energy in a closed system, dissipation
- calculating energy efficiency for any energy transfers
- renewable and non-renewable energy sources used on Earth, changes in how these are used

Forces

- forces and fields: electrostatic, magnetic, gravity
- forces as vectors
- calculating work done as force \times distance; elastic and inelastic stretching
- pressure in fluids acts in all directions: variation in Earth's atmosphere with height, with depth for liquids, up-thrust force (qualitative)

Forces and Motion

- speed of sound, estimating speeds and accelerations in everyday contexts
- interpreting quantitatively graphs of distance, time, and speed
- acceleration caused by forces; Newton's First Law
- weight and gravitational field strength
- decelerations and braking distances involved on roads, safety

Wave Motion

- amplitude, wavelength, frequency, relating velocity to frequency and wavelength
- transverse and longitudinal waves
- electromagnetic waves, velocity in vacuum; waves transferring energy; wavelengths and frequencies from radio to gamma-rays
- velocities differing between media: absorption, reflection, refraction effects
- production and detection, by electrical circuits, or by changes in atoms and nuclei
- uses in the radio, microwave, infra-red, visible, ultra-violet, X-ray and gamma-ray regions, hazardous effects on bodily tissues

Electricity

- measuring resistance using potential difference and current measurements
- exploring current, resistance and voltage relationships for different circuit elements; including their graphical representations
- quantity of charge flowing as the product of current and time
- drawing circuit diagrams; exploring equivalent resistance for resistors in series
- the domestic alternating current supply; live, neutral and earth mains wires, safety measures
- power transfer related to potential difference and current, or current and resistance



Magnetism and Electromagnetism

- exploring the magnetic fields of permanent and induced magnets, and the Earth's magnetic field, using a compass
- magnetic effects of currents, how solenoids enhance the effect
- how transformers are used in the national grid and the reasons for their use

The Structure of Matter

- relating models of arrangements and motions of the molecules in solid, liquid and gas phases to their densities
- melting, evaporation, and sublimation as reversible changes
- calculating energy changes involved on heating, using specific heat capacity; and those involved in changes of state, using specific latent heat
- links between pressure and temperature of a gas at constant volume, related to the motion of its particles (qualitative)

Atomic Structure

- the nuclear model and its development in the light of changing evidence
- masses and sizes of nuclei, atoms and small molecules
- differences in numbers of protons, and neutrons related to masses and identities of nuclei, isotope characteristics and equations to represent changes
- ionisation; absorption or emission of radiation related to changes in electron orbits
- radioactive nuclei: emission of alpha or beta particles, neutrons, or gamma-rays, related to changes in the nuclear mass and/or charge
- radioactive materials, half-life, irradiation, contamination and their associated hazardous effects, waste disposal
- nuclear fission, nuclear fusion and our Sun's energy

Space Physics

- the main features of the solar system