

# PHYSICS KS5



## Foundations of physics

How do we identify graphical treatment of errors and uncertainties such as; line of best fit; worst line; absolute and percentage uncertainties; percentage difference?

How do we check the homogeneity of physical equations using S.I. base units and use prefixes and their symbols?



## Motion

How do we interpret graphs of motion, and relate the gradient and the area under the graph to equations of motion?

How do we use the equations of motion for constant acceleration in a straight line, including motion of bodies falling in a uniform gravitational field without air resistance?



## Forces in action

How do we explain resultant force experienced by an object travelling through a different media?

How do we describe the motion of objects falling in a uniform gravitational field in the presence of drag?

**YR12**

## Charge and current

How do we explain current as the movement of electrons in metals and movement of ions in electrolytes?

How do we explain why the net charge on a particle or an object is quantised and a multiple of  $e$ ?

## Energy, power and resistance

How can we describe techniques and procedures used to investigate the electrical characteristics for a range of ohmic and non-ohmic components?

How can we describe and calculate energy transfers using  $eV = m v^2$  for electrons and other charged particles?

## Electrical circuits

How do we describe Kirchhoff's laws and explain how they are applied to a wide variety of electrical circuits?

How do we describe techniques and procedures used to determine internal resistance of a chemical cell or other source of e.m.f. and to determine values for components in a range of series and parallel circuits?



## Materials

How do we describe techniques and procedures used to investigate force-extension characteristics for arrangements which may include springs, rubber bands, and polythene strips?

How do we define stress, strain, and ultimate tensile strength and calculate the Young modulus of a material?



## Work, energy and power

How do we apply the principle of conservation of energy to produce quantitative and qualitative descriptions of a range of energy transfers?

How do we carry out calculations for situations involving the transfer of energy between different forms?

## Waves 2

How do we describe constructive interference and destructive interference in terms of path difference and phase difference?

How do we describe techniques and procedures used to determine the wavelength of light using a double-slits and a diffraction grating?

## Waves 1

How do we define displacement, amplitude, wavelength, period, phase difference, frequency, and speed of a wave?

How do we describe the electromagnetic spectrum and the properties of electromagnetic waves such as reflection, refraction, polarisation, and diffraction?



## Laws on motion and momentum

How do we explain Newton's three laws of motion, calculate linear momentum and apply the concept that net force = rate of change of momentum?

How do we define the principle of conservation of momentum and apply it in calculations?

## Thermal physics

How do we describe solids, liquids, and gases in terms of spacing, ordering, and motion of atoms or molecules?

How do we describe and calculate changes in internal energy during changes of phase?

## Quantum physics

How do we explain the particulate nature (photon model) of electromagnetic radiation by referring to the photoelectric effect?

How do we explain the idea that the maximum kinetic energy of the photoelectrons is independent of the intensity of the incident radiation?

## Ideal gases

How do we describe the model of the kinetic theory of gases and its assumptions?

How do we use the kinetic theory of gases to derive the equation of an ideal gas  $pV = nRT$ , where  $n$  is the number of moles?

## Gravitational fields

How do we understand the uniformity of gravitational field strength close to the surface of the Earth and its numerical equivalence to the acceleration of free fall?

How do we calculate the centripetal force on a planet from the gravitational force between it and the Sun?

## Oscillations

Can you explain why in isochronous oscillators the period of a simple harmonic oscillator is independent of its amplitude?

How do we explain graphical methods to relate the changes in displacement, velocity, and acceleration during simple harmonic motion?

## Circular motion

How do we calculate a constant net force perpendicular to the velocity of an object, which causes it to travel in a circular path?

How do we explain the period, frequency and angular velocity of an object in circular motion?

**YR13**

## Magnetic fields

How do we calculate the force on a charged particle travelling at right angles to a uniform magnetic field,  $F = BQv$ ?

How do we describe the movement of charged particles in a uniform magnetic field?

## Electric fields

How do we describe the motion of charged particles in a uniform electric field?

How do we describe electric potential as the work done in bringing a unit charge from infinity to a point?

## Capcitanace

How do we describe charging and discharging of capacitors in terms of the flow of electrons?

How do we explain exponential decay and the constant-ratio property of decay graphs?

## Stars

How do we describe the characteristics of neutron stars and black holes?

How do we describe the formation of a star from interstellar dust and gas in terms of gravitational collapse, fusion of hydrogen into helium, radiation, and gas pressure?

## Cosmology

How do we describe the evolution of the Universe after the Big Bang to the present?

How do we explain current ideas about the composition of the Universe in terms of dark energy, dark matter, and a small percentage of ordinary matter?

## Particle physics

How do we describe the classification, examples, and behaviour of the different families of particles?

How do we explain the simple quark model of hadrons in terms of up and down, and strange quarks and their anti-quarks?

## Radioactivity

How do we describe the nature, penetration and range of radiation active emissions, and the techniques used to investigate their absorption?

How do we demonstrate the nuclear decay equations for alpha, beta-minus and beta-plus decays?

## Nuclear physics

How do we demonstrate Einstein's mass-energy equation,  $\Delta E = \Delta mc^2$ ?

How do we understand how energy is released or absorbed in simple nuclear reactions?

## Medical imaging

How do we explain diagnosis using the gamma camera?

How do we define these X-ray attenuation mechanisms: simple scatter, photoelectric effect, Compton effect, and pair production?

## Exam preparation

- How can I make sure I am revising effectively for this subject?
- How do I memorise and recall knowledge I need for the exam?
- How do I maximise marks in this subject's exam?
- What are the gaps in my knowledge and how can I address them?
- How do I approach exam questions in this subject to ensure I reach the highest grade?
- What do I need to do to prepare myself for university courses?
- What do I need to do to prepare myself for employment?