Physics

YEAR 12

Foundations of Physics
- This module equips students with fundamental physical knowledge and skills, and mathematical tools, which will be needed throughout the A Level courses.
- Students will learn about S.I. base units, derived units, and unit prefixes; they will also reinforce and extend their skills in working with significant figures, standard form, and vectors.

Motion
- Students will explore the key ideas used to describe and analyse motion with constant acceleration in one and two dimensions.
- It will include a number of practical activities, including experiments that involve the use of graphs to establish physical relationships.

Circular motion
- Students will explore how objects can be made to move in a circle, and the equations and measurements connected with motion in a circle.

Oscillations
- The students will explore how the microscopic motion of atoms can be modelled using Newton's laws and how this provides us with an understanding of pressure and temperature.

Forces in action
- Students will examine the relationship between an object's motion and the resultant force it experiences and explain an object's lack of motion in terms of the zero vector sum of forces acting on it.
- They will develop the concepts of weight and centre of mass, drag and terminal velocity, and moments and torques.

Work, energy and power
- Students will understand and use equations for kinetic energy, gravitational potential energy, work, power, and efficiency.
- They will have opportunities to derive, rearrange, and substitute into equations, both linear and non-linear.

Materials
- Students will connect the concept of forces with the behaviour of materials under tension and compression.
- Students will learn about Hooke's law and the Young modulus, and how to draw and interpret force–extension and stress–strain graphs.

Laws of motion and momentum
- Students will enhance their understanding of Newton's three laws of motion.
- They will be introduced to the concepts of momentum and impulse are introduced and the principle of conservation of momentum applied to a range of situations.

Charge and current
- Students will explore the concepts of charge and electric current – a first step in understanding electricity and electrical circuits.

Energy, Power and Resistance
Students will explore many of the key variables and relationships that apply to electrical circuits: potential difference, electromotive force, resistance, resistivity, and power.

Electrical Circuits
- This chapter brings together earlier ideas s to explore realistic electrical circuits involving combinations of resistors and e.m.f.s.
- Potential dividers and their uses in sensor circuits are investigated.

Year 13

Ideal gases
- Students will explore how the microscopic motion of atoms can be modelled using Newton's laws and how this provides us with an understanding of pressure and temperature.

Thermal Physics
- Students are introduced to ideas around temperature, matter, specific heat capacity and specific latent heat.
- Students will learn about absolute zero and why sweating keeps us cool.

Waves 2
- Students will explore superposition and its consequences: interference and stationary waves.
- Practical work such as the Young double-slits experiment and the investigation of standing waves are an essential part of the learning.

Waves 1
- Students will explore properties and behaviours of waves, reviewing and extending concepts from Key Stage 4 study.
- They will also be introduced to the concepts of diffraction and polarisation.

Quantum Physics
- Students will explore quantum physics through the concept of wave–particle duality of photons and electrons, and the steps which led to this model.

Gravitational Fields
- Students will explore the nature of gravitational fields, along with practising calculations on a variety of aspects of gravitation, including Kepler's laws.

Stars
- Students will explore the different types of stars, and how stellar evolution can vary according to the star's mass.
- Students will be able to use observational evidence available from starlight is considered in terms of its collection and analysis.

Cosmology
- Students will explore measuring the distances to stars and galaxies, and their velocities.
- They will then discuss the implications for the development of the Universe from Big Bang to possible future ends.

Capacitance
- Students are introduced to charge storage by capacitors, and how they function in circuits for charging and discharging.
- They will become accustomed to a number of equations of varying complexity to be used, including logarithmic treatment of the charge stored, current and potential difference.

Electric Fields
- Students will explore electric fields as generated by separated or isolated charge. Radial and uniform fields, and the equations governing them, are explained in some detail, with practise using the equations.

Magnetic Fields
- Students will explore magnetic fields, initially in basic terms, but the majority of the treatment is with reference to electromagnetism in generators, transformers and particle accelerators such as the mass spectrometer.

Nuclear Physics
- Students will cover fission and fusion from the fundamental mass-energy relationship and considerations of binding energy per nucleon. It continues with the practicalities and social issues related to nuclear power.

Radioactivity
- Students will cover alpha, beta, gamma, fission, fusion, half-life, and applications of these.

Particle Physics
- Students are provided with knowledge and understanding of the atom, nucleus, the development of the model of the nuclear atom, and an introduction to the fundamental particles of the Standard Model.

Medical Imaging
- Students will bring together many areas of physics that they have now studied and extends them in real applications in medicine.

Revision of Physics – PPE's used to identify priority areas.

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