Curriculum Plans: Year 12 Physics teacher B

	Topic	Knowledge: By the end of the unit students will know:	Skills: What skills will students have developed by the end of this unit?	Key terms: What new key terms and vocabulary will be learnt in this unit?	Summative Assessment: How will pupils be assessed in this unit?
Michaelmas 1	3.2 Particles and Radiation	By the end of this unit, students will know: 1. Fundamental properties of particles, including protons, neutrons, electrons, and their charges and masses. 2. The concept of isotopes and nuclide notation. 3. The interactions between particles, antiparticles, and photons, including annihilation and pair production. 4. The four fundamental forces (gravity, electromagnetic, strong nuclear, weak nuclear) and their exchange particles. 5. The concept of baryon number, lepton number, and their conservation in interactions, including β− and β+ decay. 6. The photoelectric effect and the equation E=hf=hc/λ including the work function and stopping potential. 7. Concepts of ionization, excitation, and energy levels in atoms. 8. Wave-particle duality, including electron diffraction and the de Broglie wavelength formula λ=h/mv	. Performing conversions between energy units (eV to J and vice versa). 2. Interpreting line spectra and understanding photon emission in terms of transitions between energy levels. 3. Applying the photoelectric equation to explain the threshold frequency and stopping potential. 4. Using experimental setups to demonstrate key concepts such as the photoelectric effect, electron diffraction, and ionization. 5. Investigating the energy levels of hydrogen atoms using observations of line spectra. 6. Analyzing and explaining wave-particle duality and changes in diffraction patterns due to momentum changes.	1. **Nuclide Notation ($X^A{}_Z$)** - A notation representing atomic species based on their atomic and mass numbers. 2. **Photon** - A quantum of electromagnetic radiation. 3. **Baryon and Lepton Number** - Quantum numbers conserved in particle interactions. 4. **Antiparticle** - The counterpart of a particle with opposite charge and identical mass. 5. **Pair Production and Annihilation** - Processes where energy is converted into particle-antiparticle pairs and vice versa. 6. **Photoelectric Effect** - The emission of electrons from a material upon absorbing light energy above a threshold frequency. 7. **Work Function (ϕ)** - The minimum energy needed to release an electron from a material. 8. **Wave-Particle Duality** - The concept that particles, such as electrons, can exhibit both wave-like and particle-like behavior. 9. **de Broglie Wavelength** - The wavelength associated with a particle, given by λ=h/mv 10. **Energy Levels and Photon Emission** - The process of an electron transitioning	End of Topic Homework with past paper questions, peer assessed. End of topic test using past paper questions and retrieval of prior topics. Intervention questions to improve on areas of weakness.

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				between discrete energy levels, emitting a photon of a specific energy.	
Michaelmas 2 And Lent 1	3.5 Electricity	1. The basics of **electric current**, including the definition of current as the rate of flow of charge (I=ΔQ/ΔtI and potential difference as work done per unit charge (V=W/QV) 2. The concept of **resistance** and Ohm's Law (R=V/I), as well as the factors affecting resistance (temperature, material, length, and cross-sectional area). 3. **Resistivity** as ρ=RA/L, and how temperature influences resistance in materials like metals and thermistors. 4. The functioning of a **potential divider** and its applications in circuits using thermistors and light-dependent resistors (LDRs) to supply variable potential differences. 5. The definition and role of **electromotive force (emf)** and internal resistance in electrical circuits, including calculations of terminal potential difference in circuits where internal resistance is non-negligible (ϵ=I(R+r).	1. Constructing circuits from various components and measuring current and potential difference using ammeters and voltmeters. 2. Investigating the characteristics of **current-voltage relationships** in various components, such as ohmic conductors, diodes, and filament lamps. 3. Designing and constructing circuits that include series and parallel resistors, and performing calculations using the relationships between current, voltage, and resistance in these configurations. 4. Experimenting with and analyzing the behavior of **potential dividers**, including their application with thermistors and LDRs. 5. Investigating **emf** and **internal resistance** of cells and batteries through experimental methods.	1. **Electric Current** - The rate of flow of charge through a conductor. 2. **Potential Difference (Voltage)** - The work done per unit charge between two points in a circuit. 3. **Resistance** - The opposition to the flow of electric current, determined by the material and dimensions of the conductor. 4. **Resistivity** - A material-specific property that quantifies its resistance to the flow of electric current. 5. **Ohm's Law** - The relationship where the current through a conductor between two points is directly proportional to the voltage across the two points, provided physical conditions remain constant. 6. **Thermistor** - A temperature-dependent resistor whose resistance decreases as the temperature increases (NTC thermistor). 7. **Light-Dependent Resistor (LDR)** - A resistor whose resistance decreases with increasing light intensity. 8. **Electromotive Force (emf)** - The energy provided per coulomb of charge by an energy source such as a battery.	End of Topic Homework with past paper questions, peer assessed. End of topic test using past paper questions and retrieval of prior topics. Intervention questions to improve on areas of weakness. RP5 and RP6

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Lent 2	3.4.2 Materials	1. The concepts of **density** (ρ=m/V) and how it applies to different materials. 2. **Hooke's Law**, describing the relationship between force and extension for materials under tension (F=kΔL), including the concept of the **elastic limit**. 3. The definitions of **tensile strain** and **tensile stress**. 4. The concept of **elastic strain energy** stored in materials under tension and the **breaking stress** at which materials fail. 5. Energy stored in stretched materials as E=1/2FΔL, represented as the area under the force-extension graph. 6. Description and distinction between **plastic behavior**, **fracture**, and **brittle behavior** in materials, including the interpretation of **stress-strain curves**.	1. Applying **Hooke's Law** to solve problems involving forces and extension of materials. 2. Analyzing **stress-strain curves** to determine material properties such as the elastic limit and breaking point. 3. Performing experiments to measure and compare the **stiffness** of different materials using force-extension graphs. 4. Estimating the **volume** of irregular objects and calculating their **density** using experimental techniques. 5. Investigating **elastic strain energy** and applying it to practical situations where materials are deformed.	1. **Density** - Mass per unit volume of a material. 2. **Hooke's Law** - The relationship between force and extension in elastic materials, where F=kΔL. 3. **Elastic Limit** - The maximum force that can be applied to a material without causing permanent deformation. 4. **Tensile Stress** - The force applied per unit cross-sectional area of a material. 5. **Tensile Strain** - The extension per unit length of a material under stress. 6. **Elastic Strain Energy** - The energy stored in a material when it is stretched or compressed, up to its elastic limit. 7. **Breaking Stress** - The stress at which a material will fail and break. 8. **Plastic Behavior** - Permanent deformation of a material when the stress exceeds the elastic limit. 9. **Brittle Behavior** - The tendency of a material to fracture without significant deformation under stress.	End of Topic Homework with past paper questions, peer assessed. End of topic test using past paper questions and retrieval of prior topics. Intervention questions to improve on areas of weakness. RP4
Trinity 1 And Trinity 2	Periodic Motion 3.6.1 Circular Motion and SHM.	1. The concepts of **circular motion**, including angular speed ω=v/r=2πf, and centripetal force F=mv^2/r. 2. The definition and conditions for **simple harmonic motion (SHM)**, expressed as a$\propto$−x and a= −ω^2x. 3. The relationship between displacement, velocity, and acceleration in SHM, and how these	1. Analyzing the **circular motion** of objects, calculating centripetal forces, and determining the angular speed of rotating bodies. 2. Experimentally investigating **simple harmonic motion (SHM)**	1. **Angular speed (ω)** - The rate of change of angular displacement, measured in radians per second. 2. **Centripetal force** - The inward force required to keep an object moving in a circular path. 3. **Simple harmonic motion (SHM)** - Oscillatory motion where the acceleration	End of Topic Homework with past paper questions, peer assessed. End of topic test using past paper questions and retrieval of prior topics. RP 7

		can be represented graphically (e.g., x=Acos(ωt). 4. The maximum speed and acceleration in SHM (v_{max} = ωA and a_{max}=ω^2A). 5. The behavior of **mass-spring systems** and **simple pendulums** in SHM, including time periods T=2π$\sqrt{m/k}$ and T=2π $\sqrt{l/g}$. 6. **Energy changes** in SHM, involving potential energy (Ep) and kinetic energy (Ek), and the total energy being conserved during oscillations. 7. The effects of **damping** and **resonance** in oscillatory systems, particularly in real-world applications.	using systems like a mass-spring setup or a pendulum. 3. Plotting and interpreting graphs of **displacement, velocity, and acceleration** for systems in SHM, and using data loggers to record motion. 4. Applying equations for SHM to calculate maximum speeds, accelerations, and periods for different systems (e.g., springs, pendulums). 5. Investigating the effects of **damping** on oscillations and understanding how resonance affects the amplitude and frequency of oscillatory systems.	of the object is directly proportional to its displacement from the equilibrium position and directed toward it. 4. **Amplitude (A)** - The maximum displacement from the equilibrium position in SHM. 5. **Resonance** - The phenomenon that occurs when an oscillatory system is driven at its natural frequency, leading to a large increase in amplitude. 6. **Damping** - The process by which the amplitude of oscillations decreases over time due to energy loss (e.g., through friction). 7. **Mass-spring system** - A common example of SHM where a mass attached to a spring oscillates with a period dependent on the mass and spring constant. 8. **Simple pendulum** - A pendulum exhibiting SHM for small displacements, with a time period dependent on its length and gravitational acceleration.	Intervention questions to improve on areas of weakness.