**12 ATAR PHY Syllabus Change 2022**

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| **Course** | **Syllabus change** |
| Year 12 ATAR Physics | The following content in the syllabus has been revised:  **Unit 4 – Science Understanding**  **Wave particle duality and the quantum theory**   * a wave model explains a wide range of light-related phenomena, including reflection, refraction, dispersion, diffraction and interference, such as in Young’s double-slit experiment. A transverse wave model is required to explain polarisation * on the atomic level, electromagnetic radiation is emitted or absorbed in discrete packets called photons. The energy of a photon is proportional to its frequency. The constant of proportionality, Planck’s constant, can be determined experimentally using the photoelectric effect and the threshold voltage of coloured LEDs   *This includes applying the relationships*   * black body radiation and the photoelectric effect are explained using the concept of light quanta * the Bohr model of the hydrogen atom integrates light quanta and atomic energy states to explain the specific wavelengths in the hydrogen spectrum and in the spectra of other simple atoms; this model enables line spectra to be correlated with atomic energy-level diagrams and explains the phenomenon of fluorescence and phosphorescence * on the atomic level, energy and matter exhibit the characteristics of both waves and particles. Young’s double slit experiment is explained with a wave model but produces the same interference and diffraction patterns when one photon at a time or one electron at a time are passed through the slits   *This includes applying the relationship*  **Special relativity**   * the concept of mass-energy equivalence emerged from the special theory of relativity and explains the source of the energy produced in nuclear reactions. The mass of an object is constant and independent of its motion   *This includes applying the relationship*   * The total energy of a moving object is the sum of the energy due to its mass at rest and kinetic energy   *This includes applying the relationships*    **The Standard Model**   * the Big Bang theory explains the expansion of space, which is measured by redshift and is supported by Hubble’s law   *This includes applying the relationship*   * high-energy particle accelerators use electric and magnetic fields to accelerate particles   *This includes deriving, understanding and applying the relationship*   * mass-energy equivalence and the motion of high energy particles in accelerators can be used to test theories of particle physics, including the Standard Model * baryons and mesons are hadrons, which are composite particles made up of quarks * the Standard Model is based on the premise that all matter in the universe is made up from elementary matter particles called quarks and leptons and their corresponding antiparticles. Fundamental particles interact via the four fundamental forces * lepton number, baryon number and electric charge are quantities that are conserved in all interactions between particles; these conservation laws can be used to support or invalidate proposed reactions |