

SJBC Curriculum Termly Plan: Year 12 A-Level Physics

Term	Topic(s) and links to other subjects	Core Knowledge	Core Vocabulary	Assessment	Resources
Autumn 1	<p>Unit 1 Particle Physics</p> <p>Links to Maths Standard form and SI units Ratios (specific charge = charge ÷ mass) Rearranging formulas (e.g. $E = hf = hc/\lambda$) Conservation principles (balancing equations) Interpreting and constructing graphs (e.g. decay curves) Using MeV and unit conversions Vector quantities (momentum)</p> <p>Chemistry Atomic structure (protons, neutrons, electrons, isotopes) Nuclide notation (Z, A) Ion formation and charge Mass number vs atomic number Radioactive decay (alpha, beta) Isotopic data and relative atomic mass</p>	<ul style="list-style-type: none"> Subatomic particles: proton, neutron, electron – charge and mass Specific charge = charge ÷ mass Nuclide notation: Z (proton no.), A (nucleon no.) Isotopes = same Z, different A Strong force: attraction (~3 fm), repulsion (<0.5 fm) Alpha and beta-minus decay equations Neutrino ensures energy conservation in beta decay Every particle has an antiparticle (e.g. $e^- \leftrightarrow e^+$) Compare mass, charge, energy (MeV) Photon model: $E = hf = hc/\lambda$ Four forces: gravity, EM, weak, strong Exchange particles: virtual photon, W^+/W^- Weak: β decay, e^- capture, e^--proton collisions Simple Feynman diagrams for interactions 	<p>Proton, Neutron, Electron Charge, Mass, Specific Charge Nuclide Notation, Proton Number (Z), Nucleon Number (A) Isotope, Isotopic Data Strong Nuclear Force, Femtometre (fm) Alpha Decay, Beta-minus (β^-) Decay, Neutrino Antiparticle, Positron, Antiproton, Antineutron, Antineutrino Mass, Charge, Rest Energy (MeV) Photon, Planck Constant (h), Electromagnetic Radiation, $E = hf = hc/\lambda$ Fundamental Forces: Gravity, Electromagnetic, Weak, Strong Exchange Particles: Virtual Photon, W^+, W^- Weak Interaction, Electron Capture, Electron-Proton Collision Feynman Diagram</p>	<p>Weekly MCQ and short answer questions along with extended writing bi-weekly.</p>	<p>A Level Physics Online youtube channel UpLearn</p>

	<p>Strong nuclear force and nuclear stability</p>	<ul style="list-style-type: none"> • Hadrons: baryons (p, n), mesons (π, K) • Proton = only stable baryon; neutron decays • Baryon number conserved • Leptons: e^-, μ^-, ν_e, ν_μ – weak only • Lepton number conserved (e and μ types) • Muon decays into electron • Strange particles: made by strong, decay by weak • Strangeness: conserved in strong, changes ± 1 or 0 in weak • Quarks: up, down, strange – with charge, baryon no., strangeness • Baryons = 3 quarks, mesons = quark + antiquark • Quark change in β decay (e.g. $d \rightarrow u$) • Laws conserved: charge, baryon no., lepton no., strangeness, energy, momentum • Particle physics is collaborative science 	<p>Hadron, Baryon, Meson, Pion (π), Kaon (K) Baryon Number, Conservation Laws Lepton, Muon (μ), Electron Neutrino (ν_e), Muon Neutrino (ν_μ) Lepton Number, Muon Decay Strangeness, Strange Particle, Strange Quark Quark: Up (u), Down (d), Strange (s), Antiquark Beta Decay (Quark Change) Conservation: Charge, Baryon Number, Lepton Number, Strangeness, Energy, Momentum Particle Physics, Collaboration</p>		
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	<p><u>Unit 2 Quantum Mechanics</u></p>	<ul style="list-style-type: none"> ☐ Photoelectric effect: emission of electrons from a surface when exposed to UV/visible light ☐ Photon model: EM radiation is made of photons, each with energy $E = hf$ ☐ $E = hf$: energy of a photon is proportional to frequency ☐ Photon energy must be \geq work function (ϕ) to emit electrons ☐ Maximum kinetic energy of photoelectrons depends on frequency, not intensity ☐ Photoelectric current \propto intensity (more photons per second) ☐ Work function (ϕ): minimum energy to release an electron from a surface ☐ Threshold frequency (f_0): minimum frequency to release photoelectrons ☐ Stopping potential: voltage needed to stop emitted photoelectrons (related to max KE) ☐ Photoelectric equation: $hf = \phi + \frac{1}{2}mv^2$ (max KE) ☐ Electronvolt (eV): unit of energy, $1 \text{ eV} = 1.6 \times 10^{-19} \text{ J}$ ☐ Unit conversion: $\text{J} \leftrightarrow \text{eV}$, $\text{J} \leftrightarrow \text{kWh}$ ☐ Ionisation: electron completely removed from atom 	<ul style="list-style-type: none"> ☑ Photon, Frequency (f), Energy ($E = hf$), Planck constant (h) ☑ Photoelectric effect, Threshold frequency (f_0), Work function (ϕ), Stopping potential ☑ Maximum kinetic energy, Photoelectric current, Intensity ☑ Electronvolt (eV), Joule (J), Kilowatt-hour (kWh), Unit conversion ☑ Ionisation, Excitation, De-excitation, Fluorescent tube ☑ Line spectrum, Discrete energy levels, Energy transition ($E_1 - E_2$) ☑ Wave-particle duality, Particle nature of light, Wave nature of electrons ☑ de Broglie wavelength ($\lambda = h/mv$), Momentum (mv), Diffraction ☑ Scientific method, Peer review, Validation 		
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Autumn 2	Unit 3 : Electrical Circuits	<p>☑ Ohm's Law and its application: $V=IRV = IRV=IR$; understanding of resistance, current, and potential difference.</p> <p>☑ Kirchhoff's Laws:</p> <ul style="list-style-type: none"> • First law (conservation of charge) • Second law (conservation of energy) <p>☑ Equations for power and energy:</p> <ul style="list-style-type: none"> • $E=IVtE = IVtE=IVt$, $P=IVP = IVP=IV$, $P=I^2RP = I^2RP=I^2R$, $P=V^2RP = \frac{V^2}{R}P=RV^2$ <p>☑ Internal resistance and emf:</p> <ul style="list-style-type: none"> • $\epsilon=E/Q\epsilon = E/Q\epsilon=E/Q$, $\epsilon=I(R+r)\epsilon = I(R+r)$, terminal p.d. vs emf <p>☑ Resistors in series and parallel:</p> <ul style="list-style-type: none"> • Series: $R_T=R_1+R_2+R_3\dots R_T = R_1 + R_2 + R_3 \dots RT=R_1+R_2+R_3\dots$ • Parallel: $\frac{1}{R_T}=\frac{1}{R_1}+\frac{1}{R_2}+\frac{1}{R_3}\dots \frac{1}{R_T} = \frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3} \dots RT=1/R_1+1/R_2+1/R_3\dots$ <p>☑ Current-voltage (I–V) characteristics for:</p> <ul style="list-style-type: none"> • Ohmic conductors, filament lamps, and diodes <p>☑ Resistivity: definition and use of $\rho=RAI\rho = \frac{RA}{l}\rho=IRA$</p> <p>☑ Electric current: defined as the flow of charge; use of $\Delta Q=I\Delta t\Delta Q = I \Delta t \Delta Q=I\Delta t$</p> <p>☑ Potential difference and the volt: $V=W/QV = W/QV=W/Q$; understanding p.d. as energy per unit charge</p> <p>☑</p>	<p>Here is the core vocabulary based on the 10 selected core content points, with related terms grouped on the same line to reduce length:</p> <ul style="list-style-type: none"> • Ohm's Law, Resistance (R), Current (I), Potential Difference (V) • Kirchhoff's First Law, Kirchhoff's Second Law, Conservation of Charge, Conservation of Energy • Power (P), Energy (E), $E=IVtE = IVt$, $P=IVP = IV$, $P=I^2RP = I^2R$, $P=V^2RP = \frac{V^2}{R}$ • Electromotive Force (emf, $\epsilon\epsilon = E/Q$), Terminal p.d., Internal Resistance (r), $\epsilon=I(R+r)\epsilon = I(R+r)$ • Series Circuit, Parallel Circuit, Combined Resistance • Ohmic Conductor, Filament Lamp, Semiconductor Diode, I–V Characteristic • Resistivity ($\rho\rho$), Length (l), Cross-sectional Area (A), $\rho=RAI\rho = \frac{RA}{l}$ • Electric Current, Charge (Q), Time (t), $Q=ItQ = It$ • Potential Difference (V), Work Done (W), $V=W/QV = W/Q$ 	<p>Weekly MCQ and short answer questions along with extended writing bi-weekly.</p>	<p>A Level Physics Online youtube channel</p> <p>UpLearn</p>
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Spring 1					

Spring 2					

Summer 1					
Summer 2					