Personalised Learning Checklist

	Red	Amber	Green
AQA A Level Physics **--P1 Measurements and their Errors** **-P1.1 Use of SI units and their prefixes**			
Know the fundamental base and standard index units			
Be able to derive standard index units			
Be able to use standard index prefixes and standard form			
Be able to convert between different units of the same quantity, i.e. J and eV, J and KWh			
-P1.2 Limitation of physics measurements			
Be aware of the difference between random and systematic errors and be able to give examples			
Know the definitions for precision, repeatability, reproducibility, resolution and accuracy			
Know the difference between absolute, fractional and percentage uncertainties			
Be able to combine absolute and percentage uncertainties			
Be able to represent uncertainty in a data point on a graph using error bars			
Be able to determine uncertainties in the gradient and intercept of a straight-line graph			

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AQA A Level Physics **--P2 Particles and Radiation** **-P2.1 Constituents of the atom**			
Know the simple model of the atom, including proton, neutron and electron			
Know the charge and mass of the proton, neutron and electron in SI units and relative units			
Know the specific charge of the proton and the electron and of nuclei and ions			
Know the nuclide notation of Proton Number Z, and Nucleon Number A			
Know the meaning of isotopes and the use of isotopic data			
-P2.2 Stable and unstable nuclei			
Know the role of the strong nuclear force including distances of short range attraction and very-short range repulsion			
Know the equations for Alpha and Beta minus decay including the need for the neutrino			
Describe why the neutrino was hypothesised to account for the conservation of energy in beta decay			
-P2.3 Particles, anti-particles and photons			
Show awareness that for every type of particle there is a corresponding anti-particle			
Be able to compare particle and anti-particle masses, charge and rest energy in MeV			
Know the anti-particles for electron, proton, neutron and neutrino			
Describe the photon model of electromagnetic radiation			
Know and use $E=hf=hc/\lambda$			
Knowledge of annihilation and pair production and the energies involved			
-P2.4 Particle interactions			
Know the four fundamental interactions			
Describe the concept of exchange particles to explain forces between elementary particles			
Describe the weak interaction limited to Beta- and Beta+ decay, electron capture and electron-proton collisions; W+ and W- as the exchange particles			
Be able to draw and interpret simple diagrams to represent the above reactions in terms of incoming and outgoing particles and exchange particles			
-P2.5 Classification of particles			
Know that hadrons are subject to the strong interactions			
Know the two classes of hadrons, baryons and mesons			
Know the proton is the only stable baryon into which other baryons eventually decay			

Know the pion is the exchange particle of the strong nuclear force			
Know that the kaon is a particle that can decay into pions			
Know that leptons are subject to the weak interaction			
Be able to list leptons: electron, muon, neutrino (electron and muon types only) and their anti-particles			
Know the muon is a particle that decays into an electron			
Know that strange particles are particles produced through the strong interaction and decay through the weak interaction			
Know that strangeness can change by 0, +1 or -1 in weak interactions			
Appreciate that particle physics relies on the collaborative efforts of large teams of scientists and engineers to validate new knowledge			
-P2.6 Quarks and anti-quarks			
Know that quarks possess charge, baryon number and strangeness			
Know the combinations of quarks and anti-quarks required for; baryons (protons and neutrons only), antibaryons (antiproton and antineutron only) and mesons (pion and kaon only)			
Knowledge of properties of up, down, and strange quarks and their anti-quarks			
Knowledge of neutron decay			
-P2.7 Applications of conservation laws			
Know the change in quark structure in B- and B+ decay			
Apply the conservation laws for charge, baryon number, lepton number and strangeness to particle interactions			
Recognise that energy and momentum are conserved in interactions			
-P2.8 The photoelectric effect			
Explain what threshold frequency, work function and stopping potential are.			
Know and use $hf=\phi=E_{k(max)}$			
Know that $E_{k(max)}$ is the maximum kinetic energy of the photoelectrons			
-P2.9 Collisions of electrons with atoms			
Show understanding of ionisation and excitation in florescent tubes			
Show understanding of what the electron volt represents			
Convert eV into J and vice versa			
-P2.10 Energy levels and photon emission			
Describe how line spectra give evidence for transitions between discrete energy levels in atoms			
Know and use $hf=E_1-E_2$			
-P2.11 Wave-particle duality			
Describe how electron diffraction suggests particles possess wave properties and the photoelectric effect suggests that electromagnetic waves have a particle nature			

Know and use λ=h/mv			
Explain how and why the amount of diffraction changes when the momentum of the particle is changed			
Appreciate how knowledge and understanding of the nature of matter changes over time			
Appreciate that changes need to be evaluated through peer review and validated by the scientific community			

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AQA A Level Physics **--P3 Waves** **-P3.1 Progressive waves**			
Define amplitude, frequency, wavelength, speed, phase, phase difference			
Know and use $c=f\lambda$, $f=1/t$			
Appreciate phase difference can be measured as an angle (radians and degrees) or as fractions of a cycle			
-P3.2 Longitudinal and transverse waves			
Appreciate the nature of longitudinal and transverse waves			
Know the direction of displacement of particles/fields relative to the direction of energy propagation and that all electromagnetic waves travel at the same speed in a vacuum			
Describe how polarisation is evidence for the nature of transverse waves			
Describe some applications of polarisation to include polaroid material and the alignment of aerials for transmission and reception			
-P3.3 Principle of superposition of waves and formation of stationary waves			
Define a stationary wave			
Identify nodes and antinodes on strings			
Know and use $f=1/2l\sqrt{(t/\mu)}$			
Describe how a stationary wave can be formed by two stationary waves of the same frequency travelling in opposite directions			
Describe how stationary waves can be formed on string and with microwaves and sound waves			
-P3.4 Interference			
Define path difference			
Define coherence			
Explain how interference and diffraction can be achieved using a laser as a source of monochromatic light			
Describe Young's double-slit experiment as a method to produce an interference pattern			
Know and use $w=\lambda D/s$			
Describe and explain interference produced with sound and electromagnetic waves			
Appreciate how knowledge and understanding of the nature of electromagnetic radiation has changed over time			
-P3.5 Diffraction			
Draw the appearance of the diffraction pattern from a single slit using monochromatic and white light			
Be able to derive $d\sin\theta=n\lambda$			

-P3.6 Reflection at a plane surface			
Know and use the equation to define refractive index of a substance, n=C/Cs			
Know that the refractive index of air is approximately 1			
Know and use Snells law, n1Sinθ1=n2sinθ2			
Know and use Sinθc=n2/n1			
State the function of fibre optic cladding			
Understand the principles and consequences of pulse broadening and absorption			

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AQA A Level Physics --P4 Mechanics and Materials **-P4.1 Scalars and vectors**			
State the difference between scalars and vectors			
Add vectors by calculation or scale drawing			
Be able to resolve vectors into two components at right angles to one another			
Appreciate the meaning of equilibrium in the context of an object at rest or moving with constant velocity			
-P4.2 Moments			
Calculate the moment of a force about a point			
Define a moment as the force x perpendicular distance from the point to the line of action of the force			
Define a couple as a pair of equal and opposite coplanar forces			
Define a moment of couple as the force x perpendicular distance between the lines of action of the force			
Define centre of mass			
Know that the position of centre of mass of an uniform regular solid is at its centre			
-P4.3 Motion along a straight line			
Define displacement, speed, velocity, acceleration			
Know and use $v=\Delta s/\Delta t$			
Know and use $a=\Delta v/\Delta t$			
Represent uniform and non-uniform acceleration via graphical methods			
Recognise the significance of areas of velocity-time graphs and acceleration time graphs and gradients of displacement-time and velocity time graphs for uniform and non-uniform acceleration			
Know and use $v=u+at$			
Know and use $s=((u+v)/2)t$			
Know and use $s=ut=at^2$			
-P4.4 Projectile motion			
Show awareness of the independent effect of motion in horizontal and vertical directions of a uniform gravitational field			
Describe friction, lift, drag and terminal speed qualitatively			
Know that air resistance increases with speed			

Show qualitative understanding of the effect of air resistance on the trajectory of a projectile and on the factors that affect the maximum speed of a vehicle			
-P4.5 Newton's laws of motion			
Know and apply the three laws of motion to appropriate situations			
Know and use f=ma for situations where the mass is constant			
-P4.6 Momentum			
Know and use p=mv			
Appreciate that linear momentum is conserved			
Calculate situations involving conservation of linear momentum in one dimension			
Know and use f=Δ(mv)/t			
Appreciate that impulse=change in momentum			
Know and use fΔt=Δ(mv) where f is constant			
Know the significance of the area under a force-time graph			
Show a quantitative understanding of how forces vary with impact time			
State the difference between elastic and inelastic collisions			
Appreciate how safety features are designed with momentum conservation in mind			
-P4.7 Work, energy and power			
Know and use W=FSCosθ			
Appreciate that the rate of doing work=rate of energy transfer, P=Δw/Δt=Fv			
Know the significance of the area under a force-displacement graph			
Calculate efficiency			
-P4.8 Conservation of energy			
State the principle of the conservation of energy			
Know and use ΔEp=mgΔh, Ek=1/2MV^2			
Calculate energy transfers involving G.P.E, K.E and work done against resistive forces			
-P4.9 Bulk properties of solids			
Know and use density, ρ=m/v			
Define Hooke's Law			
Define elastic limit			
Know and use F=kΔl			

Define tensile strain and tensile stress			
Define elastic strain energy, breaking stress			
Know and use energy stored=1/2fΔl=area under a force-extension graph			
Describe plastic behaviour, fracture and brittle behaviour linked to force-extension graphs			
Be able to quantitatively and qualitatively apply the conservation of energy to examples involving elastic strain energy			
Describe how springs transform energy from kinetic to gravitational potential energy			
Interpret simple stress-strain curves			
Appreciate how safety features are designed with energy conservation issues in mind			
-P4.10 Young modulus			
Know and use the Young modulus=tensile stress/tensile strain=fl/aΔl			
Use stress-strain graphs to find the Young modulus			

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AQA A Level Physics **--P5 Electricity** **-P5.1 Basics of Electricity**			
Know that electric current is the rate of flow of charge, potential difference is the work done per unit charge			
Know and use $I = \Delta Q/\Delta t$, $V=w/q$			
Define resistance as $R=V/I$			
-P5.2 Current-voltage characteristics			
Recognise the current voltage characteristics for: ohmic conductors, semiconductor diodes and a filament lamp			
Recognise Ohm's law as a special case where I is proportional to V under constant physical conditions			
-P5.3 Resistivity			
Know and use $\rho=RA/L$			
Describe qualitatively the effect of temperature on the resistance of metal conductors and thermistors (NTC)			
Describe resistance-temperature graphs for NTCs			
State applications of NTCs			
Describe superconductivity and the conditions required for it to occur			
Describe applications of superconductors including production of magnetic fields and reduction of energy loss in the transmission of electric power			
-P5.4 Circuits			
Know and use $Rt=R1+R2+Rn\ldots$ and $1/Rt=1/R1+1/R2+1/Rn\ldots$ to calculate resistance in series and parallel			
Know and use $E=Ivt$, $P=IV$, $P=IR^2$, $P=V^2/R$			
Describe the relationship between current, voltage and resistance in series and parallel circuits, including cells in series and parallel			
Be aware of the conservation of charge and conservation of energy in DC circuits			
-P5.5 Potential divider			
Identify the use of a potential divider to supply constant or variable potential difference from a power supply			
Give examples of how the potential divider can be used, including the use of thermistors and light dependent resistors in a potential divider			
-P5.6 Electromotive force and internal resistance			
Know and use $\varepsilon=E/Q$ and $\varepsilon=I(R=r)$			
State the definitions of Terminal PD			
State the definitions of EMF			
Perform calculations for circuits in which the internal resistance is not negligible			