Space Studio West London
an Aspirations Academy

Physics - Curriculum Plan

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
Year 10 curriculum overview	P1 - Energy P2 - Energy and heating P3 - Energy resources	P4 - Electricity P5 - Electricity in the home P6 - Molecules and matter	P6 - Molecules and matter P7 - Radiation	P8 - Forces P9 - Motion P10 - Forces and motion	P10 - Forces and motion P11 - Pressure	P12 - Waves
Key knowledge outcomes (students should know)	• RRA 1 - Determining specific heat capacity. • RPA 2 - Investigating thermal insulators. • Energy has stores and can be moved between those stores. • Energy cannot be created or destroyed • Energy can be calculated from a range of equations • Energy can be moved via conduction, convection and radiation. • Electricity can be generated in a variety of ways with pros and cons. • The national grid and how different energy resources contribute to supplying power to homes.	• RPA 3 - Investigating resistance. • RPA 4 - investigating electrical components. • RPA 5 - Investigating density. • Current, potential difference, power and resistance can be calculated through a range of equations • Electrical circuits are made of components with different properties • Electrical circuits can be constructed in series and parallel with different rules for each. • Current can be AC or DC. • Plugs are designed with a range of safety features.	• Matter is described using the particles model • Gas pressure is related to temperature and volume. • Energy supplied to matter is given to internal energy. • Energy is required to change the state of a material. • Atoms are made of subatomic particles with different properties. • Theories of the atom have changed over time. • Nucleus can be unstable and emit alpha, beta and gamma radiation. • Radioactivity is random but groups	• Quantities are either vectors or scalar. • Newton's law of motion and how they apply to a range of situations. • How moments can be calculated and how they apply to a range of situations e.g gears. • How forces can be resolved. • How forces can be added in coplanner directions. • Drawing distance time graphs and interpreting them • Drawing speed time graphs and interpreting them. • Calculating speed, distance, time and acceleration. • Force is related to	• RPA 6 - Investigating hookes law • RPA 7 - investigating force and acceleration • Terminal velocity and how forces describe falling objects in a fluid • Momentum and how it is applied to a range of situations. • How forces interact with objects at impact and how this determines safety features. • How force relates to extension. • Pressure is related to force and area. • Pressure can be created by fluids and this is determined by the	• RPA 8 - investigating waves - ripple tank and waves in a solid • Waves can be categorized in different ways, e.g longitudinal and transverse. • Waves can interact with matter in several ways. E.g reflection and refraction. • Sound waves travel in materials and can echo. • How sound waves interact with the ear and the range of human hearing. • Seismic waves types and how they allow us to image the interior of the earth.

		• The structure of the national grid and the role of transformers.	can be predicted via half life. • Nucleus can be split or fuse in nuclear reactions.	acceleration.	height, density and gravity affecting the fluid. • Floating objects are subject to upthrust.	
Key skills (students should be able to)	• How to take measurements and reduce errors. • Safety of hot objects. • Mathematical skills - substitution, rearranging equations, standard form, multistep calculations and unit conversions. • Graphical skills - plotting scatter graphs, lines of best fit. • Extended writing; comparisons, interpreting data and practical methods. • Interpreting graphs.	• Measurements and errors. • Safety when working with electricity. • Mathematical skills - substitution, rearranging equations, standard form, multistep calculations and unit conversions. • Graphical skills - plotting scatter graphs, lines of best fit. • Directly proportional relationships. • Interpreting graphs. • Extended writing; practical methods. • Reading oscilloscope traces.	• Mathematical skills - substitution, rearranging equations, standard form, multistep calculations and unit conversions. • Graphical skills - plotting scatter graphs, lines of best fit. • Extended writing; history of science, comparisons of materials. • Interpreting graphs.	• Mathematical skills - substitution, rearranging equations, standard form, multistep calculations and unit conversions. • Graphical skills - plotting scatter graphs, lines of best fit. • Graphical skills - plotting speed and distance graphs. • Interpreting graphs.	• Mathematical skills - substitution, rearranging equations, standard form, multistep calculations and unit conversions. • Graphical skills - plotting scatter graphs, lines of best fit. • Extended writing; terminal velocity, practical methods. • Interpreting graphs.	• Mathematical skills - substitution, rearranging equations, standard form, multistep calculations and unit conversions. • Extended writing; describing the interior of the earth. • Reading oscilloscope traces.
Year 11 curriculum overview	P12 - Waves P13 - EM spectrum P14 - Light	P15 - Magnetism	P16 - Space	Exam practice	Exam Practice	N/A
Key knowledge outcomes	• RPA 9 - Investigating reflection and refraction • RPA 10 - investigating	• Magnets properties and magnetic materials interactions.	• How the solar system formed and how this resulted in the solar system today.	• Feedback from PPE's. • Content from all units. • Recap of practical	• Content from all units. • Recap of practical methods.	N/A

(students should know)	infrared radiation • RPA 8 - investigating waves - ripple tank and waves in a solid • Waves can be categorized in different ways, e.g longitudinal and transverse. • Waves can interact with matter in several ways. E.g reflection and refraction. • Sound waves travel in materials and can echo. • How sound waves interact with the ear and the range of human hearing. • Seismic waves types and how they allow us to image the interior of the earth. • The EM spectrum and the properties of the different parts of them. • How the EM spectrum is used in a range of applications. • Properties of light and how it interacts with different mediums. • How lenses affect	• How we can make electromagnets and how they are used in devices. • How motors work for AC and DC. • How generators work for AC and DC. • How transformers work and how they manage the electricity grid. • Reading oscilloscope traces.	• The life cycle of stars and how this is different for different mass stars. • Orbits for natural and artificial satellites. • The universe, how it started and may end. Evidence for each.	methods.		

	light and how this can be applied.					
Key skills (students should be able to)	• Mathematical skills - substitution, rearranging equations, standard form, multistep calculations and unit conversions. • Extended writing; describing the interior of the earth • Graphical skills - plotting scatter graphs, lines of best fit. • Interpreting graphs.	• Mathematical skills - substitution, rearranging equations, standard form, multistep calculations and unit conversions. • Extended writing; explaining motors, generators and transformers • Interpreting graphs.	• Extended writing; star life cycles and arguments about the universe.	• Answering simple mathematical questions based on substitution. • Answering multistep mathematical questions involving rearrangement. • Answering mathematical questions involving standard form and unit conversion. • Answering extended mathematical questions with multiple equations and skills. • Answering short exam questions based on knowledge. • Answering extended questions of a topic in sustained long answers. • Answering questions that link topics in both mathematics and extended writing. • Interpreting data/graphs and how to answer questions based on unknown data.	• Answering simple mathematical questions based on substitution. • Answering multistep mathematical questions involving rearrangement. • Answering mathematical questions involving standard form and unit conversion. • Answering extended mathematical questions with multiple equations and skills. • Answering short exam questions based on knowledge. • Answering extended questions of a topic in sustained long answers. • Answering questions that link topics in both mathematics and extended writing. • Interpreting data/graphs and how to answer questions based on unknown data.	N/A

Space Studio West London
an Aspirations Academy

Year 12 curriculum overview	Split teaching P1 - Measurements and errors, particles and radiation, mechanics foundations	Split teaching P2 - Waves, quantum phenomena, forces, motion, energy and momentum	Split teaching P3 - Materials, electricity and practical skills	Split teaching P4 - Circuits, potential dividers, internal resistance and AS consolidation	EXAM - Year 12 internal examination, AS-style Paper 1 and Paper 2 practice, practical and data analysis consolidation	
Key knowledge outcomes (students should know)	Students should know SI base and derived units, prefixes, standard form, significant figures, uncertainty, accuracy, precision, resolution, repeatability, reproducibility, random error and systematic error. Students should know the structure of the atom, specific charge, proton number, nucleon number, isotopes, the strong nuclear force, alpha and beta decay, neutrinos, antiparticles, photons, pair production, annihilation, exchange particles, hadrons, baryons, mesons, leptons, quarks, strangeness and conservation laws.	Students should know the photoelectric effect, threshold frequency, work function, stopping potential, excitation, ionisation, energy levels, photon emission, line spectra, electron diffraction and wave-particle duality. Students should know progressive waves, transverse and longitudinal waves, phase difference, polarisation, superposition, stationary waves, nodes, antinodes, harmonics, refraction, total internal reflection, fibre optics, diffraction, Young's double-slit interference and diffraction gratings. Students should know	Students should know density, Hooke's law, elastic limit, spring constant, elastic strain energy, tensile stress, tensile strain, Young modulus, brittle behaviour, plastic behaviour and interpretation of force-extension and stress-strain graphs. Students should know current as rate of flow of charge, potential difference as work done per unit charge, resistance, Ohm's law, current-voltage characteristics for ohmic conductors, filament lamps and diodes, resistivity, temperature effects on resistance, thermistors,	Students should know how potential dividers provide fixed or variable potential difference and how variable resistors, thermistors and LDRs are used in sensing circuits. Students should know emf, terminal potential difference, internal resistance and the relationship between emf, current, load resistance and internal resistance. RPA 6 should be taught through investigation of emf and internal resistance. Students should consolidate the full AS content: measurements and errors, particles and radiation, waves, mechanics and materials, and electricity. Students	Students should know the Year 12 content well enough to answer short-answer, long-answer, multiple-choice, practical and data-analysis questions across sections 3.1 to 3.5. Students should know that AS-style assessment includes topic knowledge, practical skills, data interpretation, mathematical reasoning and extended responses. Students should use examination feedback to identify weak areas in calculations, practical methods, graph interpretation, explanation questions and links between topics.	

	Students should know scalars, vectors, resolving forces, equilibrium, moments, centre of mass, displacement, velocity, acceleration and equations of uniform acceleration.	Newton's laws, projectile motion, terminal speed, momentum, impulse, force-time graphs, work, energy, power and conservation of energy. RPA 1, RPA 2 and RPA 3 should be taught through stationary waves, interference and free-fall.	superconductivity, series circuits, parallel circuits, conservation of charge and conservation of energy in dc circuits. RPA 4 and RPA 5 should be taught through Young modulus and resistivity.	should know how practical skills, mathematical reasoning, unfamiliar contexts and synoptic links are assessed in written papers.		
Key skills (students should be able to)	Mathematical skills - units, prefixes, standard form, significant figures, order-of-magnitude estimates, substitution, rearranging equations and uncertainty calculations. Practical skills - identifying random and systematic errors, reducing uncertainty, recording measurements, plotting graphs, drawing lines of best fit and using gradients and intercepts. Students should be able to apply conservation laws to particle interactions, use nuclide	Mathematical skills - photon energy calculations, electron volt conversions, de Broglie wavelength calculations, wave speed calculations, phase relationships, fringe spacing and diffraction grating calculations. Practical skills - use of signal generators, vibration transducers, lasers, diffraction gratings and graphical analysis. Students should be able to interpret wave diagrams, explain interference and diffraction, apply	Mathematical skills - gradient calculations from force-extension, stress-strain and current-voltage graphs, area under graphs for elastic strain energy, resistivity calculations and circuit calculations. Practical skills - use of micrometers, vernier calipers, ammeters, voltmeters and safe circuit construction. Students should be able to determine Young modulus, determine resistivity, compare materials, interpret I-V characteristics, identify	Mathematical skills - potential divider calculations, emf and internal resistance calculations, straight-line graph analysis and interpretation of gradient and intercept. Practical skills - design, build and check dc circuits, control variables, collect sufficient data and evaluate sources of uncertainty. Students should be able to complete AS synoptic questions, select appropriate equations, combine mechanics and electricity skills, explain	Students should be able to complete AS-style papers under timed conditions, answer practical and data-analysis questions, interpret graphs, process uncertainties, rearrange equations, use standard form, apply significant figures and write coherent extended responses. Students should be able to use feedback from assessments to identify topic gaps, calculation errors and weak practical reasoning, then revise	

	notation, calculate specific charge, draw simple exchange-particle diagrams, resolve vectors, draw free-body diagrams, apply moments and solve constant-acceleration problems.	Newton's laws, analyse motion graphs, solve projectile questions, apply momentum conservation, calculate impulse and use work-energy methods. Extended writing should explain quantum evidence, wave behaviour and mechanics applications.	ohmic and non-ohmic behaviour, calculate series and parallel resistance, calculate electrical power and evaluate practical methods with uncertainties.	practical improvements, interpret unfamiliar data and write clear extended responses using precise A-level terminology.	strategically before progression into Year 13.	
Year 13 curriculum overview	Further mechanics and thermal physics - Circular motion, simple harmonic motion, resonance, thermal energy transfer, ideal gases, kinetic theory, RPA 7 and RPA 8	Fields and capacitance - Gravitational fields, electric fields, potentials, orbits, capacitance, capacitor discharge and RPA 9	Magnetic fields, electromagnetic induction, alternating current, transformers, nuclear physics foundations, RPA 10 and RPA 11	Nuclear physics finish and Astrophysics/Astronomy option - Radiation, decay, nuclear energy, telescopes, stellar physics, cosmology, exoplanets and RPA 12	EXAM - A-level Paper 1, Paper 2 and Paper 3 preparation, practical skills, data analysis and Astrophysics/Astronomy option revision	N/A
Key knowledge outcomes (students should know)	Students should know that circular motion requires centripetal acceleration and centripetal force directed towards the centre of the circle. Students should know angular speed, radian measure, centripetal acceleration,	Students should know that fields describe non-contact forces and can be represented by field lines and equipotential surfaces. Students should know Newton's law of gravitation, gravitational field strength,	Students should know magnetic flux density, force on a current-carrying wire, Fleming's left-hand rule, the tesla, force on moving charges, circular motion of charged particles and applications such as cyclotrons.	Students should know radioactive decay as random, activity, decay constant, exponential decay, half-life, nuclear instability, decay modes, nuclear energy levels, nuclear radius, closest approach, electron diffraction evidence,	Students should know how Paper 1 assesses sections 3.1 to 3.5 plus periodic motion, how Paper 2 assesses thermal physics, fields and nuclear physics with assumed prior knowledge, and how Paper 3 assesses	N/A

	centripetal force and applications to vehicles, roundabouts, banked tracks, satellites and vertical-circle contexts where appropriate. Students should know the condition for SHM, $a = -\omega^2 x$, displacement, velocity, acceleration, amplitude, angular frequency, time period, phase, pendulums, mass-spring systems, energy changes, damping, forced vibrations and resonance. Students should know internal energy, specific heat capacity, specific latent heat, gas laws, absolute zero, $pV = nRT$, $pV = NkT$, Brownian motion, work done by gases and the molecular kinetic theory model.	gravitational potential, potential difference, orbital speed, orbital period, satellite energy, escape ideas, geostationary orbits and synchronous orbits. Students should know Coulomb's law, electric field strength, electric potential, work done moving charge and motion of charged particles in uniform electric fields. Students should know capacitance, parallel-plate capacitors, dielectric action, relative permittivity, energy stored, charge-discharge graphs, time constant RC, half-time and exponential charge and discharge.	Students should know magnetic flux, flux linkage, flux linkage in a rotating coil, Faraday's law, Lenz's law, induced emf, alternating current, rms, peak and peak-to-peak values, oscilloscope use, transformers, transformer efficiency, eddy currents, power transmission and causes of transformer inefficiency. Students should begin nuclear physics through Rutherford scattering, alpha, beta and gamma radiation, absorption, background radiation, shielding, hazards and inverse-square behaviour.	mass-energy equivalence, atomic mass unit, binding energy, fission, fusion, chain reactions, critical mass, moderator, control rods, coolant, shielding, waste and risk-benefit issues. Students should know the Astrophysics/Astronomy option: refracting and reflecting telescopes, angular magnification, Cassegrain arrangement, radio and non-visible telescopes, resolving power, collecting power, CCDs, apparent and absolute magnitude, parsecs, light years, black-body radiation, Wien's law, Stefan's law, spectral classes, HR diagrams, stellar evolution, supernovae, neutron stars, black holes, red shift, Hubble's law, Big Bang evidence, quasars and exoplanet detection.	practical skills, data analysis and the Astrophysics/Astronomy option. Students should know the twelve required practicals, key apparatus, hazards, variables, graphing methods, uncertainty treatment and common evaluation points. Students should know how to use PPE and mock feedback to target weaknesses before the final A-level examinations.	

Key skills (students should be able to)	Mathematical skills - radians, angular speed, centripetal acceleration, centripetal force, SHM equations, specific heat capacity, latent heat, ideal gas equation and kinetic theory calculations. Practical skills - timing multiple oscillations, using fiducial markers, using data loggers where appropriate, plotting graphs, determining gradients and evaluating uncertainties. Students should be able to carry out and evaluate RPA 7 and RPA 8, interpret SHM graphs, explain resonance, process gas-law data and link macroscopic gas behaviour to the molecular model.	Mathematical skills - inverse-square relationships, gravitational force, field strength, gravitational potential, electric force, electric field strength, electric potential, work done, orbital quantities, capacitance, capacitor energy, time constant and exponential discharge calculations. Practical skills - collect capacitor discharge data, plot suitable graphs including log-linear graphs, determine RC, identify uncertainty in timing and voltage measurements and evaluate improvements. Students should be able to compare gravitational and electric fields, interpret field diagrams and apply field concepts in unfamiliar contexts.	Mathematical skills - force on wires, force on moving charges, magnetic flux density, magnetic flux, flux linkage, induced emf, rms values, transformer equations and transmission-loss calculations. Practical skills - use top pan balances, search coils and oscilloscopes, control current, length, field strength and angle, and process oscilloscope traces for voltage, time period and frequency. Students should be able to explain induction, apply Lenz's law, evaluate transformer efficiency and handle radioactive-source data by subtracting background radiation and applying safe handling procedures.	Mathematical skills - radioactive decay equations, activity, decay constant, half-life, log graphs, nuclear radius, nuclear density, mass defect, binding energy, energy release, magnitude scale, distance modulus, Wien's law, Stefan's law, red shift, Hubble distance, approximate age of the universe and Schwarzschild radius. Practical skills - process inverse-square gamma radiation data safely and evaluate limitations. Students should be able to interpret spectra, black-body curves, HR diagrams, supernova light curves, Doppler-shift data and exoplanet transit graphs, and write extended explanations linking astronomical evidence to physical models.	Students should be able to complete synoptic calculations across multiple topic areas, select appropriate equations, rearrange linear and non-linear equations, use logarithmic and exponential relationships, interpret unfamiliar data, evaluate methods, identify variables, justify improvements and write coherent extended responses. Students should be able to answer Paper 1, Paper 2 and Paper 3 questions under timed conditions, including practical/data-analysis questions and Astrophysics/Astronomy option questions.	N/A