Subject	Y12 Core Knowledge – Autumn/Spring/Summer term	How to support students' learning
Science **Physics**	**Autumn Term** **Particles and Radiation -** 1. Demonstrate and show an understanding of constituents of the atom. 2. Demonstrate and show an understanding of stable and unstable nuclei. 3. Demonstrate and show an understanding of particles, antiparticles and photons. 4. Demonstrate and show an understanding of particle interactions. 5. Demonstrate and show an understanding of classification of particles. 6. Demonstrate and show an understanding of quarks and antiquarks. 7. Demonstrate and show an understanding of applications of conservation laws. 8. Demonstrate and show an understanding of the photoelectric effect. 9. Demonstrate and show an understanding of collisions of electrons with atoms. **Electromagnetic Radiation and Quantum Phenomena -** 10. Demonstrate and show an understanding of energy levels and photon emissions. 11. Demonstrate and show an understanding of wave particle duality. **Electricity -** 12. Construct and demonstrate understanding of circuit diagrams. 13. Define, calculate and show an understanding of current and potential difference. 14. Define, calculate and graphically demonstrate an understanding of resistance and Ohm's Law. 15. Recognise and show and understanding of I-V and V-I graphs for an ohmic conductor, a semiconductor diode and a filament lamp. 16. Demonstrate an understanding of resistance in thermistors and light dependent resistors and their applications. 17. Demonstrate an understanding of superconductors and their applications. 18. Define, calculate and practically investigate resistivity of a wire. 19. Calculate the power of a component and the energy transferred in a circuit. 20. Define, calculate and show an understanding of e.m.f and internal resistance.	• CGP AQA A level Physics year 1 revision guide (can be bought through the school). • CGP AQA A level Physics year 1 textbook (can be bought through the school). **Seneca:** • https://senecalearning.com/en-GB/ Free revision resource. **Free science lessons:** • https://www.freesciencelessons.co.uk/a-level-revision-videos/a-level-chemistry/ **Physics and maths tutor:** • https://www.physicsandmathstutor.com/physics-revision/a-level-aqa/

	21. Practically investigate e.m.f and internal resistance in cells and batteries. 22. Show an understanding of the relationship between current, potential difference and resistance in series and parallel circuits. 23. Demonstrate an understanding of how a potential divider can be used to supply a constant or variable potential difference from a power supply. **Spring Term** **Mechanics -** 24. Describe the difference between scalar and vector quantities. 25. Construct scale diagrams and work out the resultant vector on those scale diagrams. 26. From a set of instruction set up the practical to work out the coplanar forces. 27. Calculate moments. 28. Demonstrate how to find the centre of mass of regular and irregular shapes. 29. Understand complex motion questions selecting the correct SUVAT equations to calculate uniform motion. 30. Know how to use a distance-time and velocity-time and acceleration-time graphs to calculate velocity, distance travelled and acceleration. 31. Confidently carry out a practical to find the acceleration due to gravity. 32. Calculate components of projectile motion. 33. Explain the forces involved when an object reaches terminal velocity. 34. Explain conservation of momentum. 35. Calculate momentum. 36. Apply newtons three laws of motion. 37. Calculate energy work and power. **Waves -** 38. Describe and fully label a wave using key terms such as: amplitude, displacement, frequency, wavelength, phase and phase difference. 39. Demonstrate how to calculate the frequency, time period and speed of a wave. 40. Compare longitudinal and transverse waves in terms of their displacement, energy propagation and give examples of both. 41. Show an understanding of polarisation and give applications of this. 42. Define the principle of superposition and show an understanding of what interference is.	

	43. Describe how stationary waves are formed and give graphical explanation to support this. 44. Demonstrate an understanding of harmonics and the properties of such, plus give examples of stationary waves e.g. on musical instrument strings. 45. Practically investigate resonant frequency using knowledge of the first harmonic on a string. (Required Practical 1). 46. Show an understanding of the diffraction patterns that are made by monochromatic and white light. 47. Describe the variation of the width of the central diffraction maximum in a single slit diffraction pattern with wavelength and slit width. 48. Describe and explain how interference is produced and link to coherence and path difference. 49. Practically investigate two-source interference of light using a coherent source (Required Practical 2). 50. Demonstrate awareness of the safety issues associated with using lasers. 51. Show the ability to use Young's double-slit formula. 52. Practically investigate interference of light caused by a diffraction grating (Required Practical 2). 53. Derive the equation for diffraction gratings. 54. Show an understanding of the pattern produced by light when directed normally at a diffraction grating and give examples of the applications of diffraction gratings. 55. Show an understanding of refractive index and demonstrate how to calculate it. 56. Use Snell's law of refraction for a boundary between two substances. 57. Describe total internal reflection and the significance of the critical angle. 58. State and describe applications of total internal reflection e.g. optical fibres, including the function of cladding, pulse broadening and absorption, material and modal dispersion. **Summer Term** **Materials -** 59. Define and calculate density. 60. Recall and use the Hooke's law formula, $F=k\Delta L$. 61. Demonstrate an understanding of plastic behaviour and the elastic limit of a material.	

	62. Practically investigate Hooke's law. 63. Define tensile stress, tensile strain and breaking stress. 64. Demonstrate an understanding of energy conservation in springs. 65. Use the formula for the Young modulus. 66. Describe and carry out a method to determine the Young modulus using stress-strain graphs. 67. Interpret simple stress-strain curves and compare to force-extension graphs. 68. Describe and explain fracturing and brittle behaviour and recognise it on stress-strain & force-extension graphs.	