Subject	Year 13 Core Knowledge – Autumn/Spring/Summer term	How to support students' learning
Science - Physics	**Autumn Term** **Further mechanics –** 1. Know how to use radians as a measure of the size of an angle. 2. Know the definition of angular speed and how to calculate it using both equations. 3. Fully understand that an object travelling in a circle is accelerating towards the centre of the circle and that this is due to centripetal force. 4. Be able to use the equation for centripetal acceleration. 5. Know the characteristics of simple harmonic motion. 6. Be able to sketch a graph of displacement, velocity and acceleration as a function of time for an object moving with SHM and understand the phase difference between them. 7. Know that velocity is given by the gradient of a displacement - time graph and that acceleration is the gradient of a velocity – time graph. 8. Be able to describe how kinetic, potential and mechanical energy changes with displacement. 9. Be able to use the 4 equations for SHM to find the velocity, acceleration, displacement and maximum velocity. 10. Independently complete the simple pendulum practical. 11. Understand what is meant by free and forced vibrations. 12. Know how the phase difference between the driver and oscillator changes with increasing driving frequency. 13. Know what resonance is. 14. Know what damping is. **Capacitors –** 15. Know the definition of capacitance.	• CGP AQA A level Physics year 1 and 2 revision guide (can be bought through the school). • CGP AQA A level Physics year 1 and 2 textbook (can be bought through the school). • Seneca: https://senecalearning.com/en-GB/ Free revision resource.

	16. Be able to use the equation to calculate capacitance and the energy stored by a capacitor. 17. Be able to describe how a capacitor works. 18. Be able to plot a graph and use it to determine the energy stored by a capacitor. 19. Understand the terms permittivity and dielectric constant. 20. Be able to describe the action of a simple polar molecule that rotates in an electric field. 21. Graphically represent the charging and discharging of a capacitor knowing what the gradient and the area under the graph represents. 22. Independently complete the required practical for the discharging and charging of a capacitor. 23. Know what the time constant of a capacitor is and how to calculate it. **Thermal Physics –** 24. Show an understanding of internal energy and absolute zero. 25. Be able to calculate specific heat capacity using the equation $Q=mc\Delta\theta$ 26. Be able to calculate specific latent hear using the equation Q=ml. 27. Compare and combine specific heat capacity and specific latent heat. 28. State and describe the three gas laws for a fixed mass of an ideal gas. 29. Practically investigate Charles' law and Boyle's law. 30. Be able to effectively use the equations pV=nRT and pV=NkT 31. Be able to derive the formula pV=1/3 N〖c_((rms))〗^2 for an ideal gas and state the assumptions made about an ideal gas in kinetic theory. 32. Demonstrate an understanding of the average molecular kinetic energy of a gas is 1/2 m〖c_((rms))〗^2=3/2 kT=3RT/(2N_A).	

	Gravitational and electrical fields- 33. Define a force field and know that they are represented by vectors. 34. Be able to draw gravitational field lines and calculate the force between two-point masses using Newton's law of gravitation. 35. Define and calculate gravitational field strength, g. 36. Be able to sketch the graph of g (gravitational field strength) against r (distance from the point mass). 37. Calculate gravitational potential, V, and show an understanding of the negative sign in V=-GM/r 38. Be able to sketch the graph of V (gravitational potential) against r (distance between the point masses) 39. Describe gravitational potential difference, ΔV, and understand what equipotential surfaces are. 40. Describe how the speed and orbital period will affect the radius of a satellite's orbit. 41. Derive Kepler's law showing T^2∝r^3 42. Compare synchronous orbits to geostationary and low orbiting satellites. 43. Show an understanding of escape velocity.	