

	Year 13 Physics					
	Autumn Term 1	Autumn Term 2	Spring Term 1	Spring Term 2	Summer Term 1	Summer Term 2
BIG Q Content (max 5) Please log into Seneca to support your child to understand this learning	How does thermal energy affect particles? Use the definition of internal energy to describe changes to a system due to the first law of thermodynamics. Explain why absolute zero is the lowest possible temperature. Define and measure specific heat capacity, and use given values to describe which materials will heat up or cool down the fastest. Define latent heat and use it to calculate the energy required for substance to change state. Explain why the temperature of a substance will remain constant while it changes state. What are the principles of circular motion and simple harmonic motion? Determine the speed of an object moving in uniform circular motion and explain why velocity is not constant. Determine the centripetal force and acceleration of an object moving in uniform circular motion and apply these to vehicles. State the fundamental conditions of acceleration that apply to simple harmonic motion and describe how displacement, velocity and acceleration vary with time. Use the equation that links displacement to time for a body moving with simple	How do gases behave as their temperature changes? State the experimental gas laws and calculate the increase in pressure when a gas is heated or compressed. Calculate the work done on or by a gas during an isobaric change and state the meaning of an isothermal change. Define an ideal gas and discuss how the experimental gas laws can be combined. Explain the increase in pressure when a gas is compressed or heated using the kinetic theory of gases. Describe the behaviour of gas particles and discuss the factors that can affect the mean kinetic energy of a gas molecule. How do gravitational fields affect masses? Define a radial and uniform fields and explain what is meant by gravitational field strength. Calculate the gravitational potential difference between two points and explain where an object would have to be placed for its gravitational potential energy to be zero. Use Newton's law of gravitation to describe how gravitational attraction varies with time and explain what is meant by an inverse-square law. Interpret graphs of g against r for points outside the surface of a planet and compare this	What are the functions and properties of capacitors? Describe the process of charging and discharging a capacitor in terms of electron flow and relate the potential difference across a capacitor to the charge stored on its plates. Explain why a capacitor stores energy when it is charged and describe the form of energy that is stored by a capacitor. Interpret the shape of curves on charge-time graphs for charging and discharging capacitors and describe changes to the circuit which could increase or decrease charging time. Explain how a dielectric affects the relative permittivity of a capacitor. Use a dielectric constant to calculate how a dielectric will change the capacitance of a capacitor. How do electric charges interact? Explain how to charge a metal object and describe what the direction of field lines shows concerning a test charge. Describe how to measure the strength of an electric field and explain why electric field strength should be described as the force per unit charge rather than the force that acts on one coulomb of charge. Calculate the electric potential difference between points and explain why potential is	How do radioactive isotopes behave? Describe the properties of alpha, beta and gamma radiation and explain how the intensity of gamma radiation changes as it spreads out. Explain why ionising radiation is harmful and describe the factors that can affect how dangerous alpha, beta and gamma radiation are and how exposure to ionising radiation can be reduced. State what is meant by the activity of a radioactive isotope and define half-life. Use the decay constant of a radioactive isotope to calculate its change in activity over time or its half-life. Discuss how an N-Z graph can be used to determine properties of radioactive isotopes and how the radius of a nucleus can be determined. How do magnetic fields affect charged particles? State the factors that affect the size of the force acting on current in a wire and measure the strength of a magnetic field. Determine the direction of the force acting on a current carrying wire in a magnetic field. Describe how a magnetic field affects the motion of a charged particle and explain why a force acts on current carrying wire in a magnetic field.	How is nuclear energy used to generate electricity? Describe what happens the mass of an object when it gains or loses energy and calculate the energy released in a nuclear reaction. Define binding energy and explain why some nuclei are stable and some nuclei release energy when they undergo fission. Describe why small nuclei can't split and large nuclei can't be fused and how much energy is released during fission and fusion. Explain how a nuclear reactor is used as a thermal power plant to generate electricity. Explain how the nuclear reactions in a nuclear reactor are controlled. How is electromagnetic induction used to generate electricity? Describe what must happen to a conductor or to the magnetic field in which it is placed in order for an electric current to be generated. Define magnetic flux and magnetic flux linkage and use Lenz's law to relate the induced EMF in a coil to the magnetic flux linkage through it. State the two features of the output voltage waveform that change if a coil rotates faster and explain why the output varies.	

	harmonic motion and calculate the period of simple harmonic pendulum and mass-spring system. Distinguish between free and forced vibrations and explain why a resonant system reaches a maximum amplitude of vibration.	to graphs of V against r, explaining the significance of the gradient. State the conditions necessary for a satellite to be in a stable orbit and describe how the speed of a satellite changes with its distance from the Earth.	defined in terms of work done per unit positive charge. Use Coulomb's law to calculate the size of the force between two charged objects and describe how the force depends on the distance between two point charges. State the equation for electric field strength near a point charge and explain why E is equal to zero inside a charged sphere.	Describe what happens to the direction of the magnetic force when electrons are deflected by a magnetic field and explain why moving charges move in a circular path. State the factors that will affect the radius of the circular path of charge moving in a magnetic field.	Explain what is meant by the rms value of an alternating current and calculate the power supplied by an alternating current. Explain the purpose of transformers and describe the energy changes that take place in the transformer.	
Vocabulary (max 10)	Absolute zero Specific Heat Capacity Specific Latent Heat Kelvin Internal Energy Centripetal Force Centripetal Acceleration Resonance Simple Harmonic Motion Damping	Boyle's Law Charles' Law Pressure Law Isothermal Isobaric Gravitational Field Strength Gravitational Potential Geostationary Stable Orbit Satellite	Capacitor Dielectric Relative Permittivity Charge Discharge Electric Potential Columb's Law Electric Field Strength Point Charge Volt	Half-life Decay Constant Ionisation Nuclear Radius Activity Tesla Magnetic Field Strength Magnetic Flux Density Magnetic Flux Linkage Cyclotron	Control Rod Fuel Rod Moderator Fission Fusion Induced EMF Lenz's Law Alternating Current Step-Up Transformer Step-Down Transformer	
Catholic Link	Rights and Responsibilities: nuclear energy and environmental impact	Stewardship: application of the laws of thermodynamics	Solidarity: global satellite communication	Rights and Responsibilities: history of scientific discovery in electromagnetism	Rights and Responsibilities: generating electricity	
Careers Link	Circular Motion and SHM – robotics, gaming development	Fields – Aerospace and defence	Fields - Telecommunications	Capacitance – Materials scientist, industrial power supplies	Radioactivity – Nuclear Medicine Physicist	

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- Try some online problem solving and masterclasses: <https://www.youtube.com/@PhysicsOnline>
- Classify deep-space telescope galaxies through the Zooniverse platform: <https://www.zooniverse.org/projects/zookeeper/galaxy-zoo>
- Download Phyphox for free and turn your phone into a mobile Physics lab. Detect the frequency of a pendulum using the accelerometer, measure the Doppler effect using its microphone or use the magnetometer to map magnetic fields caused by DC currents flowing through household appliance wires.