Subject: Year 10 Physics
Year Overview

ST. MARY MAGDALENE C OF E SCHOOL PENINSULA CAMPUS

Key content – knowledge and skills	National Curriculum focus
In light of school closures during the summer term 2020, the following year 9 topics have been carried through into year 10. Work has been set via distance learning for these topics but will still need to be revisited. **Atomic Structure** Ionising radiation is hazardous but can be very useful. Although radioactivity was discovered over a century ago, it took many nuclear physicists several decades to understand the structure of atoms, nuclear forces and stability. Early researchers suffered from their exposure to ionising radiation. Rules for radiological protection were first introduced in the 1930s and subsequently improved. Today radioactive materials are widely used in medicine, industry, agriculture and electrical power generation. Additional topics include (already planned for year 10): **Physics Electricity:** **Physics: Forces:** **Physics: Waves:** **Physics: Electromagnetism and magnetism:** **Physics: Space**	Translate numeric data into graphical form. Applying knowledge of a range of techniques, apparatus and materials appropriate to the experiment. Applying scientific principles to the context of real life situations.

Key assessment points
End of unit assessment

Christian ethos

British values
• Scientific developments may give rise to moral dilemmas • Looking for meaning and purpose in natural and physical phenomena • Wonder at the vastness of space and the beauty of natural objects • Take the views and opinions of others into account • Religious beliefs often compete with scientific understanding.

Subject: Physics (year 10)
Medium-term plan

Week	Month	Learning Intentions and/or Key Questions
Aut1-1	September	Physics: Atomic Structure • I can state, giving examples, that background radiation is caused by natural and man-made sources, and that the level of radiation may be affected by occupation and/or location • I can explain the relationship between the instability and half-life of radioactive isotopes, and why the hazards associated with radioactive material differ according to the half-life involved • I can describe and evaluate the uses of nuclear radiation in exploration of internal organs, and controlling or destroying unwanted tissue • I can evaluate the perceived risks of using nuclear radiation in relation to given data and consequences • I can describe fission as rare and requiring fissionable isotopes, but as a process of huge energy release which, when controlled, can be used to generate electricity • I can draw/interpret diagrams representing nuclear fission and how a chain reaction may occur • I can describe nuclear fusion as a process which requires very high temperature and pressure, and in which some of the mass of two light nuclei is converted into energy as they join to form a heavier nucleus Physics Electricity: • I can describe the shape of the field and lines of force around a point charge or charged sphere. • I can apply the concept of electric fields to explain in detail why the force between charged objects decreases with distance. • I can explain why sparks can be produced by charged materials in terms of charge build-up. • I can explain the nature of an electric current in wires in terms of electron behaviour. • I can perform a range of calculations, including rearrangement of the equation Q=It. • I can measure the current in a circuit accurately and use it to calculate the rate of flow of electrons. • I can describe potential difference in terms of work done per unit charge. • I can rearrange equations for resistance and potential difference. • I can investigate a variety of factors that may affect the resistance of a metal wire, such as the current through it, length, cross-sectional area, and metal used. • I can explain the resistance characteristics of a filament lamp in terms of electrons and ion collisions. • I can determine the resistance of a component based on information extracted from an I–V graph. • I can compare the characteristics of a variety of electrical components, describing how the components can be used. • I can explain, in detail, why the current in a series circuit is the same at all points by using the concept of conservation of charge (electrons). • I can analyse a variety of series circuit to determine the current through, p.d. across, and resistance of combinations of components.
Aut1-2		
Aut1-3		
Aut1-4		
Aut1-5	October	
Aut1-6		
Aut1-7		

		• I can evaluate in detail the investigation of series circuits and explain discrepancies. • I can analyse parallel circuits in terms of current loops. • I can calculate the current at any point in a circuit. • I can evaluate in detail an investigation into the effect of adding resistors in parallel on a circuit.
		Half term holiday
Aut2-1	November	<u>Physics: Forces:</u> • I can state that a body in equilibrium must experience equal sums of clockwise and anticlockwise moments, and recall and apply the equation: [M = Fd] • I can apply the idea that a body in equilibrium experiences an equal total of clockwise and anti-clockwise moments about any pivot • I can explain why the distance, d, must be taken as the perpendicular distance from the line of action of the force to the pivot • I can describe a fluid as either a liquid or a gas and explain that the pressure in a fluid causes a force to act at right angles (normal) to the surface of its container • I can recall and apply the equation: [p = F/A] • I can explain why the pressure at a point in a fluid increases with the height of the column of fluid above that point and with the density of the fluid, and calculate differences in pressure at different depths in a liquid by applying • I can describe upthrust in terms of a greater pressure on the bottom surface of an object than on its top surface, and so explain why the density of the fluid has an effect on the upthrust experienced by an object submerged in it • I can explain why an object floats or sinks, with reference to its weight, volume and the upthrust it experiences • I can describe a simple model of the Earth's atmosphere and of atmospheric pressure, explaining why atmospheric pressure varies with height above a surface • I can interpret and explain the changing motion of an object in terms of the forces acting on it • I can draw and interpret velocity-time graphs for objects that reach terminal velocity • I can interpret and explain the changing motion of an object in terms of the forces acting on it. • I can explain that an object falling from rest through a fluid due to gravity reaches its terminal velocity when its increased speed creates a drag force, which is equal to its weight • I can estimate the distance required for an emergency stop in a vehicle over a range of typical speeds • I can complete conservation of momentum calculations involving two objects • I can explain that when a force acts on an object that is moving, or able to move, a change in momentum occurs • I can calculate a force applied to an object, or the change in momentum it causes, by applying but not recalling the equation: [F = mΔv/Δt] • I can explain that an increased force delivers an increased rate of change of momentum
Aut2-2		
Aut2-3		
Aut2-4		
Aut2-5		
Aut2-6	December	
Aut2-7		
		Christmas holiday
Spr1-1	January	<u>Physics: Waves:</u>

Spr1-2 Spr1-3 Spr1-4 Spr1-5		• I can demonstrate how changes in velocity, frequency and wavelength are inter-related in the transmission of sound waves from one medium to another • I can describe a wave's ability to be reflected, absorbed or transmitted at the boundary between two different materials • I can draw the reflection of a wave at a surface by constructing ray diagrams • I can define ultrasound waves as having a frequency higher than the upper limit of human hearing, and explain how these are used to form images of internal structures in both medical and industrial imaging
Spr1-6	February	• I can compare the two types of seismic wave produced by earthquakes with reference to the media they can travel in and the evidence they provide of the structure • I can state that a lens forms an image by refracting light, and that the distance from the lens to the principal focus is called the focal length • I can explain that images produced by a convex lens can be either real or virtual, but those produced by a concave lens are always virtual • I can construct ray diagrams for both convex and concave lenses • I can calculate magnification as a ratio with no units by applying, but not recalling, the formula: [magnification = image height / object height] • I can explain how the colour of an object is related to the differential absorption, transmission and reflection of different wavelengths of light by the object • I can describe the effect of viewing objects through filters or the effect on light of passing through filters, and the difference between transparency and translucency • I can explain why an opaque object has a particular colour, with reference to the wavelengths emitted • I can state that all bodies, no matter what temperature, emit and absorb infrared radiation, and that the hotter the body, the more infrared radiation it radiates in a given time • I can describe a perfect black body as an object that absorbs all the radiation incident on it and explain that, since a good absorber is also a good emitter, this would make it the best possible emitter • I can explain that, when the temperature is increased, the intensity of every wavelength of radiation emitted increases, but the intensity of the shorter wavelengths increases more rapidly making the body appear more white • I can explain and apply the idea that the temperature of a body is related to the balance between incoming radiation absorbed and radiation emitted, such that when they are equal the temperature is constant, and when uneven the temperature • I can describe the temperature of the Earth as dependent on the rates of absorption and emission of radiation, and draw and interpret diagrams that show how this radiation affects the temperature of the Earth's surface and atmosphere
		Half term holiday

Spr2-1 Spr2-2		Physics: Electromagnetism and magnetism: • I can interpret diagrams of electromagnetic devices in order to explain how they work • I can state and use Fleming's left-hand rule and explain that the size of the induced force depends on the magnetic flux density, current in, and length of, the conductor in the magnetic field • I can calculate the force on a conductor carrying a current at right angles to a magnetic field by applying, but not recalling, the equation: [F = B I L] • I can explain how rotation is caused in an electric motor
Spr2-3 Spr2-4 Spr2-5 Spr2-6	March	
	April	**Easter holiday**
Sum1-1 Sum1-2		Physics: Space • Solar system • Lifecycle of stars • Formation of elements • Satellites • Big Bang theory (TRIPLE) • Red-shift (TRIPLE) Revision, Assessment and Feedback
Sum1-3 Sum1-4 Sum1-5 Sum1-6	May	
	June	**Half term holiday**
Sum2-1 Sum2-2 Sum2-3 Sum2-4		REVISION AND PREPARATION FOR END OF YEAR EXAM.
Sum2-5 Sum2-6 Sum2-7	July	