Thomas More Catholic Academy
FAITH | EXCELLENCE | RESPECT

Physics Curriculum Sequence – Key Stage 3

	KS2 National Curriculum prior learning	**By the end of the term, students can:**	Year 7 Term 1 Solar Power Investigation	Year 7 Term 2 Energy - Energy Transfers	Year 7 Term 3 Waves - Light Waves	Year 8 Term 1 Forces - Speed	Year 8 Term 2 Electromagnets – Voltage and resistance	Year 8 Term 3 Electromagnets -	Year 9 Term 1 Energy	Year 9 Term 2 Electricity	Year 9 Term 3 Waves
What we want our students to know and remember	The principal focus in KS3 is to develop a deeper understanding of a range of scientific ideas. Pupils should begin to see the connections between these subject areas and become aware of some of the big ideas underpinning scientific knowledge and understanding. Examples of these big ideas in Physics are: Forces - Earth and Space (movement of Earth, Sun and Moon), Forces (gravity; friction; levers, pulleys and gears). Electromagnets - Electricity (brightness and voltage; circuit symbols; magnets; series circuits; conductors and insulators). Waves - Light (shadows; how we see), Sound (how sound is made; pitch, volume). They should be encouraged to relate scientific explanations to phenomena in the world around	Define the key tier 3 **vocabulary**:	Scientific enquiries: Different ways to investigate including observation over time, fair test and pattern seeking. Variable: A factor that can be changed, measured and controlled. Independent variable: What you change in an investigation to see how it affects the dependent variable. Dependent variable: What you measure or observe in an investigation. Correlation: A relationship between variables where one increases or decreases as the other increases. Risk: How likely something is to be harmful. Hazard: A situation that presents a threat to people. Benefit: Something good or helpful. Range: The maximum and minimum values of a variable. Interval: The gap between the values of the independent variable. Control	Thermal energy store: Filled when an object is warmed up. Chemical energy store: Emptied during chemical reactions when energy is transferred to the surroundings. Kinetic energy store: Filled when an object speeds up. Gravitational potential energy store: Filled when an object is raised. Elastic energy store: Filled when a material is stretched or compressed. Dissipated: Become spread out wastefully.	Incident ray: The incoming ray. Reflected ray: The outgoing ray. Normal line: From which angles are measured, at right angles to the surface. Angle of reflection: Between the normal and reflected ray. Angle of incidence: Between the normal and incident ray. Refraction: Change in the direction of light going from one material into another. Absorption: When energy is transferred from light to a material. Scattering: When light bounces off an object in all directions. Transparent: A material that allows all light to pass through it. Translucent: A material that allows some light to pass through it. Opaque: A material that allows no light to pass through it. Convex lens: A lens that is thicker in the middle	Speed: How much distance is covered in how much time. Average speed: The overall distance travelled divided by overall time for a journey. Relative motion: Different observers judge speeds differently if they are in motion too, so an object's speed is relative to the observer's speed. Acceleration: How quickly speed increases or decreases.	Potential difference (voltage): The amount of energy shifted from the battery to the moving charge, or from the charge to circuit components, in volts (V). Resistance: A property of a component, making it difficult for charge to pass through, in ohms (Ω). Electrical conductor: A material that allows current to flow through it easily, and has a low resistance. Electrical insulator: A material that does not allow current to flow easily, and has a high resistance.	Electromagnet: A non-permanent magnet turned on and off by controlling the current through it. Solenoid: Wire wound into a tight coil, part of an electromagnet. Core: Soft iron metal which the solenoid is wrapped around.	atomic energy: another name for nuclear energy. Cell: it contains a store of chemical energy that can produce electricity (the scientific name for a battery). chemical energy: the kind of energy stored in chemicals. Food, fuel and cells (batteries) all contain chemical energy. electrical energy: the kind of energy carried by electricity. energy flow diagram: a way of showing energy changes as a flow chart. Gravitational potential energy: the kind of energy stored by anything that can fall down. heat energy: the hotter something is the more heat energy it has. joule (J): the unit for measuring energy. kilojoule (kJ): there are 1000 joules (J) in 1 kilojoule (kJ). kinetic energy: the kind of energy in moving things. light energy: the kind of energy	Ammeter: measures how much electricity is flowing around a circuit. Cell: it contains a store of chemical energy that can produce electricity (the scientific name for a battery). Current: the flow of electrons around a circuit. Electron: tiny particle that flows around a circuit. in parallel: a circuit is in parallel when the current divides, a part going through each component, then joins up to complete the circuit. Model: a scientific way of thinking about how things happen. Rechargeable: cells that can have more energy stored in them after they have been used are said to be rechargeable. Resistor: a component that makes it more difficult for current to flow – resistors are used to control the size of the current in the circuit.	Vibrate: move backwards and forwards. Amplitude: half the height of a wave. Frequency: the number of waves each second. hertz (Hz): the unit for frequency. 1 hertz means one wave per second. Loudness: how loud a sound is; the volume of a sound. Oscilloscope: an instrument which shows a picture of a wave on a screen. Pitch: how high or low a note sounds. Wave: a way of transferring energy. Waves can be side to side or backwards and forwards movements. Wavelength: the distance between the top of one wave and the top of the next. Vacuum: a completely empty space with no particles.

	them and start to use modelling and abstract ideas to develop and evaluate explanations.		group: Those that are not exposed to the factor being tested. Linear relationship: When two variables are graphed and show a straight line which goes through the origin, and they can be called directly proportional. Outlier: A piece of data that does not fit the pattern. Mean: An average of a set of data, calculated by adding all the values and dividing by the number of values.		which bends light rays towards each other. Concave lens: A lens that is thinner in the middle which spreads out light rays. Retina: Layer at the back of the eye with light detecting cells and where an image is formed.				given out by light bulbs, candles, etc. machine: something that changes energy from one form to another. nuclear energy: energy stored inside atoms. potential energy: the scientific word for 'stored' energy. sound energy: the kind of energy that is made by anything that is making a noise. strain energy: the kind of energy stored in stretched or squashed things which can change back to their original shapes. Transfer: when energy is changed from one form into another we say it is transferred.	Transfer: when energy is changed from one form into another we say it is transferred. Voltage: a way of saying how much energy is transferred by electricity. Voltmeter: a component that measures voltage. volt (V): the unit for voltage.	
			Year 7 Term 1 Energy - Energy Costs	Year 7 Term 2 Waves - Sound Waves		Year 8 Term 1 Forces - Gravity	Year 8 Term 2 Electromagnets - Current	Year 8 Term 3 Electromagnets - Magnetism	Year 9 Term 1 Forces	Year 9 Term 2 Magnetism	Year 9 Term 3 Space

			Power: How quickly energy is transferred by a device (watts). Energy resource: Something with stored energy that can be released in a useful way. Non-renewable: An energy resource that cannot be replaced and will be used up. Renewable: An energy resource that can be replaced and will not run out. Examples are solar, wind, waves, geothermal and biomass. Fossil fuels: Non-renewable energy resources formed from the remains of ancient plants or animals. Examples are coal, crude oil and natural gas.	Vibration: A back and forth motion that repeats. Longitudinal wave: Where the direction of vibration is the same as that of the wave. Volume: How loud or quiet a sound is, in decibels (dB). Pitch: How low or high a sound is. A low (high) pitch sound has a low (high) frequency. Amplitude: The maximum amount of vibration, measured from the middle position of the wave, in metres. Wavelength: Distance between two corresponding points on a wave, in metres. Frequency: The number of waves produced in one second, in hertz. Vacuum: A space with no particles of matter in it. Oscilloscope: Device able to view patterns of sound waves that have been turned into electrical signals. Absorption: When energy is transferred from sound to a material. Auditory range: The lowest and highest frequencies that a type of animal can hear. Echo: Reflection of sound waves from a surface		Weight: The force of gravity on an object (N). Non-contact force: One that acts without direct contact. Mass: The amount of stuff in an object (kg). Gravitational field strength, g: The force from gravity on 1 kg (N/kg). Field: The area where other objects feel a gravitational force.	Negatively charged: An object that has gained electrons as a result of the charging process. Positively charged: An object that has lost electrons as a result of the charging process. Electrons: Tiny particles which are part of atoms and carry a negative charge. Charged up: When materials are rubbed together, electrons move from one surface to the other. Electrostatic force: Non-contact force between two charged objects. Current: Flow of electric charge, in amperes (A). In series: If components in a circuit are on the same loop. In parallel: If some components are on separate loops. Field: The area where other objects feel an electrostatic force.		mean speed: the total distance something travels divided by the total time taken allows you to calculate the thing's mean or average speed. Speed - how fast something is moving. Often measured in metres per second (m/s), miles per hour (mph) or kilometres per hour (km/h). Accelerate - change speed. air resistance - a force that tries to slow down things that are moving through the air. It is a type of friction. balanced forces - when two forces are the same strength, but working in opposite directions. Friction - a force that tries to slow things down when two things rub against each other. unbalanced forces - when two forces working in opposite directions are not the same strength. Drag - another name for air resistance or water resistance. Streamlined - giving something a smooth shape to reduce the air resistance or water resistance. water resistance - a force that tries to slow down	Attract - two things pulling towards each other. Cobalt - a metal that is a magnetic material. Iron - a metal that is a magnetic material. Magnet - something that can attract magnetic materials. magnetic materials - materials that are attracted to a magnet; iron, cobalt, nickel and steel are all magnetic materials. Magnetism - a non-contact force. Nickel - a metal that is a magnetic material. north pole - one end of a magnet. This ends points north if the magnet can move. Repel - push away. south pole - one end of a magnet. Steel - a mixture made mainly from iron; it is a magnetic material. bar magnet - a straight magnet, shaped like a small bar. Compass - a magnetised piece of metal that can swing around – it points north. north-seeking pole - the end of a magnet that points north if the magnet can move freely. Often just called the north pole.	Gravity: the force of attraction between any two objects. newton (N): the unit of force. Weight: the amount of force with which gravity pulls something towards the Earth. It is measured in newtons (N). artificial satellite: a satellite made by humans. Communications satellite: a satellite used to transmit TV programmes or telephone calls. Earth observation: a satellite used to take pictures of the Earth – for instance to help forecast Elliptical: oval shaped. The shape of a planet's orbit around the Sun. geostationary orbit: an orbit where a satellite takes exactly 24 hours to circle the Earth, so it always stays over the same part of the Earth. natural satellite: a satellite that has not been made by humans. The Moon is a natural satellite of the Earth. polar orbit: an orbit where a satellite passes over the North and South Poles. It will pass over all parts of the Earth during several orbits. Satellite: anything

				back to the listener.						things that are moving through water. It is a type of friction. distance–time graph - a graph that shows how far something has moved in a certain time.	south-seeking pole - the end of a magnet that points south if the magnet can move freely. Often just called the south pole. iron filings - tiny pieces of iron that are sometimes used to find the shape of a magnetic field. magnetic field - the space around a magnet where it can affect magnetic materials or other magnets. north magnetic pole - the place on the Earth where compasses point (it is not in the same place as the North Pole marked on maps). plotting compass - a small compass used for finding the direction of a magnetic field. Electromagnet - a coil of wire with electricity flowing in it. An electromagnet has a magnetic field like a bar magnet. permanent magnet - a magnet that keeps its magnetism – it does not depend on electricity. Solenoid - a coil of wire.	in orbit around a planet.
						Year 8 Term 1 Forces - Contact Forces							

						Equilibrium: State of an object when opposing forces are balanced. Deformation: Changing shape due to a force. Linear relationship: When two variables are graphed and show a straight line which goes through the origin, and they can be called directly proportional. Newton: Unit for measuring forces (N). Resultant force: Single force which can replace all the forces acting on an object and have the same effect. Friction: Force opposing motion which is caused by the interaction of surfaces moving over one another. It is called 'drag' if one is a fluid. Tension: Force extending or pulling apart. Compression: Force squashing or pushing together. Contact force: One that acts by direct contact.					
						Year 8 Term 1 Forces - Pressure					

						Fluid: A substance with no fixed shape, a gas or a liquid. Pressure: The ratio of force to surface area, in N/m^2, and how it causes stresses in solids. Upthrust: The upward force that a liquid or gas exerts on a body floating in it. Atmospheric pressure: The pressure caused by the weight of the air above a surface.					
		Recall the **knowledge**:	Year 7 Term 1 Solar Power Investigation	Year 7 Term 2 Energy – Energy Transfers	Year 7 Term 3 Waves - Light Waves	Year 8 Term 1 Forces - Speed	Year 8 Term 2 Electromagnetism – Voltage and resistance	Year 8 Term 3 Electromagnetism	Year 9 Term 1 Energy	Year 9 Term 2 Electricity	Year 9 Term 3 Waves
			Write an observation enquiry question. Write a pattern seeking enquiry question. Identify risks and hazards. Identify control measures. Choose range, interval, readings. Test suitability of measuring instrument. Gather data, minimising errors. Select relevant data and do calculations. Identify patterns in data. Suggest relationships between variables.	We can describe how jobs get done using an energy model where energy is transferred from one store at the start to another at the end. When energy is transferred, the total is conserved, but some energy is dissipated, reducing the useful energy	When a light ray meets a different medium, some of it is absorbed and some reflected. For a mirror, the angle of incidence equals the angle of reflection. The ray model can describe the formation of an image in a mirror and how objects appear different colours. When light enters a denser medium it bends towards the normal; when it enters a less dense medium it bends away from the normal. Refraction through lenses and prisms can be described using a ray diagram as a model. Construct ray diagrams to show how light reflects off mirrors, forms	If the overall, resultant force on an object is non-zero, its motion changes and it slows down, speeds up or changes direction.	We can model voltage as an electrical push from the battery, or the amount of energy per unit of charge transferred through the electrical pathway. In a series circuit, voltage is shared between each component. In a parallel circuit, voltage is the same across each loop. Components with resistance reduce the current flowing and shift energy to the surroundings.	An electromagnet uses the principle that a current through a wire causes a magnetic field. Its strength depends on the current, the core and the number of coils in the solenoid.	Nothing would happen without energy. Energy is needed to: keep our bodies working, make machines work, heat homes, schools and offices. Some energy has to be stored so that it is ready for use when we need it: Chemical energy is stored in food, fuels and cells; Gravitational potential energy is stored in high up things; Strain energy is stored in stretched or squashed things; Nuclear energy is stored inside atoms. Energy is measured in joules (J) or kilojoules (kJ). A kilojoule is 1000 joules. Energy needs to	A circuit must have a cell or power supply to provide a voltage. The voltage pushes the electrons around the circuit and gives them energy. This electrical energy is transferred to other components in the circuit, which convert it to other forms of energy. For instance, a light bulb transfers electrical energy to heat and light energy. The voltage of a cell can be measured using a voltmeter. The units for voltage are volts (V).The voltage across a component is a way of measuring how much energy the component is transferring. The	Sound is a form of energy. Sounds are made when things vibrate. The vibrations are passed on by particles in solids, liquids or gases. Sound needs a substance to pass on the vibrations, so it can travel through solids, liquids and gases but not through a vacuum. The speed of sound is faster through solids than liquids, and slowest through gases. This is because the particles are very close together in solids and so the energy is more likely to be passed from one particle to the next. The sound travels in all directions because the particles move in all directions

					images and refracts. Light travels at 300 million metres per second in a vacuum. Different colours of light have different frequencies.				be changed to be useful. Many energy changes take place in everyday life. Often wasted energy is produced in the forms of heat or sound. Energy cannot be made or destroyed, but can only be changed from one form to another. This is the law of conservation of energy.	voltage across all the components in a series circuit adds up to the voltage across the cell. Electricity is supplied to homes and factories as mains electricity. This travels along cables connected to the National Grid. Fossil fuels are transported to power stations where they are burnt to release heat energy. This heats water, turning it to steam. The steam drives turbines which turn generators. The electricity generated flows along cables into the National Grid. Nuclear fuel is made from a radioactive metal called uranium. The energy in nuclear fuel did not come from the Sun. Electricity can be generated from renewable resources such as wind and moving water. These will become more important as fossil fuels run out. Sometimes we need a source of portable electricity when we are not close to the mains. This can be supplied by cells (sometimes called batteries). These store chemical energy which can be changed to	unless something stops them. The frequency of a wave is the number of vibrations each second. The unit for frequency is hertz (Hz). If you listen to a sound with a frequency of 100 Hz, one hundred waves reach your ear every second. High pitched sounds have a high frequency, and low pitched sounds have a low frequency. The distance between the waves is called the wavelength. It can be measured between any point on a wave and the same point of the next wave. It is often more convenient to measure it between the top of one wave and the next. Half the height of the wave is called the amplitude. The loudness of a sound depends on the amplitude. Louder notes have more energy and the wave has a bigger amplitude. One major difference between light and sound energy is that light can travel through space (a vacuum) but sound cannot. Light also travels much faster than sound. It is nearly a million times faster. Light

												electrical energy. Cells go flat when they run out of chemical energy. Some cells can be recharged. Energy cannot be made or destroyed, but it can be changed to different forms. Not all energy is turned into a form that we want. Often it is turned into heat that we do not need. This is wasted energy. A car engine produces kinetic energy, which is useful. It also produces heat and sound which are wasted forms of energy. The percentage of useful energy produced by something is known as its efficiency. The human body is 25% efficient.	travels at 300 million metres per second (or 300 000 km/s) and sound travels at about 330 metres per second. Both light waves and sound waves can be reflected. We hear a reflected sound wave as an echo.
			Year 7 Term 1 Energy - Energy Costs	Year 7 Term 2 Waves - Sound Waves		Year 8 Term 1 Forces - Gravity	Year 8 Term 2 Electromagnetism - Current	Year 8 Term 3 Electromagnetism - Magnetism	Year 9 Term 1 Forces	Year 9 Term 2 Magnetism	Year 9 Term 3 Space		

			We pay for our domestic electricity usage based on the amount of energy transferred. Electricity is generated by a combination of resources which each have advantages and disadvantages. We calculate the cost of home energy usage, using the formula: cost = power (kW) x time (hours) x price (per kWh). Food labels list the energy content of food in kilojoules (kJ).	Sound consists of vibrations which travel as a longitudinal wave through substances. The denser the medium, the faster sound travels. The greater the amplitude of the waveform, the louder the sound. The greater the frequency (and therefore the shorter the wavelength), the higher the pitch. Sound does not travel through a vacuum. The speed of sound in air is 330 m/s, a million times slower than light.		Mass and weight are different but related. Mass is a property of the object; weight depends upon mass but also on gravitational field strength. Every object exerts a gravitational force on every other object. The force increases with mass and decreases with distance. Gravity holds planets and moons in orbit around larger bodies.	Current is a movement of electrons and is the same everywhere in a series circuit. Current divides between loops in a parallel circuit, combines when loops meet, lights up bulbs and makes components work. Around a charged object, the electric field affects other charged objects, causing them to be attracted or repelled. The field strength decreases with distance.	Magnetic materials, electromagnets and the Earth create magnetic fields which can be described by drawing field lines to show the strength and direction. The stronger the magnet, and the smaller the distance from it, the greater the force a magnetic object in the field experiences.	Speed tells us how fast something is going. We can work out the mean (average) speed of something by using this formula: mean speed = distance travelled ÷ time taken. Speed can be measured in: metres per second (m/s), kilometres per hour (km/h) or miles per hour (mph). We can show how things move on a distance–time graph. Balanced forces are forces which are the same size but work in opposite directions. Unbalanced forces make things change speed, change shape or change direction. If forces are balanced: a stationary object stays stationary; a moving object continues to move at the same speed. If forces are unbalanced: a stationary object will start to move; a moving object will change its speed or direction. A car or motorbike uses fuel to move at a steady speed because it needs a force from the engine to balance the forces of air resistance and friction.	Magnetism is a non-contact force. Magnets attract magnetic materials. Iron, nickel and cobalt are magnetic materials. Mixtures, like steel, that include a magnetic material will also be attracted to a magnet. Other metals, like aluminium, are not magnetic and will not be attracted to a magnet. Iron oxide is a compound that is a magnetic material. It is used to make video and music cassettes and computer discs. Magnetic materials can also block magnetism. You can make a magnet from a piece of iron or steel. The two ends of a bar magnet are called the north seeking pole and the south seeking pole or north pole and south pole for short. A north pole and a south pole attract each other. Two north poles or two south poles will repel each other. The space around a magnet where it has an effect is called its magnetic field. You can find the shape of the magnetic field using iron filings or using a plotting	The mass of something is the amount of substance or 'matter' it contains. It is measured in kilograms (kg). Weight is the force of gravity pulling on a mass. It is a force, so it is measured in newtons (N). Gravity is the force of attraction between two masses. The force of gravity is stronger if: the objects have large masses; the objects are close together. On Earth, the gravity pulls on every kilogram of mass with a force of 10 N. Gravity is not as strong on the Moon, because the Moon has a much smaller mass than the Earth. If you went to the Moon your mass would not change, but your weight would be less than on Earth because the Moon's gravity is weaker. If a rocket travels away from the Earth, the force of gravity gets less and less as it gets further from Earth. If it is heading for the Moon, it will eventually reach a place where the Earth's gravity is cancelled out by the Moon's gravity. After that,

											The amount of air resistance on something can be reduced by giving it a smooth, streamlined shape. The air resistance increases as the speed increases, so cars use up more fuel per mile when they are travelling fast. Air resistance is caused by air particles hitting the moving object. The particles transfer energy to the object, which is why objects moving through air can get hot. The forces on a skydiver change during a jump. Her weight is the same all the time, but her air resistance changes during the jump. We can use a speed–time graph to show what happens.	compass. The Earth has a magnetic field. A compass is a small magnet that always points north. But magnetic materials placed near a compass can change the direction that it points. Magnets can be used to sort iron and aluminium cans for recycling. Only the iron cans are attracted to the magnet. Magnets can also be used for holding fridge doors shut, and in compasses that sailors or walkers use. A wire with electricity flowing through it has a magnetic field around it. An electromagnet is a coil of wire with an electric current flowing through it. You can make an electromagnet stronger by: increasing the number of coils of wire, increasing the size of the current (by increasing the voltage) or using an iron core. Electromagnets can be used for lifting things. They are also used in electric bells, relays and in video and music recording.	the Moon's gravity will be pulling it towards the Moon. The Sun's gravity keeps all the planets moving in elliptical orbits around it. If there was no gravity from the Sun, the planets would all fly off into space. The Earth's gravity keeps the Moon in orbit around the Earth.
						Year 8 Term 1 Forces - Contact forces							

						When the resultant force on an object is zero, it is in equilibrium and does not move, or remains at constant speed in a straight line. One effect of a force is to change an object's form, causing it to be stretched or compressed. In some materials, the change is proportional to the force applied.					
						Year 8 Term 1 Forces - Pressure					
						Pressure acts in a fluid in all directions. It increases with depth due to the increased weight of fluid, and results in an upthrust. Objects sink or float depending on whether the weight of the object is bigger or smaller than the upthrust. Different stresses on a solid object can be used to explain observations where objects scratch, sink into or break surfaces.					
What we want our students to do	Pupils should understand that science is about working	Demonstrate excellence in these **skills**:	Year 7 Term 1 Solar Power Investigation	Year 7 Term 2 Energy - Energy Transfers	Year 7 Term 3 Waves - Light Waves	Year 8 Term 1 Forces - Speed	Year 8 Term 2 Electromagnetism – Voltage and resistance	Year 8 Term 3 Electromagnetism	Year 9 Term 1 Energy	Year 9 Term 2 Electricity	Year 9 Term 3 Waves

	objectively, modifying explanations to take account of new evidence and ideas and subjecting results to peer review. Pupils should decide on the appropriate type of scientific enquiry to undertake to answer their own questions and develop a deeper understanding of factors to be taken into account when collecting, recording and processing data. They should evaluate their results and identify further questions arising from them.		Identify an observation that could be recorded or measured over time. Identify a dependent variable. Identify an independent variable. Write a question linking variables in the form 'How does... affect...?' Identify features of an investigation which are hazardous. Determine the nature of the hazard. Suggest the likelihood of that happening. Identify ways of reducing the risk. Choose a suitable range for the independent and dependent variable. Gather sufficient data for the investigation and repeat if appropriate. Prepare a table with space to record all measurements. Use the measuring instrument correctly. Carry out the method carefully and consistently. Remove outliers and calculate mean of repeats. Calculate a mean from a set of data. Read values from a line graph. Spot a data point that does not fit the pattern. Identify a pattern in data from a results table or bar chart.	Describe how the energy of an object depends on its speed, temperature, height or whether it is stretched or compressed. Show how energy is transferred between energy stores in a range of real-life examples. Calculate the useful energy and the amount dissipated, given values of input and output energy. Explain how energy is dissipated in a range of situations.	Use ray diagrams of eclipses to describe what is seen by observers in different places. Explain observations where coloured lights are mixed or objects are viewed in different lights. Use ray diagrams to describe how light passes through lenses and transparent materials. Describe how lenses may be used to correct vision.	Illustrate a journey with changing speed on a distance-time graph, and label changes in motion. Describe how the speed of an object varies when measured by observers who are not moving, or moving relative to the object.	Draw a circuit diagram to show how voltage can be measured in a simple circuit. Use the idea of energy to explain how voltage and resistance affect the way components work. Given a table of voltage against current. Use the ratio of voltage to current to determine the resistance. Use an analogy like water in pipes to explain why part of a circuit has higher resistance.	Use a diagram to explain how an electromagnet can be made and how to change its strength. Explain the choice of electromagnets or permanent magnets for a device in terms of their properties.	Understand the different forms of energy. State the different ways that energy can be stored. Describe some examples of energy changes. State the law of conservation of energy. Draw an energy flow diagram. Explain which forms of energy are usually produced as waste energy. State what efficiency means and be able to calculate efficiency.	State the units for measuring voltage. Describe how to measure voltage. State what voltage is. Explain what happens to the voltage in circuits. Explain where electricity is made and how it gets to our homes. Compare electricity made using other energy resources. Explain some of the dangers of high voltages.	Explain what causes sound. State that sounds can be loud or soft and high or low. Describe how sound travels. State what frequency means. List the differences between light and sound. Explain what sound can and cannot travel through. Recall which things sound travels through the quickest. Describe how the particle model explains how sound travels.
			Year 7 Term 1 Energy - Energy Costs	Year 7 Term 2 Waves - Sound Waves		Year 8 Term 1 Forces - Gravity	Year 8 Term 2 Electromagnetism - Current	Year 8 Term 3 Electromagnetism - Magnetism	Year 9 Term 1 Forces	Year 9 Term 2 Magnetism	Year 9 Term 3 Space

			Compare the amounts of energy transferred by different foods and activities. Compare the energy usage and cost of running different home devices. Explain the advantages and disadvantages of different energy resources. Represent the energy transfers from a renewable or non-renewable resource to an electrical device in the home.	Explain observations where sound is reflected, transmitted or absorbed by different media. Explain observations of how sound travels using the idea of a longitudinal wave. Describe the amplitude and frequency of a wave from a diagram or oscilloscope picture. Use drawings of waves to describe how sound waves change with volume or pitch.		Explain unfamiliar observations where weight changes. Draw a force diagram for a problem involving gravity. Deduce how gravity varies for different masses and distances. Compare your weight on Earth with your weight on different planets using the formula.	Describe how current changes in series and parallel circuits when components are changed. Turn circuit diagrams into real series and parallel circuits, and vice versa. Describe what happens when charged objects are placed near to each other or touching. Use a sketch to describe how an object charged positively or negatively became charged up.	Use the idea of field lines to show how the direction or strength of the field around a magnet varies. Explain observations about navigation using Earth's magnetic field.	State what is meant by speed. Calculate speed. Explain what mean speed means. Rearrange the speed formula. State the effects of balanced and unbalanced forces on a moving object. Identify the forces on objects. State the factors that affect acceleration. Explain how air resistance can be reduced and the effect of speed. State why a car needs to use energy to move at a steady speed. Draw and interpret distance–time graphs and velocity–time graphs.	Describe which materials are magnetic. List some properties of magnetic materials. Identify the rules for magnets attracting and repelling. State the names of the two ends of a magnet. Draw a magnetic field for a bar magnet and explain the shape. Write about the Earth's magnetic field. Explain what an electromagnet is. Summarise how to make an electromagnet stronger. Explain why a core can make an electromagnet stronger.	Understand what causes weight. State which direction 'down' is. Explain how gravity affects objects. Calculate the weight of an object. Explain why gravity is different on other planets. Calculate weight on other planets. Describe how gravity changes with distance. Explain how changing gravity affects spacecraft. State what a satellite is. Describe of some uses of artificial satellites. Compare different kinds of orbits for artificial satellites, and why they are useful.
						Year 8 Term 1 Forces - Contact forces						
						Explain whether an object in an unfamiliar situation is in equilibrium. Describe factors which affect the size of frictional and drag forces. Describe how materials behave as they are stretched or squashed. Describe what happens to the length of a spring when the force on it changes.						
						Year 8 Term 1 Forces - Pressure						

						Use diagrams to explain observations of fluids in terms of unequal pressure. Explain why objects either sink or float depending upon their weight and the upthrust acting on them. Explain observations where the effects of forces are different because of differences in the area over which they apply. Given unfamiliar situations, use the formula to calculate fluid pressure or stress on a surface.					
Key assessment questions:			Year 7 Term 1 Solar Power Investigation	Year 7 Term 2 Energy - Energy Transfers	Year 7 Term 3 Waves - Light Waves	Year 8 Term 1 Forces - Speed	Year 8 Term 2 Electromagnetism - Voltage and resistance	Year 8 Term 3 Electromagnetism	Year 9 Term 1 Energy	Year 9 Term 2 Electricity	Year 9 Term 3 Waves

			Explain which type of enquiry is best for answering a given scientific question. Explain whether a given question can be investigated scientifically. Suggest how the question being investigated can be safely explored in a school science laboratory. Explain why having a large range or many readings leads to accurate data. Describe the factors that influence the choice of range and interval for the variables. Describe how anomalous data affects how easily you can identify a pattern. Suggest the relationship between variables.	Compare the percentages of energy wasted by renewable energy sources. Explain why processes such as swinging pendulums or bouncing balls cannot go on forever, in terms of energy. Evaluate analogies and explanations for the transfer of energy.	Use a ray diagram to predict how an image will change in different situations. Predict whether light will reflect, refract or scatter when it hits the surface of a given material. Use ray diagrams to explain how a device with multiple mirrors works.	Suggest how the motion of two objects moving at different speeds in the same direction would appear to the other. Predict changes in an object's speed when the forces on it change.	Predict the effect of changing the rating of a battery or a bulb on other components in a series or parallel circuit. Justify the sizes of voltages in a circuit, using arguments based on energy. Draw conclusions about safety risks, from data on voltage, resistance and current.	Critique the design of a device using an electromagnet and suggest improvements. Suggest how bells, circuit breakers and loudspeakers work, from diagrams.	List the different types of energy. A car engine uses chemical energy, and changes it to other forms of energy - where is the chemical energy stored? Name three kinds of energy that a car engine produces. Which form of energy is useful energy? A light bulb changes electrical energy to heat and light energy. If you could measure all the heat and light energy produced, how much energy would there be compared to the electrical energy it used? What does energy efficiency mean? If 1500 J of energy is supplied to a gas boiler, how much useful heat energy does it release? Using a gas boiler is more energy efficient overall than using electric fires. Explain why this is so.	What is voltage? What is current? What do we use to measure voltage? What do we use to measure current? Where should this equipment be placed in a circuit?	What do loudspeakers do to produce the sound? Describe how the sound gets from the loudspeaker to us. Sound, light and ripples on water travel at different speeds. Which is quicker? You can often hear an echo in a large building or a cave. Explain how an echo is formed. What is a vacuum? Why does sound not travel through a vacuum?
			Year 7 Term 1 Energy - Energy Costs	Year 7 Term 2 Waves - Sound Waves		Year 8 Term 1 Forces - Gravity	Year 8 Term 2 Electromagnetism - Current	Year 8 Term 3 Electromagnetism - Magnetism	Year 9 Term 1 Forces	Year 9 Term 2 Magnetism	Year 9 Term 3 Space

			Evaluate the social, economic and environmental consequences of using a resource to generate electricity, from data. Suggest actions a government or communities could take in response to rising energy demand. Suggest ways to reduce costs, by examining data on a home energy bill.	Suggest the effects of particular ear problems on a person's hearing. Evaluate the data behind a claim for a sound creation or blocking device, using the properties of sound waves. Use diagrams to compare the waveforms a musical instrument makes when playing different pitches or volumes.		Compare and contrast gravity with other forces. Draw conclusions from data about orbits, based on how gravity varies with mass and distance. Suggest implications of how gravity varies for a space mission.	Compare the advantages of series and parallel circuits for particular uses. Evaluate a model of current as electrons moving from the negative to the positive terminal of a battery, through the circuit. Suggest ways to reduce the risk of getting electrostatic shocks.	Predict the pattern of field lines and the force around two magnets placed near each other. Predict how an object made of a magnetic material will behave if placed in or rolled through a magnetic field.	What will happen to the speed of a car if the forward force is larger than the backward force? What units do we use for speed? What is the formula for working out speed? Why does a rocket in space not need to use its engine to keep moving? Why does a driver need to use the engine to keep a car moving at a steady speed? Why does a car use up more fuel per mile when it travels at 70 mph than when it travels at 50 mph? Why do some lorries have deflectors fitted over their cabs?	Which materials will a magnet attract? Draw in four magnetic field lines around the bar magnet. Add arrows to each line to show the direction of the field. Explain which way a compass points. Give three ways you can make an electromagnet stronger.	What is the name of the force that pulls you downwards? If your mass is 55 kg. What is your weight? How would the size of the forces change on a spacecraft if it had twice as much mass? How would the size of the forces change if the spacecraft moved further away? A satellite moves in a circular orbit around the Earth. It does not need to use its engine to keep moving. Why not? What causes its path to be circular? What are the uses for satellites?
						Year 8 Term 1 Forces – Contact forces						
						Evaluate how well sports or vehicle technology reduces frictional or drag forces. Describe the effects of drag and other forces on falling or accelerating objects as they move. Using force and extension data, compare the behaviour of different materials in deformation using the idea of proportionality. Explain how turning forces are used in levers.						
						Year 8 Term 1 Forces – Pressure						

						Use the idea of pressure changing with depth to explain underwater effects. Carry out calculations involving pressure, force and area in hydraulics, where the effects of applied forces are increased. Use the idea of stress to deduce potential damage to one solid object by another.					
Disciplinary Rigour		What makes your subject different to other subjects? What are the expectations for students in your subject area in the KS3 National Curriculum?	Year 7 Term 1 Solar Power Investigation	Year 7 Term 2 Energy - Energy Transfers	Year 7 Term 3 Waves - Light Waves	Year 8 Term 1 Forces - Speed	Year 8 Term 2 Electromagnetism – Voltage and resistance	Year 8 Term 3 Electromagnetism	Year 9 Term 1 Energy	Year 9 Term 2 Electricity	Year 9 Term 3 Waves
			What are you trying to find out? How are you going to do this? What is the best approach to use? What are the variables? How many input variables will you try? What relationships between the variables are you testing? Are there any variables that will be difficult to control? How might these affect your investigation? What equipment will you use? How will you use it to get accurate measurements? How will you make sure you are safe while doing your experiment? What are your predictions? If some of your results do not fit the pattern, why might they be	Explain the energy transfers in a hand-crank torch: Draw conclusions, Communicate ideas, Construct explanations,	Use ray diagrams to model how light passes through lenses and transparent materials: Communicate ideas, Construct explanations, Devise questions, Test hypothesis	Investigate variables on the speed of a toy car rolling down a slope: Analyse patterns, Discuss limitations, Draw conclusions, Present data, Communicate ideas, Construct explanations, Collect data, Devise questions, Plan variables, Test hypothesis.	Compare the voltage drop across resistors connected in series in a circuit: Draw conclusions, Present data, Communicate ideas, Construct explanations, Devise questions, Plan variables, Test hypothesis.	Investigate ways of varying the strength of an electromagnet: Analyse patterns, Draw conclusions, Present data, Communicate ideas, Construct explanations, Collect data, Devise questions, Plan variables, Test hypothesis, Estimate risks	Investigate what affects cooling: Analyse patterns, Discuss limitations, Draw conclusions, Present data, Communicate ideas, Construct explanations, Collect data, Devise questions, Plan variables	Explore wiring a plug: Present data, Communicate ideas, Construct explanations	Explain the differences between a sound wave and a light wave: Communicate ideas, Construct explanations, Test hypothesis

			wrong? What patterns can you see? What are the relationships between the variables? Is there a scientific idea or theory which will help you explain your results? Do your results match your prediction? If not, explain why. Have you collected enough data to support your explanation of the results? Do your results fully support your explanation? How could you do further experiments to test your explanation? Are there any other ways in which your results could be explained? How accurate do you think your data is? How could you have made it more accurate? Are there any things you would do differently if you did the investigation again? How could you improve your investigation? Were there any variables that you found difficult to control? What were they? How might you try to control them if you did the investigation again?									
			Year 7 Term 1 Energy - Energy Costs	Year 7 Term 2 Waves - Sound Waves		Year 8 Term 1 Forces - Gravity	Year 8 Term 2 Electromagnetism - Current	Year 8 Term 3 Electromagnetism - Magnetism	Year 9 Term 1 Forces	Year 9 Term 2 Magnetism	Year 9 Term 3 Space

			Compare the running costs of fluorescent and filament light bulbs: Analyse patterns, Discuss limitations, Draw conclusions, Communicate ideas, Construct explanations, Critique claims, Justify opinions, Examine consequences, Interrogate sources	Relate changes in the shape of an oscilloscope trace to changes in pitch and volume: Analyse patterns, Draw conclusions, Communicate ideas, Construct explanations, Test hypothesis		Explain the way in which an astronaut's weight varies on a journey to the moon: Analyse patterns, Draw conclusions, Present data, Communicate ideas, Construct explanations.	Compare and explain current flow in different parts of a parallel circuit: Draw conclusions, Present data, Communicate ideas, Construct explanations, Devise questions, Plan variables, Test hypothesis.	Explore the magnetic field pattern around different types or combinations of magnets: Present data, Communicate ideas, Construct explanations	Investigate the speed of a trolley down a ramp: Analyse patterns, Draw conclusions, Present data, Communicate ideas, Construct explanations, Collect data, Devise questions, Plan variables, Test hypothesis, Estimate risks	Investigate factors that affect the speed and direction of a motor: Analyse patterns, Discuss limitations, Draw conclusions, Present data, Communicate ideas, Construct explanations, Collect data, Devise questions, Plan variables, Test hypothesis	Compare gravity on other planets: Analyse patterns, Discuss limitations, Draw conclusions, Communicate ideas, Construct explanations, Critique claims, Justify opinions, Examine consequences, Interrogate sources
						Year 8 Term 1 Forces – Contact forces						
						Investigate factors that affect the size of frictional or drag forces: Analyse patterns, Discuss limitations, Draw conclusions, Present data, Communicate ideas, Construct explanations, Collect data, Devise questions, Plan variables, Test hypothesis						
						Year 8 Term 1 Forces - Pressure						
						Investigate how pressure from your foot onto the ground varies with different footwear: Analyse patterns, Draw conclusions, Communicate ideas, Construct explanations, Collect data, Devise questions, Plan variables, Test hypothesis						