Physics

	STRAND 1 Energy and efficiency	**STRAND 2** Forces, motion, pressure & magnetism	**STRAND 3** Waves – light & sound	**STRAND 4** Space Physics	**STRAND 5** Current & static electricity	**STRAND 6** Working scientifically
9	**All the steps below, and I can also...** • suggest ways that thermal energy transfer by conduction/convection/ radiation may be changed. • use efficiency to evaluate appliances.	**All the steps below, and I can also...** • use the ideas of resultant force (the overall force)s to make predictions on how an object will move; make moment calculations to determine the resultant moment. • apply Hooke's law to a range of elastic objects. • use distance/time graphs to calculate the speed of an object and describe its motion. • use knowledge of magnetism to explain why a freely suspended magnet will point to the geographical North Pole of Earth. • use the idea of electromagnetism to describe how to make a simple motor.	**All the steps below, and I can also...** • identify and explain the seven waves that make up the electromagnetic spectrum with reference to electric, magnetic fields and name some uses/dangers associated with them. • describe similarities and differences between the seven electromagnetic waves. • explain some consequences of superposition (when waves overlap), such as interference.	**All the steps below, and I can also...** • apply knowledge of the Earth's tilt to explain why the northern hemisphere and southern hemisphere experience the four seasons at different times of the year.	**All the steps below, and I can also...** • explain the difference in direction of travel between conventional current (the direction current is shown as flowing) and electron flow current.	**All the steps below, and I can also...** • explain and use the terms of accuracy, precision, repeatability, reproducibility, range, interval and bias correctly and in any context. • use data to support or refute an argument or stated position.
8	**All the steps below, and I can also...** • use the energy of particles to explain the expansion of materials when heated. • use data on energy efficiencies to contrast and compare different items.	**All the steps below, and I can also...** • use the formula for Hooke's Law to calculate extension. • use the correct formula to calculate movements and explain how/why levers multiply the force. • explain what causes upthrust and how to increase/decrease the pressure of a liquid. • describe how, using a plotting compass, the shape of a magnetic field can be determined.	**All the steps below, and I can also...** • label and describe the meaning of transverse and longitudinal waves. • explain dispersion and use the words 'rods' and 'cones' to explain colour blindness.	**All the steps below, and I can also...** • apply knowledge of the Earth's orbit around the Sun to explain the existence of a leap year. • recall that the Sun provides the Earth with light and heat energy and this travels as an electromagnetic wave.	**All the steps below, and I can also...** • identify which direction the current flows in circuits and in solutions. • explain electrostatic induction (charging without direct contact) with or without the use of diagrams.	**All the steps below, and I can also...** • give reasoned explanations that link data to predictions and hypotheses (testable explanations).
7	**All the steps below, and I can also...** • use the idea of particles to describe the process of convection. • explain ways to increase/decrease the amount of energy that is wasted.	**All the steps below, and I can also...** • use the formula to calculate the speed of an object. • recall that a magnetic field is produced when an electric current flows through a conductor. • use the terms 'hard' and 'soft' magnets to describe temporary/permanent magnetic materials.	**All the steps below, and I can also...** • with the help of ray diagrams, describe how convex lenses focus light, the uses of convex lenses and describe the differences between real and virtual images. • compare the human eye to a camera and state similarities/differences. • describe white light as a mixture of colours and how our eye detects the different colours.	**All the steps below, and I can also...** • use the formula to calculate weight when given a mass. • describe the term 'light years' and explain it as a unit of distance and not time.	**All the steps below, and I can also...** • use a formula to calculate current when knowing the charge and the time the current is flowing for. • describe, with and without the aid of a diagram, how to connect a voltmeter in a circuit. • use a formula to calculate resistance when given the voltage and current. • use the idea of friction between two insulators causing the transfer of electrons to describe how objects become electrically charged and give some examples.	**All the steps below, and I can also...** • use scientific names for chemicals correctly. • identify further questions arising from the results of an investigation. • apply sampling techniques.
6	**All the steps below, and I can also...** • use the idea of particles to describe the process of conduction and describe how colour affects the rate of radiation. • use the formula to calculate efficiency.	**All the steps below, and I can also...** • state what a 'moment' is, describe a lever as an example. • state how height affects atmospheric pressure. • explain factors that can alter an object's speed. • describe how the strength of a magnetic field varies with distance between the lines of magnetic field.	**All the steps below, and I can also...** • describe the superposition (when waves overlap) of waves. • state and give examples of longitudinal/transverse waves. • describe the term 'frequency' and with the help of ray diagrams describe refraction. • recall that convex lenses focus light.	**All the steps below, and I can also...** • state that all objects on Earth have a gravitational field and the more massive the object is the larger the field is. • recall that the gravitational field strength of the Earth is 10N/kg • describe the difference between mass and weight.	**All the steps below, and I can also...** • describe how in a series circuit the voltage of the cell/battery is shared across each component. If the components are identical then the voltage is shared equally. • describe how in a parallel circuit the voltage across each branch is the same as the voltage in the cell/battery.	**All the steps below, and I can also...** • evaluate data and explain how random and systematic errors may affect the results. analyse data using simple statistical techniques. • recognise anomalous results (results that do not fit the pattern) in data. • calculate mean data while recognising the need to exclude anomalous results (results that do not fit the pattern) from mean calculations.
5	**All the steps below, and I can also...** • describe the process of conduction, convection and radiation and explain expansion. • recognise that heat and temperature are different and use the terms correctly.	**All the steps below, and I can also...** • describe how to make an electromagnet. • list uses of electromagnets including how to increase their strength and draw the field around a bar magnet/electromagnet. predict whether an object will float or sink using density calculations.	**All the steps below, and I can also...** • recall that some waves can be reflected, refracted, dispersed, absorbed and experience superposition (when waves overlap). • recall 'The Law of Reflection'. can, with the use of a ray diagram, explain how a plane mirror and the human eye can form an image. • describe how the secondary colours of light are formed from combining two primary colours of light.	**All the steps below, and I can also...** • describe the different phases of the Moon as a direct consequence of the orbit of the Moon around the Earth.	**All the steps below, and I can also...** • describe how in a series circuit the current is the same everywhere. • describe how in a parallel circuit the current in each branch adds up to the total current flowing. • describe the effect of a high/low resistance on the current flowing in a circuit and state the unit for resistance.	**All the steps below, and I can also...** • make and record observations and measurements using a range of methods for different investigations. • comment on the reliability of methods. • suggest possible improvements to an investigative technique. • work out appropriate axes and scales for graphs. • draw best-fit lines for appropriate data. • know that scientific theories develop as earlier explanations are modified to take into account new evidence. • understand the importance of publishing results and peer review.

4	**All the steps below, and I can also...** • apply the words conduction, convection and radiation to a variety of situations involving thermal energy transfers.	**All the steps below, and I can also...** • describe forces in terms of contact/non-contact. • explain how friction can be reduced/increased and draw appropriately labelled force diagrams using correct notation. • describe balanced, unbalanced and resultant force (the overall force)s; calculate resultant force (the overall force)s. • describe Hooke's Law and explain ways to increase/decrease drag. • use a formula to calculate pressure. • use the formula to calculate density.	**All the steps below, and I can also...** • use the arrangement of particles in a solid, liquid and gas to explain which material sound will travel through the fastest. • describe how sound waves can be used to transfer information if they are converted to electrical signals.	**All the steps below, and I can also...** • list the planets in our Solar System in order. • recall and explain why Pluto is classed as a dwarf planet.	**All the steps below, and I can also...** • name the components used to measure current and voltage. • describe, with and without the aid of a diagram, how to connect an ammeter in a circuit. • describe the electric current as a flow of electrons and state the unit of current as the ampere, amps, A.	**All the steps below, and I can also...** • use simple equations to carry out calculations from results and interpret observations to identify simple patterns. • ask questions based on observations and make simple predictions. • plan a simple investigation and identify independent, dependent and control variables. • recognise some potential sources of error.
3	**All the steps below, and I can also...** • use the correct notation and apply it to a variety of energy transformations, stating what the useful and wasted energies are. • recall the 'Law of Conservation of Energy'.	**All the steps below, and I can also...** • describe how friction, air and water resistance (drag forces) all change with speed. • recall what 'gravity' is.	**All the steps below, and I can also...** • list some examples of waves.	**All the steps below, and I can also...** • recall facts about the Earth, such as the names of the seasons, length of the day/year. can, through the use of a model, describe facts about the Earth, such as day, year and seasons.	**All the steps below, and I can also...** • form circuit diagrams, state which is a series circuit and which is a parallel circuit. • identify and draw more complex circuit symbols, such as Ammeter, Voltmeter, fuse, resistor, variable resistor, diode, LED, LDR and thermistor. • correctly use the words current and voltage.	**All the steps below, and I can also...** • name and use some SI units. • identify hazards and carry out a simple risk assessment. • identify simple patterns or trends from data presented in graphs.
2	**All the steps below, and I can also...** • make predictions as to whether a material is a conductor or insulator.	**All the steps below, and I can also...** • use the words 'friction', 'air- and water-resistance' correctly and state how they change with increasing/decreasing speed; state that these forces occur when objects move. • recall what is meant by 'speed'	**All the steps below, and I can also...** • recall the primary and secondary colours of light and use the words 'transparent', 'translucent' and 'opaque'.	**All the steps below, and I can also...** • recall that the Earth spins on its axis and use this to explain why we have day and night and why the Sun appears to move across the sky.	**All the steps below, and I can also...** • use recognised circuit symbol for battery, wire, lamp, open switch and closed switch when drawing circuit diagrams. • describe how changing the voltage of a circuit changes the current flowing and this increases the brightness of a lamp.	**All the steps below, and I can also...** • present findings and draw simple conclusions from experimental data. • present observations and data using simple labels and graphs where axes and scales are provided.
1	**I can...** • use the words 'conductor' and 'insulator' correctly. • name some conductors and insulators	**I can...** • state that a force is a push or a pull and name some examples of forces. • describe magnets as having poles and that like poles repel, opposite poles attract.	**I can...** • explain how the human eye sees luminous and non-luminous objects/ use the idea that light travels in straight lines to explain the formation of shadows. • find patterns between the pitch of a sound and features of the object that produced it. • find patterns between the volume of a sound and the strength of the vibrations that produced it. • recognise that sound gets fainter the further away you get from a source.	**I can...** • describe the Sun, Moon and Earth as approximately spherical bodies.	**I can...** • construct a simple series circuit. • use the term 'complete' or 'incomplete' circuit correctly.	**I can...** • take measurements using a range of scientific equipment, including repeat readings. • draw simple, correctly labelled scientific diagrams. • follow instructions safely.