

Topic Journey – Year 7

Building Scientific Knowledge.

Introduction

Aim of our syllabus Our Key Stage 3 (KS3) Science Syllabus will deliver engaging lessons and promotes teaching for understanding rather than covering fragmented content. By following the framework within this syllabus, students will understand what they need to know by the end of Key Stage 3 (KS3). Using a logical order of objectives, this syllabus uses big ideas and mastery goals to equip students for success at GCSE. It also provides a method to follow student progress as their understanding develops during KS3.

- Our KS3 Curriculum aims to including:

Enquiry processes: working scientifically

Analyse

- Analyse patterns
- Discuss limitations
- Draw conclusions
- Present data



Communicate

- Communicate ideas
- Construct explanations
- Critique claims
- Justify opinions



Enquire

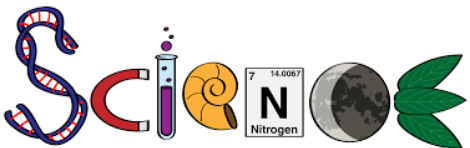
- Collect data
- Devise questions
- Plan variables
- Test hypotheses



Solve

- Estimate risks
- Examine consequences
- Review theories
- Interrogate sources





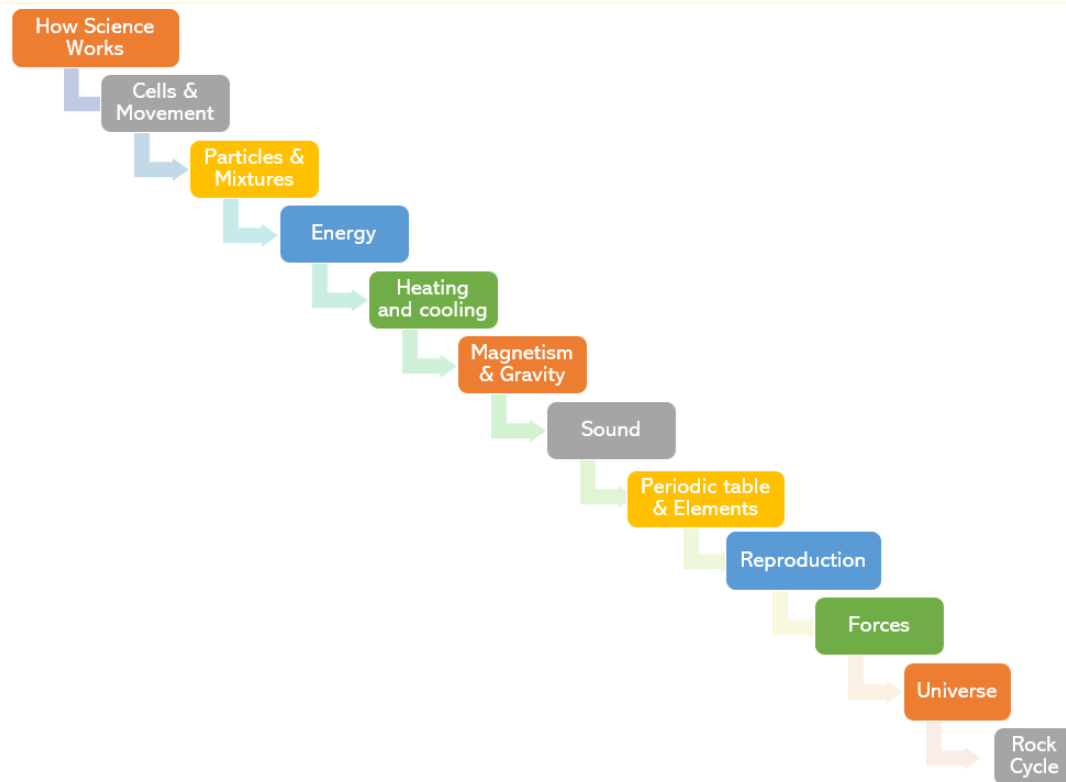
Our Key Stage 3, Year 7 curriculum:

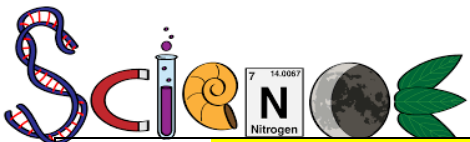
Purpose of Study:

A high-quality science education provides the foundations for understanding the world through the specific disciplines of biology, chemistry and physics. Science has changed our lives and is vital to the world's future prosperity, and all pupils should be taught essential aspects of the knowledge, methods, processes and uses of science. Through building up a body of key foundational knowledge and concepts, pupils should be encouraged to recognise the power of rational explanation and develop a sense of excitement and curiosity about natural phenomena. They should be encouraged to understand how science can be used to explain what is occurring, predict how things will behave, and analyse causes.

The principal focus of science teaching in key stage 3 is to develop a deeper understanding of a range of scientific ideas in the subject disciplines of biology, chemistry and physics. Pupils should begin to see the connections between these subject areas and become aware

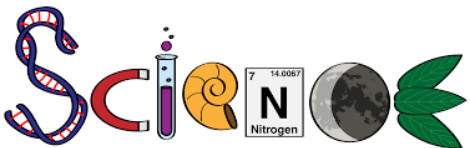
of some of the big ideas underpinning scientific knowledge and understanding. Examples of these big ideas are the links between structure and function in living organisms, the particulate model as the key to understanding the properties and interactions of matter in all its forms, and the resources and means of transfer of energy as key determinants of all of these interactions. They should be encouraged to relate scientific explanations to phenomena in the world around them and start to use modelling and abstract ideas to develop and evaluate explanations.



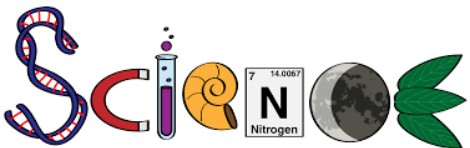


The below table identifies and highlights the key stages in our curriculum for Key Stage 3, Year 7 Students.

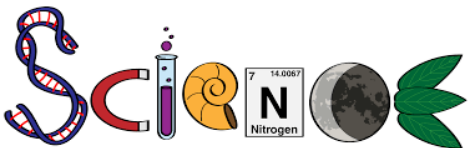
Science – unit of study	When is this taught? (Approx)	National Curriculum Links – Developing knowledge
How Science Works	September – October	<ul style="list-style-type: none"> • Develop scientific knowledge and conceptual understanding through the specific disciplines of biology, chemistry and physics. • Develop understanding of the nature, processes and methods of science through different types of science enquiries that help them to answer scientific questions about the world around them. • Equipped with the scientific knowledge required to understand the uses and implications of science, today and for the future. • Pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility. • Understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review. • Evaluate risks. • Ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience. • Present observations and data using appropriate methods, including tables and graphs
Cells	September – November	<ul style="list-style-type: none"> • Cells as the fundamental unit of living organisms, including how to observe, interpret and record cell structure using a light microscope. • The functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, mitochondria and chloroplasts. • The similarities and differences between plant and animal cells. • The role of diffusion in the movement of materials in and between cells. • The structural adaptations of some unicellular organisms. • The structure and functions of the human skeleton, to include support, protection, movement and making blood cells.
Energy	November-December	<ul style="list-style-type: none"> • Energy changes on changes of state (qualitative). • Exothermic and endothermic chemical reactions (qualitative). • Calculation of fuel uses and costs in the domestic context. • Comparing energy values of different foods (from labels) (kJ). • Comparing power ratings of appliances in watts (W, kW). • Comparing amounts of energy transferred (J, kJ, kW hour). • Domestic fuel bills, fuel use and costs. • Fuels and energy resources.



<p>Particles</p>	<p>November – December</p>	<ul style="list-style-type: none"> • Be able to describe properties of solids, liquids and in terms of particles in motion but with differences in the arrangement and movement of these same particles: closely spaced and vibrating (solid), in random motion but in contact (liquid), or in random motion and widely spaced (gas). • Carry out observations where substances change temperature or state can be described in terms of particles gaining or losing energy • Understand key facts, such as; A substance is a solid below its melting point, a liquid above it, and a gas above its boiling point.
<p>Magnetism</p>	<p>January</p>	<ul style="list-style-type: none"> • Develop knowledge of Magnetic materials, electromagnets and the Earth create magnetic fields which can be described by drawing field lines to show the strength and direction. • Be able to describe, the stronger the magnet, and the smaller the distance from it, the greater the force a magnetic object in the field experiences. • Develop understanding of key words such as; Magnetic Force, Permanent magnet, magnetic poles.
<p>Heating & Cooling</p>	<p>January – February</p>	<ul style="list-style-type: none"> • Develop knowledge of the thermal energy of an object depends upon its mass, temperature and what it's made of. • Be able to describe when there is a temperature difference, energy transfers from the hotter to the cooler object. • Know that thermal energy is transferred through different pathways, by particles in conduction and convection, and by radiation • Develop understanding of key words such as; Thermal conductor, Thermal insulator, Temperature, Thermal Energy, Conduction, Convection, & Radiation.
<p>Periodic Table</p>	<p>February – April</p>	<ul style="list-style-type: none"> • The varying physical and chemical properties of different elements. • The principles underpinning the Mendeleev Periodic Table. • The Periodic Table: periods and groups; metals and non-metals. • How patterns in reactions can be predicted with reference to the Periodic Table. • The properties of metals and non-metals. • The chemical properties of metal and non-metal oxides with respect to acidity.
<p>Sound</p>	<p>February – March</p>	<ul style="list-style-type: none"> • frequencies of sound waves, measured in hertz (Hz); echoes, reflection and absorption of sound. • Sound needs a medium to travel, the speed of sound in air, in water, in solids. • Sound produced by vibrations of objects, in loud speakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal. • Auditory range of humans and animals.



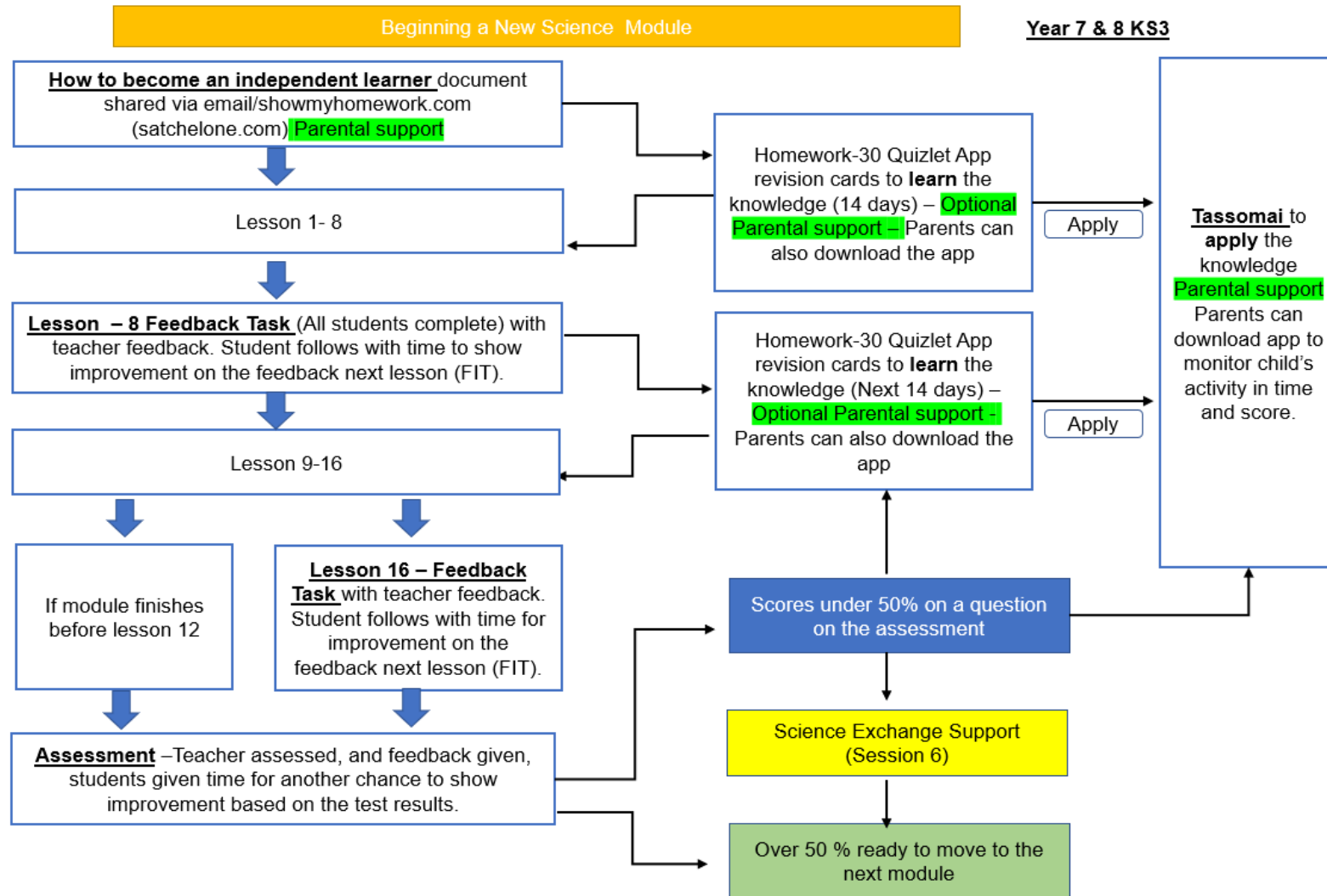
<p>Forces</p>	<p>May – June</p>	<ul style="list-style-type: none"> • forces as pushes or pulls, arising from the interaction between two objects. • Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces. • Moment as the turning effect of a force. • Forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water. • Forces measured in newtons, measurements of stretch or compression as force is changed. • Force-extension linear relation; Hooke’s Law as a special case. • Work done and energy changes on deformation Science – key stage 3. • Non-contact forces: gravity forces acting at a distance on Earth and in space, forces between magnets and forces due to static electricity
<p>Reproduction</p>	<p>March – May</p>	<ul style="list-style-type: none"> • reproduction in humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta. • Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms.
<p>Universe</p>	<p>May</p>	<ul style="list-style-type: none"> • Gravity force, weight = mass x gravitational field strength (g), on Earth $g=10 \text{ N/kg}$, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and Sun (qualitative only). • Our Sun as a star, other stars in our galaxy, other galaxies. • The seasons and the Earth’s tilt, day length at different times of year, in different hemispheres. • The light year as a unit of astronomical distance.
<p>Rock Cycle</p>	<p>June - July</p>	<ul style="list-style-type: none"> • The composition of the Earth. • The structure of the Earth. • The rock cycle and the formation of igneous, sedimentary and metamorphic rocks. • Earth as a source of limited resources and the efficacy of recycling.

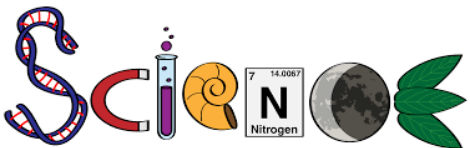


Year 7 - Assessment cycles: - This varies depending on the number of teachers each class has, and the rough timeframe on learning.

Topic Assessed	When? (Roughly)	How to Revise/review
How Science Works	Week before October half term	Class books, website resources (How to become an independent learner & Above and beyond tasks) & Tassomai
Cells & Movement	Mid November	Class books, website resources (How to become an independent learner & Above and beyond tasks) & Tassomai
Particles & Mixtures	Between the week before Christmas and the week after Christmas	Class books, website resources (How to become an independent learner & Above and beyond tasks) & Tassomai
Periodic Table	Early May	Class books, website resources (How to become an independent learner & Above and beyond tasks) & Tassomai
Reproduction	Mid May	Class books, website resources (How to become an independent learner & Above and beyond tasks) & Tassomai
Progress Assessments: GL Assessments	Start of Year 7 & End of Year 8.	Class books, website resources (How to become an independent learner & Above and beyond tasks) & Tassomai

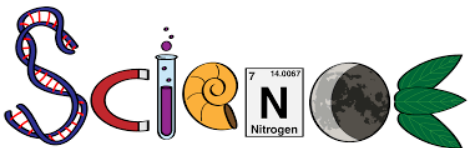
Support Roadmap in place for KS3



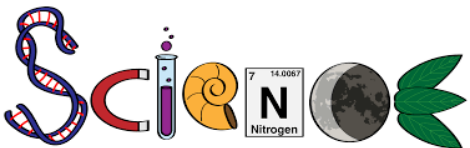


Key word bank for each topic:

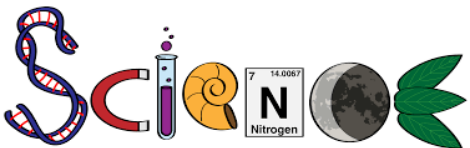
TOPIC	Key Word & Definition
How Science Works	<ul style="list-style-type: none"> • Experimental error: Variations in measurements, owing to the method, measurement techniques or the instrument. • Random and systematic error: Random errors are when the same quantity is measured and inconsistent values obtained. • Systematic errors: arise from an inaccuracy in the system and give rise to errors of the same value • 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. • Continuous variable: Has values that can be any number. • Discontinuous variable: Has values that are words or discrete numbers. Bar chart/column graph: Displays the values of categories. • Line graph: Shows the relationship between two continuous variables. • Pie chart: Shows the proportions or percentages that make up a whole. • Line of best fit: A straight or curved line drawn to show the pattern of data points. • Scatter graph: Shows the independent variable vs dependent variable • Observation: Information gathered by your senses. • Evidence: Information from an observation or experiment that supports an idea. • Range: The maximum and minimum values of a variable. • Interval: The gap between the values of the independent variable. • Control group: Those that are not exposed to the factor being tested. • Repeatable: When repeat readings are close together • 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



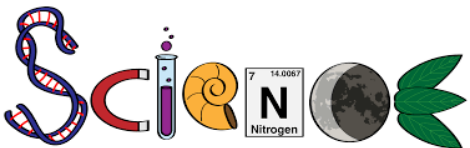
	<ul style="list-style-type: none"> • Control variable: One that remains unchanged or is held constant to stop it affecting the dependent variable • Hypothesis: An explanation you can test which includes a reason and a 'science idea'. • Observation: Information gathered by your senses. • Prediction: What you think will happen in an experiment. • Risk: How likely something is to be harmful. • Hazard: A situation that presents a threat to people. • Benefit: Something good or helpful. • Control measure: An action taken to remove the hazard or to reduce the exposure to it.
<p>Cells & Movement</p>	<ul style="list-style-type: none"> • Cell: The unit of a living organism, contains parts to carry out life processes. • Uni-cellular: Living things made up of one cell. • Multi-cellular: Living things made up of many types of cell. • Tissue: Group of cells of one type. • Organ: Group of different tissues working together to carry out a job. • Diffusion: One way for substances to move into and out of cells. • Structural adaptations: Special features to help a cell carry out its functions. • Cell membrane: Surrounds the cell and controls movement of substances in and out. • Nucleus: Contains genetic material (DNA) which controls the cell's activities. • Vacuole: Area in a cell that contains liquid, and can be used by plants to keep the cell rigid and store substances. • Mitochondria: Part of the cell where energy is released from food molecules. • Cell wall: Strengthens the cell. In plant cells it is made of cellulose. • Chloroplast: Absorbs light energy so the plant can make food. • Cytoplasm: Jelly-like substance where most chemical processes happen. • Immune system: Protects the body against infections. • Reproductive system: Produces sperm and eggs, and is where the foetus develops. • Digestive system: Breaks down and then absorbs food molecules. • Circulatory system: Transports substances around the body. • Respiratory system: Replaces oxygen and removes carbon dioxide from blood. • Muscular skeletal system: Muscles and bones working together to cause movement and support the body.
<p>Particles & Mixtures</p>	<ul style="list-style-type: none"> • Particle: A very tiny object such as an atom or molecule, too small to be seen with a microscope. • Particle model: A way to think about how substances behave in terms of small, moving particles.



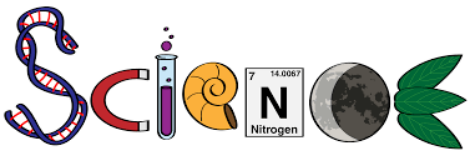
	<ul style="list-style-type: none"> • Diffusion: The process by which particles in liquids or gases spread out through random movement from a region where there are many particles to one where there are fewer. • Gas pressure: Caused by collisions of particles with the walls of a container. • Density: How much matter there is in a particular volume, or how close the particles are. • Evaporate: Change from liquid to gas at the surface of a liquid, at any temperature. • Boil: Change from liquid to a gas of all the liquid when the temperature reaches boiling point. • Condense: Change of state from gas to liquid when the temperature drops to the boiling point. • Melt: Change from solid to liquid when the temperature rises to the melting point. • Freeze: Change from liquid to a solid when the temperature drops to the melting point. • Sublime: Change from a solid directly into a gas. • Solvent: A substance, normally a liquid, that dissolves another substance. • Solute: A substance that can dissolve in a liquid. • Dissolve: When a solute mixes completely with a solvent. • Solution: Mixture formed when a solvent dissolves a solute. • Soluble (insoluble): Property of a substance that will (will not) dissolve in a liquid. • Solubility: Maximum mass of solute that dissolves in a certain volume of solvent. • Pure substance: Single type of material with nothing mixed in. • Mixture: Two or more pure substances mixed together, whose properties are different to the individual substances. • Filtration: Separating substances using a filter to produce a filtrate (solution) and residue. • Distillation: Separating substances by boiling and condensing liquids. • Evaporation: A way to separate a solid dissolved in a liquid by the liquid turning into a gas. • Chromatography: Used to separate different coloured substances.
<p>Energy</p>	<ul style="list-style-type: none"> • 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.
<p>Heating & Cooling</p>	<ul style="list-style-type: none"> • Thermal conductor: Material that allows heat to move quickly through it.



	<ul style="list-style-type: none"> • Thermal insulator: Material that only allows heat to travel slowly through it. • Temperature: A measure of the motion and energy of the particles. • Thermal energy: The quantity of energy stored in a substance due to the vibration of its particles. • Conduction: Transfer of thermal energy by the vibration of particles. • Convection: Transfer of thermal energy when particles in a heated fluid rise. • Radiation: Transfer of thermal energy as a wave.
Magnetism & Gravity	<ul style="list-style-type: none"> • 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 • Mass: The amount of stuff in an object (kg). Gravitational field strength, g: The force from gravity on 1 kg (N/kg). • Magnetic force: Non-contact force from a magnet on a magnetic material. • Permanent magnet: An object that is magnetic all of the time. • Magnetic poles: The ends of a magnetic field, called north-seeking (N) and south-seeking poles (S).
Sound	<ul style="list-style-type: none"> • 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 back to the listener.
Periodic Table	<ul style="list-style-type: none"> • Periodic table: Shows all the elements arranged in rows and columns. • Physical properties: Features of a substance that can be observed without changing the substance itself. • Chemical properties: Features of the way a substance reacts with other substances. • Groups: Columns of the periodic table. • Periods: Rows of the periodic table. • Elements: What all substances are made up of, and which contain only one type of atom.



	<ul style="list-style-type: none"> • Atom: The smallest particle of an element that can exist. • Molecules: Two to thousands of atoms joined together. Most non-metals exist either as small or giant molecules. • Compound: Pure substances made up of two or more elements strongly joined together
<p>Reproduction</p>	<ul style="list-style-type: none"> • Pollen: Contains the plant male sex cells found on the stamens. • Ovules: Female sex cells in plants found in the ovary. • Pollination: Transfer of pollen from the male part of the flower to the female part of the flower on the same or another plant. • Fertilisation: Joining of a nucleus from a male and female sex cell. • Seed: Structure that contains the embryo of a new plant. • Fruit: Structure that the ovary becomes after fertilisation, which contains seeds. • Carpel: The female part of the flower, made up of the stigma where the pollen lands, style and ovary. • Gamete: The male gamete (sex cell) in animals is a sperm, the female an egg. • Fertilisation: Joining of a nucleus from a male and female sex cell. • Ovary: Organ which contains eggs. • Testicle: Organ where sperm are produced. • Oviduct, or fallopian tube: Carries an egg from the ovary to the uterus and is where fertilisation occurs. • Uterus, or womb: Where a baby develops in a pregnant woman. • Ovulation: Release of an egg cell during the menstrual cycle, which may be met by a sperm. • Menstruation: Loss of the lining of the uterus during the menstrual cycle. • Reproductive system: All the male and female organs involved in reproduction. • Penis: Organ which carries sperm out of the male's body. • Vagina: Where the penis enters the female's body and sperm is received. • Foetus: The developing baby during pregnancy. • Gestation: Process where the baby develops during pregnancy. • Placenta: Organ that provides the foetus with oxygen and nutrients and removes waste substances. • Amniotic fluid: Liquid that surrounds and protects the foetus. • Umbilical cord: Connects the foetus to the placenta.
<p>Forces</p>	<ul style="list-style-type: none"> • 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.



	<ul style="list-style-type: none"> • Acceleration: How quickly speed increases or decreases. • 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. • 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
<p>Universe</p>	<ul style="list-style-type: none"> • Galaxy: Collection of stars held together by gravity. Our galaxy is called the Milky Way. • Light year: The distance light travels in a year (over 9 million, million kilometres). • Stars: Bodies which give out light, and which may have a solar system of planets. • Orbit: Path taken by a satellite, planet or star moving around a larger body. Earth completes one orbit of the Sun every year. • Exoplanet: Planet that orbits a star outside our solar system
<p>Rock Cycle</p>	<ul style="list-style-type: none"> • Rock cycle: Sequence of processes where rocks change from one type to another. • Weathering: The wearing down of rock by physical, chemical or biological processes. • Erosion: Movement of rock by water, ice or wind (transportation). • Minerals: Chemicals that rocks are made from. • Sedimentary rocks: Formed from layers of sediment, and which can contain fossils. Examples are limestone, chalk and sandstone. • Igneous rocks: Formed from cooled magma, with minerals arranged in crystals. Examples are granite, basalt and obsidian. • Metamorphic rocks: Formed from existing rocks exposed to heat and pressure over a long time. Examples are marble, slate and schist. • Strata: Layers of sedimentary rock