Airedale Academy's KS3 Assessment Overview: Science

At Airedale Academy, assessment is embedded into lessons in a coherent manner. Key Assessment Pieces will follow a sequence of 6-8 lessons, using a mastery-approach to teaching and learning, by which Key Assessment Pieces are used to assess the extent to which students know more and can remember more of the curriculum that has been taught specific to their age and stage of education.

Written Key Assessment Pieces will be completed in 'Silent and Independent' conditions and should assess the extent to which curriculum knowledge and skills have been grasped by students and can be reapplied. However, in some subjects such as Dance, Drama, PE and Music, Key Assessment Pieces may be collaborative and of a more practical nature and may include photographic or video evidence, a record of verbal feedback, a written evaluation and/or a written reflection. The information gleaned by the teacher through diagnostic marking and feedback will be used to close specific gaps in learning and to address misconceptions, leading to improved progress over time.

The information gained from the marking and feedback of Key Assessment Pieces, will be used to assess students' progress (relative to starting point) more holistically in terms of their grasp of the curriculum at key points of the academic year, using the identified 'Expected' and 'Enhanced' knowledge and skills listed below.

Progress will be holistically reported to students and their parents/carers, relative to starting point for that particular point of their KS3 journey, as follows: 'On Track'- making expected progress; 'Working Towards'- making less than expected progress and 'Exceeding'- making enhanced progress appropriate to their age and stage of education.

The statements build on the principles of 'Big Ideas'. They are supported and co-developed by the Sheffield Institute of Education at Sheffield Hallam University.

K = Knowledge statements (I should know…)
Know is know-how, or being able to carry out the skills accurately and fluently. Keywords are defined because processes require conceptual knowledge as well as skill. At KS3, know is sufficient for mastery

A = Apply statements
Apply goes beyond what is generally expected and assessed at KS3. It is the thinking behind the doing, or describing and explains the principles to carry out skills and strategies.

E = Extend Statements
Some students will exceed the mastery goals of know and apply. The third, 'extend' statements, provide more challenging objectives, using the same knowledge, but requiring higher level thinking. There are three types of extend objectives:
1 Compare: analyse similarities and differences.
2 Evaluate: judge whether information is reasonable, or spot weaknesses.
3 Predict: suggest what will happen in a new situation.

			Year 7		Year 8		Year 9	
Big Idea	**Knowledge and Skills to be embedded by the end of the academic year:**		**Essential**	**Enhanced**	**Essential**	**Enhanced**	**Essential**	**Enhanced**
EM1	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.	**K**	X					
EM1	Components with resistance reduce the current flowing and shift energy to the surroundings.	**K**	X					
EM1	Calculate resistance using the formula: Resistance (Ω) = potential difference (V) ÷ current (A).	**K**	X					
EM1	Draw a circuit diagram to show how voltage can be measured in a simple circuit.	**A**	X					
EM1	Use the idea of energy to explain how voltage and resistance affect the way components work.	**A**	X					
EM1	Given a table of voltage against current. Use the ratio of voltage to current to determine the resistance.	**A**	X					
EM1	Use an analogy like water in pipes to explain why part of a circuit has higher resistance.	**A**	X					
EM1	Predict the effect of changing the rating of a battery or a bulb on other components in a series or parallel circuit.	**E**		X				
EM1	Justify the sizes of voltages in a circuit, using arguments based on energy.	**E**		X				
EM1	Draw conclusions about safety risks, from data on voltage, resistance and current.	**E**		X				
EM1	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.	**K**	X					
EM1	Around a charged object, the electric field affects other charged objects, causing them to be attracted or repelled. The field strength decreases with distance.	**K**	X					
EM1	Two similarly charged objects repel, two differently charged objects attract.	**K**	X					
EM1	Describe how current changes in series and parallel circuits when components are changed.	**A**	X					
EM1	Turn circuit diagrams into real series and parallel circuits, and vice versa.	**A**	X					
EM1	Describe what happens when charged objects are placed near to each other or touching.	**A**	X					
EM1	Use a sketch to describe how an object charged positively or negatively became charged up.	**A**	X					
EM1	Compare the advantages of series and parallel circuits for particular uses.	**E**		X				
EM1	Evaluate a model of current as electrons moving from the negative to the positive terminal of a battery, through the circuit.	**E**		X				
EM1	Suggest ways to reduce the risk of getting electrostatic shocks.	**E**		X				
M1	Properties of solids, liquids and gases can be described 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).	**K**	X					
M1	Observations where substances change temperature or state can be described in terms of particles gaining or losing energy.	**K**	X					
M1	A substance is a solid below its melting point, a liquid above it, and a gas above its boiling point.	**K**	X					
M1	Explain unfamiliar observations about gas pressure in terms of particles.	**A**	X					
M1	Explain the properties of solids, liquids and gases based on the arrangement and movement of their particles.	**A**	X					

M1	Explain changes in states in terms of changes to the energy of particles.	A	X					
M1	Draw before and after diagrams of particles to explain observations about changes of state, gas pressure and diffusion.	A		X				
M1	Argue for how to classify substances which behave unusually, as solids, liquids, or gases.	E		X				
M1	Evaluate observations that provide evidence for the existence of particles.	E		X				
M1	Make predictions about what will happen during unfamiliar physical processes, in terms of particles and their energy.	E		X				
M1	A pure substance consists of only one type of element or compound, and has a fixed melting and boiling point. Mixtures may be separated due to differences in their physical properties.	K	X					
M1	The method chosen to separate a mixture depends on which physical properties of the individual substances are different.	K	X					
M1	Use techniques to separate mixtures.	K	X					
M1	Air, fruit juice, sea water and milk are mixtures.	K	X					
M1	Liquids have different boiling points.	K	X					
M1	Explain how substances dissolve using the particle model.	A	X					
M1	Use the solubility curve of a solute to explain observations about solutions.	A	X					
M1	Use evidence from chromatography to identify unknown substances in mixtures.	A	X					
M1	Choose the most suitable technique to separate out a mixture of substances.	A	X					
M1	Explain how substances dissolve using the particle model.	A	X					
M1	Use the solubility curve of a solute to explain observations about solutions.	A	X					
M1	Use evidence from chromatography to identify unknown substances in mixtures.	A	X					
M1	Choose the most suitable technique to separate out a mixture of substances.	A	X					
M1	Analyse and interpret solubility curves.	E		X				
M1	Suggest a combination of methods to separate a complex mixture and justify the choices.	E		X				
M1	Evaluate the evidence for identifying an unknown substance using separating techniques.	E		X				
O1	The parts of the human skeleton work as a system for support, protection, movement and the production of new blood cells.	K	X					
O1	Antagonistic pairs of muscles create movement when one contracts and the other relaxes.	K	X					
O1	Explain how a physical property of part of the skeleton relates to its function.	A	X					
O1	Explain why some organs contain muscle tissue.	A	X					
O1	Explain how antagonistic muscles produce movement around a joint.	A	X					
O1	Use a diagram to predict the result of a muscle contraction or relaxation.	A	X					
O1	Predict the consequences of damage to a joint, bone or muscle.	E		X				
O1	Suggest factors that affect the force exerted by different muscles.	E		X				
O1	Consider the benefits and risks of a technology for improving human movement.	E		X				
O1	Multicellular organisms are composed of cells which are organised into tissues, organs and systems to carry out life processes.	K	X					
O1	There are many types of cell. Each has a different structure or feature so it can do a specific job.	K	X					

O1	Use a light microscope to observe and draw cells.	K	X					
O1	Both plant and animal cells have a cell membrane, nucleus, cytoplasm and mitochondria.	K	X					
O1	Plant cells also have a cell wall, chloroplasts and usually a permanent vacuole.	K	X					
O1	Explain why multi-cellular organisms need organ systems to keep their cells alive.	A	X					
O1	Suggest what kind of tissue or organism a cell is part of, based on its features.	A	X					
O1	Explain how to use a microscope to identify and compare different types of cells.	A	X					
O1	Explain how uni-cellular organisms are adapted to carry out functions that in multicellular organisms are done by different types of cell.	A	X					
O1	Make deductions about how medical treatments work based on cells, tissues, organs and systems.	E		X				
O1	Suggest how damage to, or failure of, an organ would affect other body systems.	E		X				
O1	Deduce general patterns about how the structure of different cells is related to their function.	E		X				
F1	If the overall, resultant force on an object is unbalanced, its motion changes and it slows down, speeds up or changes direction.	K	X					
F1	Use the formula: speed = distance (m) / time (s) or distance-time graphs, to calculate speed.	K	X					
F1	A straight line on a distance-time graph shows constant speed, a curving line shows acceleration.	K	X					
F1	The higher the speed of an object, the shorter the time taken for a journey.	K	X					
F1	Illustrate a journey with changing speed on a distance-time graph, and label changes in motion.	A	X					
F1	Describe how the speed of an object varies when measured by observers who are not moving, or moving relative to the object.	A	X					
F1	Suggest how the motion of two objects moving at different speeds in the same direction would appear to the other.	E		X				
F1	Predict changes in an object's speed when the forces on it change.	E		X				
F1	Mass and weight are different but related. Mass is a property of the object; weight depends upon mass but also on gravitational field strength.	K	X					
F1	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.	K	X					
F1	Use the formula: weight (N) = mass (kg) x gravitational field strength (N/kg).	K	X					
F1	g on Earth = 10 N/kg. On the Moon it is 1.6 N/kg.	K	X					
F1	Explain unfamiliar observations where weight changes.	A	X					
F1	Draw a force diagram for a problem involving gravity.	A	X					
F1	Deduce how gravity varies for different masses and distances.	A	X					
F1	Compare your weight on Earth with your weight on different planets using the formula.	A	X					
F1	Compare and contrast gravity with other forces.	E		X				
F1	Draw conclusions from data about orbits, based on how gravity varies with mass and distance.	E		X				
F1	Suggest implications of how gravity varies for a space mission.	E		X				
R1	Metals and non-metals react with oxygen to form oxides which are either bases or acids.	K	X					
R1	Metals can be arranged as a reactivity series in order of how readily they react with other substances.	K	X					
R1	Some metals react with acids to produce salts and hydrogen.	K	X					
R1	Iron, nickel and cobalt are magnetic elements.	K	X					

R1	Mercury is a metal that is liquid at room temperature.	K	X					
R1	Describe an oxidation, displacement, or metal-acid reaction with a word equation.	A	X					
R1	Use particle diagrams to represent oxidation, displacement and metal-acid reactions.	A	X					
R1	Identify an unknown element from its physical and chemical properties.	A	X					
R1	Place an unfamiliar metal into the reactivity series based on information about its reactions.	A	X					
R1	Deduce the physical or chemical changes a metal has undergone from its appearance.	E		X				
R1	Justify the use of specific metals and non-metals for different applications, using data provided.	E		X				
R1	Deduce a rule from data about which reactions will occur or not, based on the reactivity series.	E		X				
R1	The pH of a solution depends on the strength of the acid: strong acids have lower pH values than weak acids.	K	X					
R1	Mixing an acid and alkali produces a chemical reaction, neutralisation, forming a chemical called a salt and water.	K	X					
R1	Acids have a pH below 7, neutral solutions have a pH of 7, alkalis have a pH above 7.	K	X					
R1	Acids and alkalis can be corrosive or irritant and require safe handling.	K	X					
R1	Hydrochloric, sulfuric and nitric acid are strong acids.	K	X					
R1	Acetic and citric acid are weak acids.	K	X					
R1	Identify the best indicator to distinguish between solutions of different pH, using data provided.	A	X					
R1	Use data and observations to determine the pH of a solution and explain what this shows.	A	X					
R1	Explain how neutralisation reactions are used in a range of situations.	A	X					
R1	Describe a method for how to make a neutral solution from an acid and alkali.	A	X					
R1	Given the names of an acid and an alkali, work out the name of the salt produced when they react.	E		X				
R1	Deduce the hazards of different alkalis and acids using data about their concentration and pH.	E		X				
R1	Estimate the pH of an acid based on information from reactions.	E		X				
G1	There is variation between individuals of the same species. Some variation is inherited, some is caused by the environment, and some is a combination.	K	X					
G1	Variation between individuals is important for the survival of a species, helping it to avoid extinction in an always changing environment.	K	X					
G1	Explain whether characteristics are inherited, environmental or both.	A	X					
G1	Plot bar charts or line graphs to show discontinuous or continuous variation data.	A	X					
G1	Explain how variation helps a particular species in a changing environment.	A	X					
G1	Explain how characteristics of a species are adapted to particular environmental conditions.	A	X					
G1	Predict implications of a change in the environment on a population.	E		X				
G1	Use the ideas of variation to explain why one species may adapt better than another to an environmental change.	E		X				
G1	Critique a claim that a particular characteristic is inherited or environmental.	E		X				
G1	The menstrual cycle prepares the female for pregnancy and stops if the egg is fertilised by a sperm.	K	X					
G1	The developing foetus relies on the mother to provide it with oxygen and nutrients; to remove waste and protect it against harmful substances.	K	X					
G1	The menstrual cycle lasts approximately 28 days.	K	X					
G1	If an egg is fertilised it settles into the uterus lining.	K	X					
G1	Explain whether substances are passed from the mother to the foetus or not.	A	X					

G1	Use a diagram to show stages in development of a foetus from the production of sex cells to birth.	A	X					
G1	Describe causes of low fertility in male and female reproductive systems.	A	X					
G1	Identify key events on a diagram of the menstrual cycle.	A	X					
G1	Explain why pregnancy is more or less likely at certain stages of the menstrual cycle.	E		X				
G1	Make deductions about how contraception and fertility treatments work.	E		X				
G1	Predict the effect of a mother taking cigarettes, alcohol or drugs on the developing foetus.	E		X				
E1	We pay for our domestic electricity usage based on the amount of energy transferred.	K			X			
E1	Electricity is generated by a combination of resources which each have advantages and disadvantages.	K			X			
E1	Calculate the cost of home energy usage, using the formula: cost = power (kW) x time (hours) x price (per kWh).	K			X			
E1	Food labels list the energy content of food in kilojoules (kJ).	K			X			
E1	Compare the amounts of energy transferred by different foods and activities.	A			X			
E1	Compare the energy usage and cost of running different home devices.	A			X			
E1	Explain the advantages and disadvantages of different energy resources.	A			X			
E1	Evaluate the social, economic and environmental consequences of using a resource to generate electricity, from data.	E				X		
E1	Suggest actions a government or communities could take in response to rising energy demand.	E				X		
E1	Suggest ways to reduce costs, by examining data on a home energy bill.	E				X		
E1	The thermal energy of an object depends upon its mass and temperature and what it’s made of. When there is a temperature difference, energy transfers from the hotter to the cooler object.	K			X			
E1	Thermal energy is transferred through different pathways, by particles in conduction and convection, and by radiation.	K			X			
E1	Explain observations about changing temperature in terms of energy transfer.	A			X			
E1	Describe how an object's temperature changes over time when heated or cooled.	A			X			
E1	Explain how a method of thermal insulation works in terms of conduction, convection and radiation.	A			X			
E1	Sketch diagrams to show convection currents in unfamiliar situations.	A			X			
E1	Sketch a graph to show the pattern of temperature change against time.	E				X		
E1	Evaluate a claim about insulation in the home or for clothing technology.	E				X		
E1	Compare and contrast the three ways that energy can be moved from one place to another by heating.	E				X		
Ea1	Sedimentary, igneous and metamorphic rocks can be interconverted over millions of years through weathering and erosion, heat and pressure, and melting and cooling.	K			X			
Ea1	The three rock layers inside Earth are the crust, the mantle, and the core.	K			X			
Ea1	Explain why a rock has a particular property based on how it was formed.	A			X			
Ea1	Identify the causes of weathering and erosion and describe how they occur.	A			X			
Ea1	Construct a labelled diagram to identify the processes of the rock cycle.	A			X			
Ea1	Identify circumstances that indicate fast processes of change on Earth and those that indicate slower processes.	E				X		
Ea1	Predict planetary conditions from descriptions of rocks on other planets.	E				X		
Ea1	Describe similarities and differences between the rock cycle and everyday physical and chemical processes.	E				X		

Ea1	The solar system can be modelled as planets rotating on tilted axes while orbiting the Sun, moons orbiting planets, and sunlight spreading out and being reflected. This explains day and year length, seasons and the visibility of objects from Earth.	K			X			
Ea1	Our solar system is a tiny part of a galaxy, one of many billions in the Universe. Light takes minutes to reach Earth from the Sun, four years from our nearest star and billions of years from other galaxies.	K			X			
Ea1	Describe the appearance of planets or moons from diagrams showing their position in relation to the Earth and Sun.	A			X			
Ea1	Explain why places on the Earth experience different daylight hours and amounts of sunlight during the year.	A			X			
Ea1	Describe how space exploration and observations of stars are affected by the scale of the universe.	A			X			
Ea1	Explain the choice of particular units for measuring distance.	A			X			
Ea1	Predict patterns in day length, the Sun's intensity or an object's shadow at different latitudes.	E				X		
Ea1	Make deductions from observation data of planets, stars and galaxies.	E				X		
Ea1	Compare explanations from different periods in history about the motion of objects and structure of the Universe.	E				X		
W1	Sound consists of vibrations which travel as a longitudinal wave through substances. The denser the medium, the faster sound travels.	K			X			
W1	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.	K			X			
W1	Sound does not travel through a vacuum.	K			X			
W1	The speed of sound in air is 330 m/s, a million times slower than light.	K			X			
W1	Explain observations where sound is reflected, transmitted or absorbed by different media.	A			X			
W1	Explain observations of how sound travels using the idea of a longitudinal wave.	A			X			
W1	Describe the amplitude and frequency of a wave from a diagram or oscilloscope picture.	A			X			
W1	Use drawings of waves to describe how sound waves change with volume or pitch.	A			X			
W1	Suggest the effects of particular ear problems on a person's hearing.	E				X		
W1	Evaluate the data behind a claim for a sound creation or blocking device, using the properties of sound waves.	E				X		
W1	Use diagrams to compare the waveforms a musical instrument makes when playing different pitches or volumes.	E				X		
W1	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.	K			X			
W1	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.	K			X			
W1	Construct ray diagrams to show how light reflects off mirrors, forms images, and refracts.	K			X			
W1	Light travels at 300 million metres per second in a vacuum.	K			X			
W1	Different colours of light have different frequencies.	K			X			
W1	Use ray diagrams of eclipses to describe what is seen by observers in different places.	A			X			
W1	Explain observations where coloured lights are mixed or objects are viewed in different lights.	A			X			
W1	Use ray diagrams to describe how light passes through lenses and transparent materials.	A			X			
W1	Describe how lenses may be used to correct vision.	A			X			
W1	Use a ray diagram to predict how an image will change in different situations.	E				X		

W1	Predict whether light will reflect, refract or scatter when it hits the surface of a given material.	E				X		
W1	Use ray diagrams to explain how a device with multiple mirrors works.	E				X		
Ec1	Organisms in a food web (decomposers, producers and consumers) depend on each other for nutrients. So, a change in one population leads to changes in others.	K	X					
Ec1	The population of a species is affected by the number of its predators and prey, disease, pollution and competition between individuals for limited resources such as water and nutrients.	K	X					
Ec1	Insects are needed to pollinate food crops.	K	X					
Ec1	Describe how a species' population changes as its predator or prey population changes.	A	X					
Ec1	Explain effects of environmental changes and toxic materials on a species' population.	A	X					
Ec1	Combine food chains to form a food web.	A	X					
Ec1	Explain issues with human food supplies in terms of insect pollinators.	A	X					
Ec1	Suggest what might happen when an unfamiliar species is introduced into a food web.	E		X				
Ec1	Develop an argument about how toxic substances can accumulate in human food.	E		X				
Ec1	Make a deduction based on data about what caused a change in the population of a species.	E		X				
Ec1	Plants have adaptations to disperse seeds using wind, water or animals.	K	X					
Ec1	Plants reproduce sexually to produce seeds, which are formed following fertilisation in the ovary.	K	X					
Ec1	Flowers contain the plant's reproductive organs.	K	X					
Ec1	Pollen can be carried by the wind, pollinating insects or other animals.	K	X					
Ec1	Describe the main steps that take place when a plant reproduces successfully.	A	X					
Ec1	Identify parts of the flower and link their structure to their function.	A	X					
Ec1	Suggest how a plant carried out seed dispersal based on the features of its fruit or seed.	A	X					
Ec1	Explain why seed dispersal is important to survival of the parent plant and its offspring.	A	X					
Ec1	Describe similarities and differences between the structures of wind pollinated and insect pollinated plants.	E		X				
Ec1	Suggest how plant breeders use knowledge of pollination to carry out selective breeding.	E		X				
Ec1	Develop an argument why a particular plant structure increases the likelihood of successful production of offspring.	E		X				
EM2	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.	K					X	
EM2	The magnetic force of an electromagnet decreases with distance.	K					X	
EM2	Use a diagram to explain how an electromagnet can be made and how to change its strength.	A					X	
EM2	Explain the choice of electromagnets or permanent magnets for a device in terms of their properties.	A					X	
EM2	Critique the design of a device using an electromagnet and suggest improvements.	E						X
EM2	Suggest how bells, circuit breakers and loudspeakers work, from diagrams.	E						X
EM2	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.	K					X	
EM2	Two 'like' magnetic poles repel and two 'unlike' magnetic poles attract.	K					X	
EM2	Field lines flow from the north-seeking pole to the south-seeking pole.	K					X	
EM2	Use the idea of field lines to show how the direction or strength of the field around a magnet varies.	A					X	

EM2	Explain observations about navigation using Earth's magnetic field.	A					X	
EM2	Predict the pattern of field lines and the force around two magnets placed near each other.	E						X
EM2	Predict how an object made of a magnetic material will behave if placed in or rolled through a magnetic field.	E						X
M2	The elements in a group all react in a similar way and sometimes show a pattern in reactivity.	K			X			
M2	As you go down a group and across a period the elements show patterns in physical properties.	K			X			
M2	Metals are generally found on the left side of the table, non-metals on the right.	K			X			
M2	Group 1 contains reactive metals called alkali metals.	K			X			
M2	Group 7 contains non-metals called halogens.	K			X			
M2	Group 0 contains unreactive gases called noble gases.	K			X			
M2	Use data to describe a trend in physical properties.	A			X			
M2	Describe the reaction of an unfamiliar Group 1 or 7 element.	A			X			
M2	Use data showing a pattern in physical properties to estimate a missing value for an element.	A			X			
M2	Predict the position of an element in the Periodic table based on information about its physical and chemical properties.	E				X		
M2	Choose elements for different uses from their position in the Periodic table.	E				X		
M2	Use data about the properties of elements to find similarities, patterns and anomalies.	E				X		
M2	Most substances are not pure elements, but compounds or mixtures containing atoms of different elements. They have different properties to the elements they contain.	K			X			
M2	Use particle diagrams to classify a substance as an element, mixture or compound, and as molecules or atoms.	K			X			
M2	Name simple compounds using rules: change non-metal to –ide; mono, di, tri prefixes; and symbols of hydroxide, nitrate, sulfate and carbonate.	K			X			
M2	The symbols of hydrogen, oxygen, nitrogen, carbon, iron, zinc, copper, sulfur, aluminium, iodine, bromine, chlorine, sodium, potassium, magnesium.	K			X			
M2	Name compounds using their chemical formulae.	A			X			
M2	Given chemical formulae, name the elements present and their relative proportions.	A			X			
M2	Represent atoms, molecules and elements, mixtures and compounds using particle diagrams.	A			X			
M2	Use particle diagrams to predict physical properties of elements and compounds.	E				X		
M2	Deduce a pattern in the formula of similar compounds and use it to suggest formulae for unfamiliar ones.	E				X		
M2	Compare and contrast the properties of elements and compounds and give a reason for differences.	E				X		
O2	In gas exchange, oxygen and carbon dioxide move between alveoli and the blood. Oxygen is transported to cells for aerobic respiration and carbon dioxide, a waste product of respiration, is removed from the body.	K			X			
O2	Breathing occurs through the action of muscles in the ribcage and diaphragm. The amount of oxygen required by body cells determines the rate of breathing.	K			X			
O2	Explain how exercise, smoking and asthma affect the gas exchange system.	A			X			
O2	Explain how the parts of the gas exchange system are adapted to their function.	A			X			
O2	Explain observations about changes to breathing rate and volume.	A			X			
O2	Explain how changes in volume and pressure inside the chest move gases in and out of the lungs.	A			X			
O2	Evaluate a possible treatment for a lung disease.	E				X		

O2	Predict how a change in the gas exchange system could affect other processes in the body.	E				X		
O2	Evaluate a model for showing the mechanism of breathing.	E				X		
O2	Find out how recreation drugs might affect different body systems.	E				X		
O2	The body needs a balanced diet with lipids, proteins, vitamins, minerals, dietary fibre and water, for its cells' energy, growth and maintenance.	K			X			
O2	Organs of the digestive system are adapted to break large food molecules into small ones which can travel in the blood to cells and are used for life processes.	K			X			
O2	Iron is a mineral important for red blood cells.	K			X			
O2	Calcium is a mineral needed for strong teeth and bones.	K			X			
O2	Vitamins and minerals are needed in small amounts to keep the body healthy.	K			X			
O2	Describe possible health effects of unbalanced diets from data provided.	A			X			
O2	Calculate food requirements for a healthy diet, using information provided.	A			X			
O2	Describe how organs and tissues involved in digestion are adapted for their role.	A			X			
O2	Describe the events that take place in order to turn a meal into simple food molecules inside a cell.	A			X			
O2	Design a diet for a person with specific dietary needs.	E				X		
O2	Critique claims for a food product or diet by analysing nutritional information.	E				X		
O2	Make deductions from medical symptoms showing problems with the digestive system.	E				X		
F2	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.	K			X			
F2	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.	K			X			
F2	Sketch the forces acting on an object, and label their size and direction.	K			X			
F2	Explain whether an object in an unfamiliar situation is in equilibrium.	A			X			
F2	Describe factors which affect the size of frictional and drag forces.	A			X			
F2	Describe how materials behave as they are stretched or squashed.	A			X			
F2	Describe what happens to the length of a spring when the force on it changes.	A			X			
F2	Evaluate how well sports or vehicle technology reduces frictional or drag forces.	E				X		
F2	Describe the effects of drag and other forces on falling or accelerating objects as they move.	E				X		
F2	Using force and extension data, compare the behaviour of different materials in deformation using the idea of proportionality.	E				X		
F2	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.	K			X			
F2	Different stresses on a solid object can be used to explain observations where objects scratch, sink into or break surfaces.	K			X			
F2	Use the formula: fluid pressure, or stress on a surface = force (N) / area (m^2).	K			X			
F2	Use diagrams to explain observations of fluids in terms of unequal pressure.	A			X			
F2	Explain why objects either sink or float depending upon their weight and the upthrust acting on them.	A			X			

F2	Explain observations where the effects of forces are different because of differences in the area over which they apply.	A			X			
F2	Given unfamiliar situations, use the formula to calculate fluid pressure or stress on a surface.	A			X			
F2	Use the idea of pressure changing with depth to explain underwater effects.	E				X		
F2	Carry out calculations involving pressure, force and area in hydraulics, where the effects of applied forces are increased.	E				X		
F2	Use the idea of stress to deduce potential damage to one solid object by another.	E				X		
R2	During a chemical reaction bonds are broken (requiring energy) and new bonds formed (releasing energy). If the energy released is greater than the energy required, the reaction is exothermic. If the reverse, it is endothermic.	K					X	
R2	Use experimental observations to distinguish exothermic and endothermic reactions.	A					X	
R2	Use a diagram of relative energy levels of particles to explain energy changes observed during a change of state.	A					X	
R2	Predict whether a chemical reaction will be exothermic or endothermic given data on bond strengths.	E						X
R2	Use energy data to select a reaction for a chemical hand warmer or cool pack.	E						X
R2	Combustion is a reaction with oxygen in which energy is transferred to the surroundings as heat and light.	K					X	
R2	Thermal decomposition is a reaction where a single reactant is broken down into simpler products by heating.	K					X	
R2	Chemical changes can be described by a model where atoms and molecules in reactants rearrange to make the products and the total number of atoms is conserved.	K					X	
R2	Write word equations from information about chemical reactions.	K					X	
R2	Explain why a reaction is an example of combustion or thermal decomposition.	A					X	
R2	Predict the products of the combustion or thermal decomposition of a given reactant and show the reaction as a word equation.	A					X	
R2	Explain observations about mass in a chemical or physical change.	A					X	
R2	Use particle diagrams to show what happens in a reaction.	A					X	
R2	Compare the pros and cons of fuels in terms of their products of combustion.	E						X
R2	Use known masses of reactants or products to calculate unknown masses of the remaining reactant or product.	E						X
R2	Devise a general rule for how a set of compounds reacts with oxygen or thermally decomposes.	E						X
R2	Balance a symbol equation.	E						X
R2	Use mass of reactant in equation to determine mass of product eg magnesium and oxygen.	E						X
G2	Natural selection is a theory that explains how species evolve and why extinction occurs.	K					X	
G2	Biodiversity is vital to maintaining populations. Within a species variation helps against environment changes, avoiding extinction. Within an ecosystem, having many different species ensures resources are available for other populations, like humans.	K					X	
G2	Use evidence to explain why a species has become extinct or adapted to changing conditions.	A					X	
G2	Evaluate whether evidence for a species changing over time supports natural selection.	A					X	
G2	Explain how a lack of biodiversity can affect an ecosystem.	A					X	
G2	Describe how preserving biodiversity can provide useful products and services for humans.	A					X	
G2	Predict and explain the changes in a population over time due to natural selection.	E						X
G2	Suggest an explanation, based on data, for how a particular evolutionary change occurred.	E						X

G2	Evaluate ways of preserving plant or animal material for future generations.	E						X
G2	Inherited characteristics are the result of genetic information, in the form of sections of DNA called genes, being transferred from parents to offspring during reproduction.	K					X	
G2	Chromosomes are long pieces of DNA which contain many genes. Gametes, carrying half the total number of chromosomes of each parent, combine during fertilisation.	K					X	
G2	The DNA of every individual is different, except for identical twins.	K					X	
G2	There is more than one version of each gene e.g. different blood groups.	K					X	
G2	Use a diagram to show the relationship between DNA, chromosomes and genes.	A					X	
G2	Use a diagram to show how genes are inherited.	A					X	
G2	Explain how a change in the DNA (mutation) may affect an organism and its future offspring.	A					X	
G2	Explain why offspring from the same parents look similar but are not usually identical.	A					X	
G2	Suggest arguments for and against genetic modification.	E						X
G2	Suggest benefits from scientists knowing all the genes in the human genome.	E						X
G2	Determine how the number of chromosomes changes during cell division, production of sex cells and fertilisation.	E						X
G2	Find out why scientist Watson, Crick and Franklin were so important.	E						X
E2	Work is done and energy transferred when a force moves an object. The bigger the force or distance, the greater the work. Machines make work easier by reducing the force needed. Levers and pulleys do this by increasing the distance moved, and wheels reduce friction.	K					X	
E2	Draw a diagram to explain how a lever makes a job easier.	A					X	
E2	Compare the work needed to move objects different distances.	A					X	
E2	Use the formula: work done (J) = force (N) x distance moved (m) to compare energy transferred for objects moving horizontally.	E						X
E2	Compare and contrast the advantages of different levers in terms of the forces needed and distance moved.	E						X
E2	The thermal energy of an object depends upon its mass and temperature and what it's made of. When there is a temperature difference, energy transfers from the hotter to the cooler object.	K					X	
E2	Thermal energy is transferred through different pathways, by particles in conduction and convection, and by radiation.	K					X	
E2	Explain observations about changing temperature in terms of energy transfer.	A					X	
E2	Describe how an object's temperature changes over time when heated or cooled.	A					X	
E2	Explain how a method of thermal insulation works in terms of conduction, convection and radiation.	A					X	
E2	Sketch diagrams to show convection currents in unfamiliar situations.	A					X	
E2	Sketch a graph to show the pattern of temperature change against time.	E						X
E2	Evaluate a claim about insulation in the home or for clothing technology.	E						X
E2	Compare and contrast the three ways that energy can be moved from one place to another by heating.	E						X
Ea2	Carbon is recycled through natural processes in the atmosphere, ecosystems, oceans and the Earth's crust (such as photosynthesis and respiration) as well as human activities (burning fuels).	K					X	
Ea2	Greenhouse gases reduce the amount of energy lost from the Earth through radiation and therefore the temperature has been rising as the concentration of those gases has risen.	K					X	

Ea2	Scientists have evidence that global warming caused by human activity is causing changes in climate.	K					X	
Ea2	Methane and carbon dioxide are greenhouse gases.	K					X	
Ea2	Earth's atmosphere contains around 78% nitrogen, 21% oxygen, <1% carbon dioxide, plus small amounts of other gases.	K					X	
Ea2	Use a diagram to show how carbon is recycled in the environment and through living things.	A					X	
Ea2	Describe how human activities affect the carbon cycle.	A					X	
Ea2	Describe how global warming can impact on climate and local weather patterns.	A					X	
Ea2	Evaluate the implications of a proposal to reduce carbon emissions.	E						X
Ea2	Evaluate claims that human activity is causing global warming or climate change.	E						X
Ea2	There is only a certain quantity of any resource on Earth, so the faster it is extracted, the sooner it will run out. Recycling reduces the need to extract resources.	K					X	
Ea2	Most metals are found combined with other elements, as a compound, in ores. The more reactive a metal, the more difficult it is to separate it from its compound. Carbon displaces less reactive metals, while electrolysis is needed for more reactive metals.	K					X	
Ea2	Explain why recycling of some materials is particularly important.	A					X	
Ea2	Describe how Earth's resources are turned into useful materials or recycled.	A					X	
Ea2	Justify the choice of extraction method for a metal, given data about reactivity.	A					X	
Ea2	Suggest factors to take into account when deciding whether extraction of a metal is practical.	A					X	
Ea2	Suggest ways in which changes in behaviour and the use of alternative materials may limit the consumption of natural resources.	E						X
Ea2	Suggest ways in which waste products from industrial processes could be reduced.	E						X
Ea2	Use data to evaluate proposals for recycling materials.	E						X
W2	When a wave travels through a substance, particles move to and fro. Energy is transferred in the direction of movement of the wave. Waves of higher amplitude or higher frequency transfer more energy.	K					X	
W2	Explain differences in the damage done to living cells by light and other waves, in terms of their frequency.	A					X	
W2	Explain how audio equipment converts sound into a changing pattern of electric current.	A					X	
W2	Suggest reasons why sound waves can agitate a liquid for cleaning objects, or massage muscles for physiotherapy.	E						X
W2	Evaluate electricity production by wave energy using data for different locations and weather conditions.	E						X
W2	A physical model of a transverse wave demonstrates it moves from place to place, while the material it travels through does not, and describes the properties of speed, wavelength and reflection.	K					X	
W2	Describe the properties of different longitudinal and transverse waves.	A					X	
W2	Use the wave model to explain observations of the reflection, absorption and transmission of a wave.	A					X	
W2	Compare and contrast the properties of sound and light waves.	E						X
W2	Suggest what happens when two waves combine.	E						X
Ec2	Respiration is a series of chemical reactions, in cells, that breaks down glucose to provide energy and form new molecules. Most living things use aerobic respiration but switch to anaerobic respiration, which provides less energy, when oxygen is unavailable.	K			X			
Ec2	Yeast fermentation is used in brewing and bread-making.	K			X			

Ec2	Use word equations to describe aerobic and anaerobic respiration.	**A**			X			
Ec2	Explain how specific activities involve aerobic or anaerobic respiration.	**A**			X			
Ec2	Suggest how organisms living in different conditions use respiration to get their energy.	**E**				X		
Ec2	Describe similarities and differences between aerobic and anaerobic respiration.	**E**				X		
Ec2	Plants and algae do not eat, but use energy from light, together with carbon dioxide and water to make glucose (food) through photosynthesis. They either use the glucose as an energy source, to build new tissue, or store it for later use.	**K**			X			
Ec2	Plants have specially-adapted organs that allow them to obtain resources needed for photosynthesis.	**K**			X			
Ec2	Iodine is used to test for the presence of starch.	**K**			X			
Ec2	Describe ways in which plants obtain resources for photosynthesis.	**A**			X			
Ec2	Explain why other organisms are dependent on photosynthesis.	**A**			X			
Ec2	Sketch a line graph to show how the rate of photosynthesis is affected by changing conditions.	**A**			X			
Ec2	Use a word equation to describe photosynthesis in plants and algae.	**A**			X			
Ec2	Suggest how particular conditions could affect plant growth.	**E**				X		
Ec2	Suggest reasons for particular adaptations of leaves, roots and stems.	**E**				X		
Ec2	Compare the movement of carbon dioxide and oxygen through stomata at different times of day.	**E**				X		