



Curriculum Guide for Science

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The de Ferrers Trust

Curriculum Rational in

Science

Curriculum and

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Curriculum Intent

The intent of the science curriculum at Granville is to provide the pupils with the foundations for the understanding of the world through the teaching of Biology, Chemistry and Physics. It is hoped that the pupils will learn the essential aspects of the knowledge, methods, processes and uses of science. It is also the intent of the curriculum to encourage pupils to understand how science can be used to explain what is occurring, make predictions on how things will behave and to analyse their observations. It is also hoped that pupils will develop a secure understanding of each key scientific concept in order to allow them to progress further. Through all of this the pupils will also benefit from extending their own scientific vocabulary.

Curriculum Implementation

The curriculum is taught in weekly lessons. Years 7 and 8 have three lessons of science a week that are usually taught by one teacher but some groups may have two. Year 9 have three lessons a week. One lesson of Biology, one of Chemistry and one of Physics and where possible taught by a subject specialist as the year 9 content is GCSE work. Years 10 and 11 have 5 lessons a week that are split between the three science disciplines.

Lessons in both key stages are planned so that pupils develop an understanding of the nature, processes and methods involved in scientific enquiries. Throughout the three disciplines of science “working scientifically” is embedded in lessons. Within some lessons where appropriate pupils will also have opportunities to apply their mathematical knowledge.

Each lesson should begin with a short quiz on previously covered content (5-10 minutes). The aims of this are:

- To improve students’ long-term retention of key scientific concepts and knowledge to help improve fluency, transfer and reduce cognitive load.
- To help develop a culture of high expectations, exemplary behaviour and scientific rigour within every classroom.
- The systematic approach to retrieval practice ensures key knowledge and skills are recalled at specific intervals, leveraging the ‘spacing effect’ and ‘testing effect’ to build durable learning. The systematic approach ensures that information is repeated in a distributed fashion or spaced over time, it is learned more slowly but it is repeated much longer’ (Roediger & Pyc, 2012).
- To develop students who are capable of selecting required approaches from a variety of different interleaved questions, rather than providing solutions to a

'blocked' set of questions from the same topic (Rohrer, Dedrick & Burgess, 2014).

Where the questions included in the systematic retrieval practice are not deemed appropriate for the students at that time, staff are encouraged to adapt the questions which are included according to the needs of the class.

Impact

Assessment in years 7-9

The curriculum for science is divided into three 'cycles'. Each cycle contains a discrete body of knowledge and, at the end of each cycle, knowledge is tested through three summative assessments.

These assessments will test all of the knowledge and skills that the students have developed up to that point. The third assessment in each year will therefore assess all of the knowledge that has been taught in that particular year. As year 9 are taught GCSE topics the first two assessments are a mixed paper and the third assessment is three separate Biology, Chemistry and Physics papers. There will be a foundation paper and higher paper for each assessment.

Assessment in year 10 and 11.

In year 10 The assessments as in KS3 will test all of the knowledge and skills that the students have developed in each subject. Each discipline of science will have their own assessment. The first assessment in year 10 will contain questions based on some of the work studied in year 9 and the topics studied up to that point in year 10. Assessment two is a Paper 1 mock exam for each of the three disciplines of science. Assessment three will primarily focus on the paper two topics studied up to that point.

Assessments in year 11 are mock exams. Assessment 1 is a paper 2 mock exam and assessment two will be mock exams of both paper 1 and paper 2

'learning is a change in long term memory' (Kirschner et al, 2006), the aim of these assessments is to provide a guide to the extent to which all of the content which has been taught has been mastered, rather than assessing performance. Each assessment therefore aims to cover questions from a range of difficulties, ensuring that students at different attainment levels can be distinguished between.

Formative assessment, during which students are given advice on how to improve, should be a regular element of science lessons (assessment at the point of learning). There will be particular pieces of work in topics in which written feedback will give students advice on how to improve their understanding of particular scientific concepts. The intent here is to use these strategies to assess performance rather than learning. Success within a lesson sequence does not provide an indication of learning, but failure to demonstrate competence is unlikely to lead to learning.

Sequence of Topics

A more detailed curriculum plan can be accessed at S:\2019-20\Science 2019-20

Year 7

Biology	Chemistry	Physics
Cells	Elements	Sound
		Light
Digestion	Metals and non-metals	Energy transfers
		Energy costs
Variation	Periodic table	Gravity
Human Reproduction	Acids and bases	Contact forces
		Current
		Voltage and resistance
Breathing	Particle model	Universe

Assessment	Topics
1 (week 8)	Cells, Elements, Sound, Light
2 (week 24)	Cells, Digestion, Variation, Elements, Metals and non-metals, Periodic table, Sound, Light, Energy transfers, Energy costs, Gravity, Contact forces
3 (week 34)	Cells, Digestion, Variation, Human Reproduction, Elements, Metals and non-metals, Periodic table, Acids and bases, Sound, Light, Energy transfers, Energy costs, Gravity, Contact forces, Current, Voltage and resistance

Biology	Chemistry	Physics
Respiration	Separating Mixtures	Pressure
		Work
Interdependence	Types of Reaction	Magnetism and Electromagnets
Evolution	Chemical Energy	Wave effects
Photosynthesis	Earth Resources	Wave properties
		Speed
Inheritance	Climate	Heating and cooling

Year 8

Assessment	Topics
1 (week 8)	Breathing, Respiration, Particle model, Separating mixtures, Pressure
2 (week 24)	Breathing, Respiration, Interdependence, Evolution, Particle model, Separating mixtures, Types of reaction, Chemical Energy, Pressure, Work, Magnetism and electromagnets, Wave effects
3 (week 34)	Respiration, Interdependence, Evolution, Photosynthesis, Separating mixtures, Types of reaction, Chemical Energy, Earth resources, Pressure, Work, Magnetism and electromagnets, Wave effects, Wave properties, Speed

Year 9

Biology	Chemistry	Physics
Cells structure and transport	Atomic Structure	Conservation and dissipation of energy
Cell division	Periodic Table	Energy transfer by heating
Organisation and the digestive system	Chemical Changes	Energy Resources
Organising animals and plants		Energy Changes
	Electricity in the home	

Assessment	Topics
1 (week 8)	Cells structure, Atomic structure, Conservation and dissipation of energy
2 (week 21)	Cells structure and transport, Cell division, organisation and the digestive system, Atomic structure, Periodic table, Conservation and dissipation of energy, Energy transfer by heating, Energy resources
3 (week 36)	Cells structure and transport, Cell division, organisation and the digestive system, Organising animals and plants, Atomic structure, Periodic table, Chemical changes, Energy changes, Conservation and dissipation of energy, Energy transfer by heating, Energy resources, Electric circuits, Electricity in the home. [Separate papers]

Year 10

Biology	Chemistry	Physics
Communicable diseases	Structure and bonding	Molecules and matter
Preventing and treating diseases		Radioactivity
Non-communicable diseases		
Photosynthesis	Chemical calculations	Forces in balance
Respiration	Electrolysis	Motion
The human nervous system	Rates and Equilibrium	Force and motion
Hormonal coordination		Wave Properties
Reproduction	Crude oil and fuels	Electromagnetic waves
	Chemical analysis	Electromagnetism
Variation and evolution	The Earth's atmosphere	Forces and pressure (Physics only)
Adaptations, interdependence and competition	The Earth's resources	Light (Physics only)
	Using our resources (Chemistry only)	Space (Physics only)

Assessment	Topics
1 (week 9/10)	Assessment on Cells structure and transport, Cell division, organisation and the digestive system, Organising animals and plants, Communicable diseases, Preventing and treating disease, Atomic structure, Periodic table, Chemical changes, Energy changes, Structure and bonding, chemical calculations (part), Conservation and dissipation of energy, Energy transfer by heating, Energy resources, Electric circuits, Electricity in the home, Molecules and matter, Radioactivity
2 (week 19/20)	Paper 1 mock exam
3 (week 34)	The human nervous system, Hormonal coordination, reproduction, variation and evolution, Rates of reaction, crude oil and fuels, chemical analysis The Earth's atmosphere The Earth's resources, Wave properties, Electromagnetic waves, electromagnetism

Year 11

Biology	Chemistry	Physics
Organising an ecosystem	Organic Reactions (Chemistry only)	Consolidation of learning for combined science and extra content needed for Triple science
Biodiversity and ecosystems	Polymers (Chemistry only)	
Homeostasis in action (Biology only)	Consolidation of learning for combined science and extra content needed for Triple science	Consolidation of learning for combined science and extra content needed for Triple science
Consolidation of learning for combined science and extra content needed for Triple science		
Exam preparation for GCSE	Exam preparation for GCSE	Exam preparation for GCSE

Assessment	Topics
1 (Week 9/10)	Paper 2 mock exam
2 Weeks (20-23)	Paper 1 mock exam Paper 2 mock exam

KEY WORDS	MEANINGS
Cell	The unit of a living organism, contains parts to carry out life processes.
Uni-cellular	Living things made up of one 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

Multi-cellular Cells	Living things made up of many types of cell.
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KS 3 Keywords

KEY WORDS	MEANINGS
Elements	What all substances are made up of, and which contain only one type of atom.
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.
Chemical formula	Shows the elements present in a compound and their relative proportions.
Polymer	A molecule made of thousands of smaller molecules in a repeating pattern. Plastics are man-made polymers, starch is a natural polymer.
Formula	The symbols and numbers that represent the atoms in a substance.
Periodic table	Table in which all known elements are arranged based on their properties.
Symbol	One or two letters that represent an element.
Mixture	Two or more substances that are mixed but not chemically joined together.

Elements

KEY WORDS	MEANINGS
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.

Light

KEY WORDS	MEANINGS
Longitudinal wave	Where the direction of vibration is the same as that of the wave.
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 for viewing patterns of sound waves that have been turned into electrical current.
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

Sound

Movement and Digestion

KEY WORDS	MEANINGS
Joints	Places where bones meet.
Bone marrow	Tissue found inside some bones where new blood cells are made.
Antagonistic muscle pair	Muscles working in unison to create movement
Ligaments	Connect bones in joints.
Tendons	Connect muscles to bones.
Cartilage	Smooth tissue found at the end of bones, which reduces friction between them.
Enzymes	Substances that speed up the chemical reactions of digestion.
Dietary fibre	Parts of plants that cannot be digested, which helps the body eliminate waste.
Carbohydrates	The body's main source of energy. There are two types: simple (sugars) and complex (starch).
Lipids (fats and oils)	A source of energy. Found in butter, milk, eggs, nuts.
Protein	Nutrient your body uses to build new tissue for growth and repair. Sources are meat, fish, eggs, dairy products, beans, nuts and seeds.
Stomach	A sac where food is mixed with acidic juices to start the digestion of protein and kill microorganisms.

Small intestine	Upper part of the intestine where digestion is completed and nutrients are absorbed by the blood.
Large intestine	Lower part of the intestine from which water is absorbed and where faeces are formed.
Gut bacteria	Microorganisms that naturally live in the intestine and help food break down.

Reactions: Metals and non-metals, Acids and Bases

KEY WORDS	MEANINGS
Metals	Shiny, good conductors of electricity and heat, malleable and ductile, and usually solid at room temperature.
Non-metals	Dull, poor conductors of electricity and heat, brittle and usually solid or gaseous at room temperature.
Displacement	Reaction where a more reactive metal takes the place of a less reactive metal in a compound.
Oxidation	Reaction in which a substance combines with oxygen.
Reactivity	The tendency of a substance to undergo a chemical reaction.
pH	Scale of acidity and alkalinity from 0 to 14.
Indicators	Substances used to identify whether unknown solutions are acidic or alkaline.
Base	A substance that neutralises an acid - those that dissolve in water are called alkalis.
Concentration	A measure of the number of particles in a given volume
Chemical reaction	A change in which a new substance is formed.

Energy transfers and Energy costs

Words	Meanings
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.
Thermal energy store	Filled when an object is warmed up.
Chemical energy store	Emptied during chemical reactions when energy is transferred to 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.

Genes: Variation, inheritance and evolution

KEY WORDS	MEANINGS
Species	A group of living things that have more in common with each other than with other groups.
Variation	The differences within and between species.
Continuous variation	Where differences between living things can have any numerical value.
Discontinuous variation	Where differences between living things can only be grouped into categories.
Population	Group of organisms of the same kind living in the same place.
Natural selection	Process by which species change over time in response to environmental changes and competition for resources.
Extinct	When no more individuals of a species remain.
Evolution	Theory that the animal and plant species living today descended from species that existed in the past.
Biodiversity	The variety of living things. It is measured as the differences between individuals of the same species, or the number of different species in an ecosystem.
Competition	When two or more living things struggle against each other to get the same resource.

Forces (Gravity, contact forces)

Words	Meanings
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.
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 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

Human Reproduction

Words	Meanings
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.
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 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

Human Reproduction (continued)

KEY WORDS	MEANINGS
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.
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.
Menstruation	Loss of the lining of the uterus during the menstrual cycle.
Reproductive system	All the male and female organs involved in reproduction.
Embryo	The first two months of development of a baby.
Egg	The female sex cell.

KEY WORDS	MEANINGS
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 series	If components in a circuit are on the same loop.
In parallel	If some components are on separate loops.
Ammeter	Device for measuring current.
Amperes	Unit measurement of current.

Current

Voltage and Resistance

KEY WORDS	MEANINGS
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.
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.
Volt	Unit of measurement of potential difference.
Voltmeter	Device for measuring potential difference across a component. Must be wired in parallel.
Ohms Law	The current through a conductor between two points is directly proportional to the potential difference across the two points.
Ohmmeter	Device for measuring resistance of a component.
Resistor	A component specifically designed to reduce current flowing and transfer energy to the surroundings.
Ohms	Unit of measuring a components resistance, calculated as; resistance (Ω) = potential difference (V) \div current (A).

KEY WORDS	MEANINGS
Breathing	The movement of air in and out of the lungs.
Trachea (windpipe)	Carries air from the mouth and nose to the lungs.
Bronchi	Two tubes which carry air to the lungs.
Bronchioles	Small tubes in the lung.
Alveoli	Small air sacs found at the end of each bronchiole.
Ribs	Bones which surround the lungs to form the ribcage.
Diaphragm	A sheet of muscle found underneath the lungs.
Lung volume:	Measure of the amount of air breathed in or out.
Pleural membranes	Allow the lungs to move easily during ventilation
Intercostal muscles	Allow the ribcage to change in volume for ventilation to happen.

Breathing

Matter: Particle model and Periodic table

Words	Meanings
Particle	A very tiny object such as an atom or molecule, too small to be seen with a microscope.
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
Particle Model	A way to think about how substances behave in terms of small, moving particles.
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.

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.

Earth: Earth Structure, Universe

KEY WORDS	MEANINGS
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
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.

Respiration and Photosynthesis

Separating mixtures

KEY WORDS	MEANINGS
Respiration	A series of chemical reactions in cells that break down glucose to provide energy and form new molecules.
Aerobic respiration	Breaking down glucose with oxygen to release energy and producing carbon dioxide and water.
Anaerobic respiration (fermentation)	Releasing energy from the breakdown of glucose without oxygen, producing lactic acid (in animals) and ethanol and carbon dioxide (in plants and microorganisms).
Fertilisers	Chemicals containing minerals that plants need to build new tissues.
Photosynthesis	A process where plants and algae turn carbon dioxide and water into glucose and release oxygen.
Chlorophyll	Green pigment in plants and algae which absorbs light energy.
Stomata	Pores in the bottom of a leaf which open and close to let gases in and out.
Products	Substances that are produced in the reaction.
reactants	Substances that start a chemical reaction.
oxygen debt	Occurs during anaerobic respiration, muscles get energy from glucose but do not 'pay' for it with oxygen.

KEY WORDS	MEANINGS
Filtration	Separating substances using a filter to produce a filtrate (solution) and residue.
Mixture	Two or more pure substances mixed together, whose properties are different to the individual substances.
Pure substance	Single type of material with nothing mixed in.
Solubility	Maximum mass of solute that dissolves in a certain volume of solvent.
Soluble (insoluble)	Property of a substance that will (will not) dissolve in a liquid.
Solution	Mixture formed when a solvent dissolves a solute.
Dissolve	When a solute mixes completely with a solvent.
Solute	A substance that can dissolve in a liquid.
Distillation	Separating substances by boiling and condensing liquids.
Solvent	A substance, normally a liquid that dissolves another substance.

Pressure and Speed

Words	Meanings
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.
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.
Newton	Unit for measuring forces (N).
Linear relationship	When two variables are graphed and show a straight line which goes through the origin, and they can be called proportional.

Energy: Work, Heating and cooling

KEY WORDS	MEANINGS
Thermal conductor	Material that allows heat to move quickly through it.
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.
heat	A form of energy, measured in joules (J).
heating	The transfer of heat energy.
Work	The transfer of energy when a force moves an object, in joules.
Lever	A type of machine which is a rigid bar that pivots about a point.

Input force	The force you apply to a machine.
Output force	The force that is applied to the object moved by the machine.
Displacement	The distance an object moves from its original position.
Deformation	When an elastic object is stretched or squashed, which requires work.

Interdependence

KEY WORDS	MEANINGS
Food web	Shows how food chains in an ecosystem are linked.
Food chain	Part of a food web, starting with a producer, ending with a top predator
Ecosystem	The living things in a given area and their non-living environment.
Environment	The surrounding air, water and soil where an organism lives.
Population	Group of the same species living in an area.
Producer	Green plant or algae that make its own food using sunlight.
Consumer	Animal that eats other animals or plants.
Decomposer	Organism that breaks down dead plant and animal material so nutrients can be recycled back to the soil or water
Predator	an animal that lives by killing and eating other animals
Prey	An animal taken by a predator as food.

Reactions: Chemical energy, types of reaction

KEY WORDS	MEANINGS
Fuel	Stores energy in a chemical store which it can release as heat.
Chemical reaction	A change in which a new substance is formed.
Physical change	One that changes the physical properties of a substance, but no new substance is formed.
Reactants	Substances that react together, shown before the arrow in an equation.
Products	Substances formed in a chemical reaction, shown after the reaction arrow in an equation.
Conserved	When the quantity of something does not change after a process takes place.
Catalysts	Substances that speed up chemical reactions but are unchanged at the end.
Exothermic reaction	One in which energy is given out, usually as heat or light.
Endothermic reaction	One in which energy is taken in, usually as heat.
Chemical bond	Force that holds atoms together in molecules.

Magnetism and electromagnets

KEY WORDS	MEANINGS
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.
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).
Magnet	An object that has a magnetic field and can attract magnetic materials.
Repulsion	The force that pushes things away from each other, e.g. similar poles of two magnets.
Magnetic materials	Materials that are attracted to a magnet, e.g. iron, cobalt and nickel.
Magnetism	The non-contact force of a magnetic field.

Waves and Wave properties

KEY WORDS	MEANINGS
Wave	Vibrations that transport energy from place to place without transporting matter.
Transverse wave	Where the direction of vibration is perpendicular to that of the wave.
Transmission	Where waves travel through a medium rather than be absorbed or reflected.
Longitudinal waves	Where the direction of vibration is the same as that of the wave.
Pressure wave	An example is sound, which has repeating patterns of high-pressure and low-pressure regions.
Loudspeaker	Turns an electrical signal into a pressure wave of sound.
Microphone	Turns the pressure wave of sound hitting it into an electrical signal.
Ultraviolet (UV)	Waves with frequencies higher than light, which human eyes cannot detect.
Ultrasound:	Sound waves with frequencies higher than the human auditory range.
Frequency	The number of waves produced in one second, in hertz.

Climate

KEY WORDS	MEANINGS
Global warming	The gradual increase in surface temperature of the Earth.
Fossil fuels	Remains of dead organisms that are burned as fuels, releasing carbon dioxide.
Carbon sink	Areas of vegetation, the ocean or the soil, which absorb and store carbon.
Greenhouse effect	When energy from the sun is transferred to the thermal energy store of gases in Earth's atmosphere.
Carbon cycle	Recycling of carbon through living organisms and the environment.
Atmosphere	The gaseous layer that surrounds the Earth.
Carbon footprint	The total amount of greenhouse gases produced to directly and indirectly support human activities.
Greenhouse gases	A gas that contributes to the greenhouse effect by absorbing infrared radiation.
Carbon capture	The capture, collection and storage of carbon dioxide emissions from power stations and industrial sources.

Chlorofluorocarbon (CFC)	Gases from various industrial processes that are responsible for ozone layer depletion and as a result increased ultra-violet radiation levels on the earth. Controlled by the Montreal Protocol 1987.
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GCSE Key Words for scientific investigations

Accuracy

A measurement result is considered accurate if it is judged to be close to the true value.

Calibration

Marking a scale on a measuring instrument. This involves establishing the relationship between indications of a measuring instrument and standard or reference quantity values, which must be applied. For example, placing a thermometer in melting ice to see whether it reads zero, in order to check if it has been calibrated correctly.

Data

Information, either qualitative or quantitative, that has been collected.

Error

See also uncertainty.

Measurement error

The difference between a measured value and the true value.

Anomalies

These are values in a set of results which are judged not to be part of the variation caused by random uncertainty.

Random error

These cause readings to be spread about the true value, due to results varying in an unpredictable way from one measurement to the next. Random errors are present when any measurement is made, and cannot be corrected. The effect of random errors can be reduced by making more measurements and calculating a new mean.

Systematic error

These cause readings to differ from the true value by a consistent amount each time a measurement is made. Sources of systematic error can include the environment, methods of observation or instruments used. Systematic errors cannot be dealt with by simple repeats. If a systematic error is suspected, the data collection should be repeated using a different technique or a different set of equipment, and the results compared.

Zero error

Any indication that a measuring system gives a false reading when the true value of a measured quantity is zero, eg the needle on an ammeter failing to return to zero when no current flows. A zero error may result in a systematic uncertainty.

Evidence

Data which has been shown to be valid.

Fair test

A fair test is one in which only the independent variable has been allowed to affect the dependent variable.

Hypothesis

A proposal intended to explain certain facts or observations.

Interval

The quantity between readings, eg a set of 11 readings equally spaced over a distance of 1 metre would give an interval of 10 centimetres.

Precision

Precise measurements are ones in which there is very little spread about the mean value. Precision depends only on the extent of random errors – it gives no indication of how close results are to the true value.

Prediction

A prediction is a statement suggesting what will happen in the future, based on observation, experience or a hypothesis.

Range

The maximum and minimum values of the independent or dependent variables; important in ensuring that any pattern is detected. For example a range of distances may be quoted as either: 'From 10 cm to 50 cm' or 'From 50 cm to 10 cm'.

Repeatable

A measurement is repeatable if the original experimenter repeats the investigation using same method and equipment and obtains the same results. Previously known as reliable.

Reproducible

A measurement is reproducible if the investigation is repeated by another person, or by using different equipment or techniques, and the same results are obtained. Previously known as reliable.

Resolution

This is the smallest change in the quantity being measured (input) of a measuring instrument that gives a perceptible change in the reading.

Sketch graph

A line graph, not necessarily on a grid, that shows the general shape of the relationship between two variables. It will not have any points plotted and although the axes should be labelled they may not be scaled.

True value

This is the value that would be obtained in an ideal measurement.

Uncertainty

The interval within which the true value can be expected to lie. Whenever a measurement is made, there will always be some uncertainty or doubt about the result obtained. Uncertainty can be expressed in terms of spread of values obtained. For example, a length of 56 cm \pm 2 cm would mean the true value could be anywhere between 54 cm and 58 cm.

Validity

Suitability of the investigative procedure to answer the question being asked. For example, an investigation to find out if the rate of a chemical reaction depended upon the concentration of one of the reactants would not be a valid procedure if the temperature of the reactants was not controlled.

Valid conclusion

A conclusion supported by valid data, obtained from an appropriate experimental design and based on sound reasoning.

Variables

These are physical, chemical or biological quantities or characteristics.

Categoric

Categoric variables have values that are labels, eg names of plants or types of material.

Continuous

Continuous variables can have values (called a quantity) that can be given a magnitude either by counting (as in the case of the number of shrimp) or by measurement (eg light intensity, flow rate etc). Previously known as discrete variable.

Control

Control variable is one which may, in addition to the independent variable, affect the outcome of the investigation and therefore has to be kept constant or at least monitored.

Dependent

Dependent variable is the variable of which the value is measured for each and every change in the independent variable.

Independent

Independent variable is the variable for which values are changed or selected by the investigator.

Cultural Capital Audit

Ofsted define Cultural Capital: 'It is the essential knowledge that pupils need to be educated citizens, introducing them to the best that has been thought and said and helping to engender an appreciation of human creativity and achievement.'

I am looking for examples of when in your areas, **extra curricula/enhanced experience** (beyond the normal curriculum) for students where

- 1) Knowledge, understanding and skills is used as part of the **wider school curriculum**. Think how students have informed enthusiasm and the ability to think independently about your subject
- 2) Opportunities for discussion, debate, exploration of ideas, individual research
- 3) Development of cultural knowledge (local and worldwide)
- 4) Rich cultural experiences
- 5) Development of character

The above are interlinked, I am not looking for examples of each (but would love it if you could!)

Think: Visits to the theatre, National Parks, visits/experience of areas outside of Swadlincote/South Derbyshire, Sporting events, National events, Galleries, museums, talks from other adults, STEM, careers, multi-cultural links, literacy....the list is endless!

Subject area:

Activity/event	Brief outline of the activity/event if it not obvious(!)	Year group/target students (NOT NAMES)
Think Tank experience	Visit to Birmingham Think Tank to take part in a range of science experiences.	Y7
Chester Zoo	Visit to Chester Zoo, followed by debate on the scientific value of zoos for species protection, weighed against the issues with keeping wild animals in cages.	Y8
Safari park trip	Visit to West Midlands Safari park with an emphasis on the science involved. (Animals and adaptations and forces involved In the park rides)	Pupils from years 7-10
STEM Club	Opportunity for students to develop scientific thinking, group work and investigative science outside of the core curriculum.	Open to Year 7 most able
Curriculum Collapse events	Problem solving and competitive activities working collaboratively with	With various year groups

	groups out of the usual teaching groups.	
Science leaders	Most able year 10's educating disadvantaged underachieving year 7 pupils during a registration period.	Year 10 most able students