Science

KEMNAL HEARTS

KEMNAL MINDS

Curriculum Overview | Curriculum Enriching Opportunities | Links To The National Curriculum

Curriculum Overview

	Transition [June / July]	Term 1 [Sept]	Term 2	Term 3	Term 4	Term 5
Year 7		Intro to Science Transition Lessons	Energy stores and changes Atoms, elements, compounds Cells	Forces- contact and non-contact Mixtures Body systems	Electrical circuits Acids and alkalis Nutrition and digestion	Particle model of matter Energy transfer Reproduction
Year 8	Space and solar system Metals and non metals Plants and photosynthesis	Energy calculation Atomic structure cells	Waves Structure and properties Gas exchange	Forces and motion Strong and weak acids respiration	Electrical circuits rates evolution	Particle Model of Matter Crude oil DNA
Year 9	The universe The atmosphere ecosystems	Waves Periodic table Cells	Energy Chemical bonding Health and disease	Forces Bonding Organisation	Electricity Rates Cell Processes	Radiation Crude Oil Genetics & Inheritance
Year 10	Radiation The Atmosphere Ecology	Particle Model of Matter Atomic Structure & Periodic Table Organisation	Atomic Structure Bonding Structure & Properties of Matter Infection and response	Forces Quantitative Chemistry Bioenergetics	Forces / Waves Quantitative Chemistry Homeostasis	Waves / Magnetism Chemical Changes / Energy Changes Ecology
Year 11	Space Rate of Chemical Change Inheritance	Waves Organic Chemistry Inheritance	Magnetism Chemical Analysis Inheritance / Homeostasis	Space / Energy Quantitative Chemistry Homeostasis	Energy Chemical Changes Bioenergetics	Electricity Rate of Chemical Change Infection & Response

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Curriculum Enriching Opportunities

Curriculum Enriching Opportunities					
	Year 7	**Year 8**	**Year 9**	**Year 10**	**Year 11**
Suggested Reading	Charlotte's Web (life cycles) George's secret to the universe (space) One Smart Fish (evolution) Exploring the elements Can Reindeer Fly: The Science of Xmas	My Experiment (Poem) Women in Science: 50 fearless pioneers Neil deGrasse Tyson (Short biography) Kays Anatomy (the human body) Pig Boy Heart	Albert Einstein (Short Biography) A Brief History of Time Periodic Tales How Science Works	Girling up - Mayin Bialik; My sister's keeper - Jodie Picoult	Ender's Game - Orson Scott Card; The boy who harnessed the wind - William Kamkwamba
Suggested Viewing	www.discoveryuk.com/ www.schoolscience.co.uk	www.discoveryuk.com/ www.schoolscience.co.uk	www.discoveryuk.com/ www.schoolscience.co.uk	How the universe works [Discovery]	https://www.ted.com/playlists/181/the_most_popular_science_talks
Cultural Capital Experiences	Farm Club Science Club Biology Week Chemistry Week Physics Week	Farm Club Biology Week Chemistry Week Physics Week	Science Live Biology Week Chemistry Week Physics Week	University Science Trips	University Science Trips

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Links To The National Curriculum - Biology - Chemistry - Physics

The National Curriculum - Biology	KTC reference to the National Curriculum
Structure and function of living organisms	
Cells and organisation	
cells as the fundamental unit of living organisms, including how to observe, interpret and record cell structure using a light microscope	Yr. 7 Term 1, 2
the functions of the cell wall, cell membrane, cytoplasm, nucleus, vacuole, mitochondria and chloroplasts	Yr. 7 Term 1, 2
the similarities and differences between plant and animal cells	Yr. 7 Term 1, 2
the role of diffusion in the movement of materials in and between cells	Yr. 8 Term 1, 2
the structural adaptations of some unicellular organisms	Yr. 7 Term 1, Year 8 Term 1, Yr. 9 Term 1

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the hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms	Year 8 Term 1, Yr. 9 Term 1
The skeletal and muscular systems	Yr. 7 Term 3
the structure and functions of the human skeleton, to include support, protection, movement and making blood cells	Yr. 7 Term 3
biomechanics – the interaction between skeleton and muscles, including the measurement of force exerted by different muscles	Yr 7 Term 3
the function of muscles and examples of antagonistic muscles	Yr. 7 Term 3
Nutrition and digestion	
the content of a healthy human diet: carbohydrates, lipids (fats and oils), proteins, vitamins, minerals, dietary fibre and water, and why each is needed	Yr. 7 Term 4
calculations of energy requirements in a healthy daily diet	Yr. 7 Term 4
the consequences of imbalances in the diet, including obesity, starvation and deficiency diseases	Yr. 7 Term 4
the tissues and organs of the human digestive system, including adaptations to function and how the digestive system digests food (enzymes simply as biological catalysts)	Yr. 7 Term 4, Yr. 9 Term 3
the importance of bacteria in the human digestive system	Yr. 7 Term 4, Yr. 9 Term 3

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plants making carbohydrates in their leaves by photosynthesis and gaining mineral nutrients and water from the soil via their roots	Yr. 8 Term Transition
Gas exchange systems	
the structure and functions of the gas exchange system in humans, including adaptations to function	Yr. 8 Term 3
the mechanism of breathing to move air in and out of the lungs, using a pressure model to explain the movement of gases, including simple measurements of lung volume	Yr. 8 Term 3
the impact of exercise, asthma and smoking on the human gas exchange system	Yr. 8 Term 3
the role of leaf stomata in gas exchange in plants	Yr. 8 Term 3
Reproduction	
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	Yr. 8 Transition
reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms	Yr. 8 Transition
Health	
the effects of recreational drugs (including substance misuse) on behaviour, health and life processes	Yr. 9 Term 2

Material cycles and energy	

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Photosynthesis	
the reactants in, and products of, photosynthesis, and a word summary for photosynthesis	Yr. 8 Term Transition
the dependence of almost all life on Earth on the ability of photosynthetic organisms, such as plants and algae, to use sunlight in photosynthesis to build organic molecules that are an essential energy store and to maintain levels of oxygen and carbon dioxide in the atmosphere	Yr. 8 Term Transition, Yr 9 Term Transition
the adaptations of leaves for photosynthesis	Yr. 8 Term Transition, Yr 8 Term 2
Cellular respiration	Yr. 8 Term 3, Yr. 9 Term 4
aerobic and anaerobic respiration in living organisms, including the breakdown of organic molecules to enable all the other chemical processes necessary for life	Yr. 8 Term 3, Yr. 9 Term 4
a word summary for aerobic respiration	Yr. 8 Term 3, Yr. 9 Term 4
the process of anaerobic respiration in humans and micro-organisms, including fermentation, and a word summary for anaerobic respiration	Yr. 8 Term 3, Yr. 9 Term 4
the differences between aerobic and anaerobic respiration in terms of the reactants, the products formed and the implications for the organism	Yr. 8 Term 3, Yr. 9 Term 4
Interactions and interdependencies	
Relationships in an ecosystem	
the interdependence of organisms in an ecosystem, including food webs and insect pollinated crops	Yr. 9 Term Transition, Yr. 10 Term Transition

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the importance of plant reproduction through insect pollination in human food security	Yr. 9 Term Transition, Yr. 10 Term Transition
how organisms affect, and are affected by, their environment, including the accumulation of toxic materials	Yr. 9 Term Transition, Yr. 10 Term Transition
Genetics and evolution	
Inheritance, chromosomes, DNA and genes	
heredity as the process by which genetic information is transmitted from one generation to the next	Yr. 8 Term 5, Year. 9 Term 5
a simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model	Yr. 8 Term 5, Year. 9 Term 5
differences between species	Yr. 8 Term 4
the variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation	Yr. 8 Term 4
the variation between species and between individuals of the same species meaning some organisms compete more successfully, which can drive natural selection	Yr. 8 Term 4
changes in the environment which may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction	Yr. 8 Term 4, Yr. 10 Term Transition
the importance of maintaining biodiversity and the use of gene banks to preserve hereditary material	Yr. 8 Term 4, Yr. 10 Term Transition

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Chemistry

The particulate nature of matter	
the properties of the different states of matter (solid, liquid and gas) in terms of the particle model, including gas pressure	Year 7 Term 3
changes of state in terms of the particle model	Year 7 Term 3
Atoms, elements and compounds	
a simple (Dalton) atomic model	Yr. 7 Term 1 / 2
differences between atoms, elements and compounds	Yr. 7 Term 1 / 2
chemical symbols and formulae for elements and compounds	Yr. 7 Term 1 / 2
conservation of mass changes of state and chemical reactions	Yr. 7 Term 1 / 2
Pure and impure substances	
the concept of a pure substance	Year 7 Term 3
mixtures, including dissolving	Year 7 Term 3

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diffusion in terms of the particle model	Year 7 Term 3
simple techniques for separating mixtures: filtration, evaporation, distillation and chromatography	Yr. 7 Term 3
the identification of pure substances	Yr. 7 Term 3
Chemical reactions	
chemical reactions as the rearrangement of atoms	Yr. 7 Term 3, Yr. 9 Term 1
representing chemical reactions using formulae and using equations	Yr. 7 Term 3, Yr. 9 Term 1
combustion, thermal decomposition, oxidation and displacement reactions	Yr. 8 Transition
defining acids and alkalis in terms of neutralisation reactions	Yr. 7 Term 4
the pH scale for measuring acidity/alkalinity; and indicators	Yr. 7 Term 4
reactions of acids with metals to produce a salt plus hydrogen	Yr. 7 Term 4
reactions of acids with alkalis to produce a salt plus water	Yr. 7 Term 4
what catalysts do	Yr. 7 Term 5

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Energetics	
energy changes on changes of state (qualitative)	Yr. 7 Term 4
exothermic and endothermic chemical reactions (qualitative)	Yr. 7 Term 4
The periodic table	
the varying physical and chemical properties of different elements	Yr. 7 Term 2, Yr. 8 Term 1, Yr. 9 Term 1
the principles underpinning the Mendeleev periodic table	Yr. 8 Term 1, Yr. 9 Term 1
the periodic table: periods and groups; metals and non-metals	Yr. 8 Term 1
how patterns in reactions can be predicted with reference to the periodic table	Yr. 8 Term 1, Yr. 9 Term 1
the properties of metals and non-metals	Yr. 8 Term Transition, Yr. 9 Term 1
the chemical properties of metal and non-metal oxides with respect to acidity	Yr. 8 Term Transition
Materials	
the order of metals and carbon in the reactivity series	Yr. 8 Term Transition

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the use of carbon in obtaining metals from metal oxides	Yr. 8 Term 3
properties of ceramics, polymers and composites (qualitative)	Yr. 8 Term Transition, Yr. 8 Term 2
Earth and atmosphere	
the composition of the Earth	Yr. 8 Term 2
the structure of the Earth	Yr. 8 Term 2
the rock cycle and the formation of igneous, sedimentary and metamorphic rocks	Yr. 8 Term 2
Earth as a source of limited resources and the efficacy of recycling	Yr. 9 Term Transition
the composition of the atmosphere	Yr. 8 Term 5
the production of carbon dioxide by human activity and the impact on climate	Yr. 9 Term Transition

Physics

Energy	

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Calculation of fuel uses and costs in the domestic context	Yr. 7 Term 1 / 2
comparing energy values of different foods (from labels) (kJ)	Yr. 7 Term 1 / 2
comparing power ratings of appliances in watts (W, kW)	Yr. 8 Term 1
comparing amounts of energy transferred (J, kJ, kW hour)	Yr. 8 Term 1
domestic fuel bills, fuel use and costs	Yr. 8 Term 1
fuels and energy resources	Yr.8 Term 1
Energy changes and transfers	
simple machines give bigger force but at the expense of smaller movement (and vice versa): product of force and displacement unchanged	Yr. 8 Term 1
heating and thermal equilibrium: temperature difference between 2 objects leading to energy transfer from the hotter to the cooler one, through contact (conduction) or radiation; such transfers tending to reduce the temperature difference; use of insulators	Yr. 8 Term 1
other processes that involve energy transfer: changing motion, dropping an object, completing an electrical circuit, stretching a spring, metabolism of food, burning fuels	Yr. 8 Term 1

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Changes in systems	
energy as a quantity that can be quantified and calculated; the total energy has the same value before and after a change	Yr. 9 Term 2
comparing the starting with the final conditions of a system and describing increases and decreases in the amounts of energy associated with movements, temperatures, changes in positions in a field, in elastic distortions and in chemical compositions	Yr. 9 Term 2
using physical processes and mechanisms, rather than energy, to explain the intermediate steps that bring about such changes	Yr. 9 Term 2
Motion and forces	
Describing motion	
speed and the quantitative relationship between average speed, distance and time (speed = distance ÷ time)	Yr. 8 Term 3
the representation of a journey on a distance-time graph	Yr. 8 Term 3
relative motion: trains and cars passing one another	Yr. 8 Term 3
Forces	
forces as pushes or pulls, arising from the interaction between 2 objects	Yr. 7 Term 2

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using force arrows in diagrams, adding forces in 1 dimension, balanced and unbalanced forces	Yr. 7 Term 2
moment as the turning effect of a force	Yr. 7 Term 2
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	Yr. 9 Term 3
forces measured in newtons, measurements of stretch or compression as force is changed	Yr. 9 Term 3
force-extension linear relation; Hooke's Law as a special case	Yr. 9 Term 3
work done and energy changes on deformation	Yr. 9 Term 3
non-contact forces: gravity forces acting at a distance on Earth and in space, forces between magnets, and forces due to static electricity	Yr. 7 Term 2
Pressure in fluids	
atmospheric pressure, decreases with increase of height as weight of air above decreases with height	Yr. 9 Term 3
pressure in liquids, increasing with depth; upthrust effects, floating and sinking	Yr. 9 Term 3
pressure measured by ratio of force over area – acting normal to any surface	Yr. 9 Term 3

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Balanced forces	
opposing forces and equilibrium: weight held by stretched spring or supported on a compressed surface	Yr. 9 Term 3
Forces and motion	
forces being needed to cause objects to stop or start moving, or to change their speed or direction of motion (qualitative only)	Yr. 8 Term 3
change depending on direction of force and its size	Yr. 8 Term 3
Waves	
Observed waves	Yr. 8 Term 2, Yr. 9 Term 1
waves on water as undulations which travel through water with transverse motion; these waves can be reflected, and add or cancel – superposition	Yr. 8 Term 2, Yr. 9 Term 1
Sound waves	Yr. 8 Term 2, Yr. 9 Term 1
frequencies of sound waves, measured in hertz (Hz); echoes, reflection and absorption of sound	Yr. 8 Term 2, Yr. 9 Term 1
sound needs a medium to travel, the speed of sound in air, in water, in solids	Yr. 8 Term 2, Yr. 9 Term 1
sound produced by vibrations of objects, in loudspeakers, detected by their effects on microphone diaphragm and the ear drum; sound waves are longitudinal	Yr. 8 Term 2

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the auditory range of humans and animals	Yr. 8 Term 2,
Energy and waves	
pressure waves transferring energy; use for cleaning and physiotherapy by ultrasound; waves transferring information for conversion to electrical signals by microphone	Yr. 9 Term 1
Light waves	Yr. 9 Term 1
the similarities and differences between light waves and waves in matter	Yr. 9 Term 1
light waves travelling through a vacuum; speed of light	Yr. 9 Term 1
the transmission of light through materials: absorption, diffuse scattering and specular reflection at a surface	Yr. 9 Term 1
use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing (qualitative); the human eye	Yr. 9 Term 1
light transferring energy from source to absorber, leading to chemical and electrical effects; photosensitive material in the retina and in cameras	Yr. 9 Term 1
colours and the different frequencies of light, white light and prisms (qualitative only); differential colour effects in absorption and diffuse reflection	Yr. 9 Term 1
Electricity and electromagnetism	

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Current electricity	
electric current, measured in amperes, in circuits, series and parallel circuits, currents add where branches meet and current as flow of charge	Yr. 7 Term 3
potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms, as the ratio of potential difference (p.d.) to current	Yr. 7 Term 3
differences in resistance between conducting and insulating components (quantitative)	Yr. 8 Term 4
Static electricity	
separation of positive or negative charges when objects are rubbed together: transfer of electrons, forces between charged objects	Yr. 9 Term 4
the idea of electric field, forces acting across the space between objects not in contact	Yr. 9 Term 4
Magnetism	
magnetic poles, attraction and repulsion	Yr. 7 Term 2
magnetic fields by plotting with compass, representation by field lines	Yr. 7 Term 2
Earth’s magnetism, compass and navigation	Yr. 7 Term 2

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the magnetic effect of a current, electromagnets, DC motors (principles only)	Yr. 9 Term 4
Matter	
Physical changes	
conservation of material and of mass, and reversibility, in melting, freezing, evaporation, sublimation, condensation, dissolving	Yr. 7 Term 3
similarities and differences, including density differences, between solids, liquids and gases	Yr. 7 Term 4, Yr. 8 Term 5
Brownian motion in gases	Yr. 7 Term 4, Yr. 8 Term 5
diffusion in liquids and gases driven by differences in concentration	Yr. 8 Term 1
the difference between chemical and physical changes	Yr. 7 Term 5
Particle model	
the differences in arrangements, in motion and in closeness of particles explaining changes of state, shape and density; the anomaly of ice-water transition	Yr. 7 Term 5
atoms and molecules as particles	Yr. 7 Term 5
Energy in matter	

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changes with temperature in motion and spacing of particles	Yr. 8 Term 5
internal energy stored in materials	Yr. 8 Term 5
Space physics	
gravity force, weight = mass x gravitational field strength (g), on Earth g=10 N/kg, different on other planets and stars; gravity forces between Earth and Moon, and between Earth and sun (qualitative only)	Yr. 8 Term Transition
our sun as a star, other stars in our galaxy, other galaxies	Yr. 8 Term Transition
the seasons and the Earth's tilt, day length at different times of year, in different hemispheres	Yr. 8 Term Transition
the light year as a unit of astronomical distance	Yr 8 Term Transition