

DMS Curriculum Plan

SUBJECT: Science

At Dorchester Middle School, as part of our planning in science we ensure that pupils can remember more and learn more by weaving the Big Ideas of Science, and scientific skills, throughout units of learning. This way, pupils have the opportunity to practise, discuss, reflect and revisit what they have been taught. We carefully follow the National Curriculum and ensure learning is progressive and sequential, giving pupils the opportunity to build on and apply previous knowledge in all units before further development in the subject.

Key Skills in this subject are:

KEY SKILL	EXPLANATION
Enquire	Devise questions and collect data. Plan variables and test hypotheses.
Analyse	Present data and draw conclusions. Analyse patterns in data and discuss its limitations.
Communicate	Communicate ideas and construct explanations. Critique claims and justify opinions.
Solve	Estimate risks, examine consequences, review theories and interrogate sources.

The Big Ideas of Science

1	All matter in the Universe is made of very small particles Atoms are the building blocks of all matter, living and non-living. The behaviour and arrangement of the atoms explains the properties of different materials. In chemical reactions atoms are rearranged to form new substances. Each atom has a nucleus containing neutrons and protons, surrounded by electrons. The opposite electric charges of protons and electrons attract each other, keeping atoms together and accounting for the formation of some compounds.
2	Objects can affect other objects at a distance All objects have an effect on other objects without being in contact with them. In some cases, the effect travels out from the source to the receiver in the form of radiation (e.g. visible light). In other cases, action at a distance is explained in terms of the existence of a field of influence between objects, such as a magnetic, electric or gravitational field. Gravity is a universal force of attraction between all objects however large or small, keeping the planets in orbit round the Sun and causing terrestrial objects to fall towards the centre of the Earth.
3	Changing the movement of an object requires a net force to be acting on it A force acting on an object is not seen directly but is detected by its effect on the object's motion or shape. If an object is not moving the forces acting on it are equal in size and opposite in direction, balancing each other. Since gravity affects all objects on Earth there is always another force opposing gravity when an object is at rest. Unbalanced forces cause change in movement in the direction of the net force. When opposing forces acting on an object are not in the same line, they cause the object to turn or twist. This effect is used in some simple machines.
4	The total amount of energy in the Universe is always the same but can be transferred from one energy store to another during an event Many processes or events involve changes and require an energy source to make them happen. Energy can be transferred from one body or group of bodies to another in various ways. In these processes some energy becomes less easy to use. Energy cannot be created or

	destroyed. Once energy has been released by burning a fossil fuel with oxygen, some of it is no longer available in a form that is as convenient to use.
5	The composition of the Earth and its atmosphere and the processes occurring within them shape the Earth's surface and its climate Radiation from the Sun heats the Earth's surface and causes convection currents in the air and oceans, creating climates. Below the surface heat from the Earth's interior causes movement in the molten rock. This in turn leads to movement of the plates which form the Earth's crust, creating volcanoes and earthquakes. The solid surface is constantly changing through the formation and weathering of rock.
6	Our Solar System is a very small part of one of billions of galaxies in the universe Our Sun and eight planets and other smaller objects orbiting it comprise the solar system. Day and night and the seasons are explained by the orientation and rotation of the Earth as it moves round the Sun. The solar system is part of a galaxy of stars, gas and dust, one of many billions in the Universe, enormous distances apart. Many stars appear to have planets.
7	Organisms are organised on a cellular basis and have a finite life span All organisms are constituted of one or more cells. Multi-cellular organisms have cells that are differentiated according to their function. All the basic functions of life are the result of what happens inside the cells which make up an organism. Growth is the result of multiple cell divisions.
8	Organisms require a supply of energy and materials for which they often depend on, or compete with, other organisms Food provides materials and energy for organisms to carry out the basic functions of life and to grow. Green plants and some bacteria are able to use energy from the Sun to generate complex food molecules. Animals obtain energy by breaking down complex food molecules and are ultimately dependent on green plants as their source of energy. In any ecosystem there is competition among species for the energy resources and materials they need to live and reproduce.
9	Genetic information is passed down from one generation of organisms to another Genetic information in a cell is held in the chemical DNA. Genes determine the development and structure of organisms. In asexual reproduction all the genes in the offspring come from one parent. In sexual reproduction half of the genes come from each parent.
10	The diversity of organisms, living and extinct, is the result of evolution All life today is directly descended from a universal common ancestor that was a simple one-celled organism. Over countless generations changes resulting from natural diversity within a species lead to the selection of those individuals best suited to survive under certain conditions. Species not able to respond sufficiently to changes in their environment become extinct.

	Year 5	Year 6	Year 7	Year 8
T1 Knowledge	Working scientifically <ul style="list-style-type: none"> - To devise scientific questions that can be investigated - To identify variables in an investigation 	Working scientifically (Microorganisms) Big ideas 7 8 <ul style="list-style-type: none"> - To describe microorganisms and give examples - To devise an investigative question and a hypothesis 	Working scientifically Big idea 9 <ul style="list-style-type: none"> - To ask scientific questions and write a hypothesis - To identify variables in an investigation - To represent a scientific experiment with a diagram 	Working scientifically (Fields) Big idea 2 <ul style="list-style-type: none"> - To accurately record complex data in a table - To accurately record data in a graph - To draw a conclusion from data and evaluate the

	<ul style="list-style-type: none"> - To collect data in a tally and present in a bar graph - To control variables in an investigation - To take record accurate measurements in a table - To identify the features of, and interpret, line graphs - To present data in a line graph - To analyse data and write a conclusion 	<ul style="list-style-type: none"> - To investigate food sources for microbes - To present data in a line graph (compare evidence to hypothesis) - To investigate the effect of temperature on microbial growth (control variables) - To report findings of an investigation - To investigate microorganisms in our environment - To describe how scientists in the past have influenced our understanding today 	<ul style="list-style-type: none"> - To identify hazards and reduce risk - To recognise and apply features of a method - To recognise the three types of data - To record accurate and reliable data in a table - To present data accurately in a graph - To determine a relationship between two variables (line of best fit) - To describe the stages in evaluating data 	<p>investigation</p> <ul style="list-style-type: none"> - To represent magnetic field lines in a diagram - To construct an electromagnet - To explain how to increase the strength of an electromagnet. - To explain some examples of when electromagnets are useful. - To describe how gravitational force varies with mass and distance <p>Nutrition Big idea 7</p> <ul style="list-style-type: none"> - To describe the components of a balanced diet - To test foods for energy - To test for sugar, protein and starch
Skills	<ul style="list-style-type: none"> - recognise and control variables - take measurements using a range of scientific apparatus - take repeat readings when appropriate - present data in tables and graphs - draw conclusions from data and discuss causal relationships 	<ul style="list-style-type: none"> - set up a comparative test - explain which variables need to be controlled and why - present data in a bar graph - make careful observation - present observations in scientific diagrams - draw a conclusion from data and explain the degree of trust in results 	<ul style="list-style-type: none"> - develop a hypothesis - describe what makes data accurate and precise - describe a risk assessment - calculate a mean from repeat measurements - choose how to display data and justify your opinion - present data appropriately in tables, charts and graphs - interpret data to suggest relationships between two variables and to draw conclusions - describe the steps in evaluating data 	<ul style="list-style-type: none"> - identify a pattern in data from a results table or bar chart. - Identify aspects of the method that did not go according to plan and suggest ways to improve the method. - Suggest better ways to control variables. - Suggest ways to reduce measurement errors. - Suggest reasons for differences in repeat readings. - Comment on whether findings fit with known scientific explanations.

			- suggest ways to improve a practical investigation	- Explain why having someone else repeat the experiment could increase confidence in the conclusion.
Assessment	End of topic test	End of topic test	Assessed practical - marshmallows	Exam style test
T2 Knowledge	<p>Properties of materials Big idea 1</p> <ul style="list-style-type: none"> - To compare materials based on their properties - To describe solids, liquids and gases, based on their properties - To explain why materials change state - To describe substances as soluble or insoluble - To investigate the solubility of a substance - To describe the best way to separate substances - To plan a fair test - To give reasons, based on evidence, for using a particular material - To describe some irreversible changes 	<p>Evolution and inheritance Big ideas 8 9 10</p> <ul style="list-style-type: none"> - To recognise inherited and environmental characteristic - To explain how inherited characteristics can lead to variation - To explain when inherited characteristics are an advantage - To research to work of Charles Darwin - To explain how adaptation can lead to variation within a species - To explain how variation can lead to evolution by natural selection - To describe how life on Earth has evolved over time - To describe how fossils are formed - To describe how the fossil record supports the theory of evolution over time 	<p>Particle theory Big idea 1</p> <ul style="list-style-type: none"> - To describe the arrangement of particles in solids, liquids and gases - To use the particle model to explain the properties of solids, liquids and gases - To use the particle model to explain diffusion - To investigate how temperature affects the rate of diffusion - To describe changes of state in terms of transferring energy - To investigate the cooling of stearic acid - To present data in a line graph - To interpret heating and cooling curves - To use particle theory to explain expansion - To use particle theory to explain changes in gas pressure 	<p>Digestion Big idea 7</p> <ul style="list-style-type: none"> - To describe the purpose of digestion - To describe the organs of the digestive system - To explain the adaptations of the small intestine - To model the digestion process - To model diffusion in the small intestine - To describe how diet can affect health <p>Periodic table, metals and non-metals Big idea 1</p> <ul style="list-style-type: none"> - To describe the structure of the periodic table of elements - To describe the properties of most metals - To identify elements, compounds and mixtures - To use word equations to describe compound formation - To identify atoms within a chemical formula - To explain the law of conservation of mass - To describe trends in the Group 1 elements

Skills	<ul style="list-style-type: none"> - classify materials - present information using scientific diagrams - write a scientific prediction - recognise and control variables - take accurate measurements and record in a table - draw a conclusion based on data and discuss causal relationships 	<ul style="list-style-type: none"> - record findings in written form - record findings in scientific diagrams 	<ul style="list-style-type: none"> - present data appropriately in tables, charts and graphs - interpret data to suggest relationships between two variables and to draw conclusions 	<ul style="list-style-type: none"> - describe some limitations of a model - assess the risk of a practical - use data about the properties of elements to find similarities, patterns and anomalies - name simple compounds using rules: change non-metal to -ide; mono, di, tri prefixes; and symbols of hydroxide, nitrate, sulfate and carbonate.
Assessment	End of topic test	End of topic test	Particles HOT task To compare solids and gases	Exam style test
T3 Knowledge	Forces Big ideas 3 2 <ul style="list-style-type: none"> - To describe the effects of forces - To identify the forces acting on objects and represent them in force diagrams - To investigate mass and weight - To investigate air resistance - To investigate water resistance 	Electrical circuits Big idea 4 <ul style="list-style-type: none"> - To represent an electrical circuit with a diagram - To investigate the effect of making changes to a circuit - To investigate voltage in a circuit - To plan a comparative test 	Cells and systems Big idea 7 <ul style="list-style-type: none"> - To describe the levels of organisation in an organism - To identify the organelles in animal and plant cells - To identify the parts of a microscope and describe how to use one - To prepare a microscope slide to view animal and plant cells - To identify different tissue types - To relate cell structure to diffusion - To describe how some plant cells are adapted for their function - To describe how some animal cells are adapted for their function Energy Big idea 4	Respiration and breathing Big idea 7 <ul style="list-style-type: none"> - To describe respiration using a word equation - To describe the organs of the respiratory system - To compare inhaled and exhaled air - To describe the process of inhaling and exhaling - To explain what happens during breathing using the bell-jar model - To explain how the trachea is adapted for its function - To observe a lung dissection - To explain how the alveoli are adapted for gas exchange - To describe the effects of smoking on the body - To describe the effects of asthma on the body Types of reaction Big idea 1

			<ul style="list-style-type: none"> - To describe how energy is stored - To describe how energy is transferred - To describe how the energy that devices use is measured - To apply the power calculation - To describe the conservation of energy - To calculate the efficiency of energy transfers - To calculate work done 	<ul style="list-style-type: none"> - To describe oxidation reactions using word equations - To describe combustion reactions using word equations - To describe metal and acid reactions using word equations - To compare the reactions of different metals in acid - To describe metal carbonate reactions using word equations - To test for hydrogen, carbon dioxide and oxygen - To use evidence to explain the reactivity series - To identify when a displacement reaction will occur
Skills	<ul style="list-style-type: none"> - compare evidence to predictions - collect and record accurate data - determine trust in our results - present data in a line graph 	<ul style="list-style-type: none"> - explain which variables need to be controlled and why - decide which observations to make and what measurements to use - explain why taking repeat measurements is necessary - present data in a line graph 	<ul style="list-style-type: none"> - draw an annotate scientific diagrams - prepare microscope slides - Use a light microscope to observe and draw cells. - Use the energy calculation to calculate power/energy in a range of situations. - Calculate the useful energy and the amount dissipated, given values of input and output energy. - Calculate the work needed to move a variety of objects 	<ul style="list-style-type: none"> - draw an annotate scientific diagrams - describe some limitations of a model - interpret data to suggest relationships between two variables and to draw conclusions - make careful observations to draw conclusions and identify patterns - assess the risk of a practical
Assessment	End of topic test	End of topic test	Cells HOT task To compare an amoeba and a euglena	Respiration HOT task To sequence the journey of oxygen in respiration

T4 Know ledge	Continuation from T3	Classifying organisms Big ideas 9 10 <ul style="list-style-type: none"> - To explain how all living things are classified today - To classify mammals according to their characteristics - To recognise animals using the binomial naming system - To create a classification key - To justify the classification of a species of invertebrate - To carry out sampling of the local environment - To create a classification key of species in our local environment - To report and present findings using appropriate scientific language 	Separating mixtures Big idea 1 <ul style="list-style-type: none"> - To describe elements, compounds and mixtures - To explain what happens during dissolving - To describe substances in terms of their solubility - To explain saturation point and how to increase solubility - To explain why mass is conserved when a substance is dissolved - To describe a mixture and plan how to separate it - To explain how to separate substances using filtration and evaporation - To explain the process of distillation - To explain how to separate coloured substances using chromatography 	Thermal transfers Big ideas 4 5 <ul style="list-style-type: none"> - To explain thermal equilibrium - To explain the difference between energy and temperature - To explain thermal energy transfer by conduction - To explain thermal energy transfer by convection - To explain thermal energy transfer by radiation Photosynthesis Big ideas 4 5 8 <ul style="list-style-type: none"> - To describe photosynthesis using a word equation - To describe the structure of a leaf - To explain how the leaf is adapted to take in carbon dioxide - To describe how a plant transports glucose and water - To investigate the effect of light intensity on photosynthesis
Skills		<ul style="list-style-type: none"> - present data using keys - carry out sampling - present data using scientific language 	<ul style="list-style-type: none"> - write a method - separate substances using filtration, evaporation, distillation and chromatography 	<ul style="list-style-type: none"> - draw and annotate scientific diagrams - prepare microscope slides - Use a light microscope to observe and draw cells.
Assessment		End of topic test	Exam style test	Exam style test
T5 Know ledge	Earth and space Big ideas 2 6	Light Big idea 2	Electrical circuits Big idea 4	Light and sound Big idea 2

	<ul style="list-style-type: none"> - To identify objects in our Solar System - To identify scientific evidence to prove an idea - To compare the geocentric and heliocentric models - To compare the planets in our Solar System - To describe the features of the planets in our Solar System - To explain day and night - To investigate how shadows change throughout the day - To describe the shape of the moon 	<ul style="list-style-type: none"> - To describe how light travels - To describe refraction when light travels through transparent objects - To explain how we see things - To explain shadow formation 	<ul style="list-style-type: none"> - to interpret an electrical circuit diagram - to describe current in a series circuit - to describe current in a parallel circuit - to compare the advantages and disadvantages of series and parallel circuits - to explain the use of switches in circuits <p>Acids and alkalis Big idea 1</p> <ul style="list-style-type: none"> -to compare physical changes to chemical reactions -to describe simple chemical reactions using word equations -to identify substances as acid, alkali or neutral -to describe how to make a neutral solution from an acid and an alkali -to state what products are formed in a reaction between an acid and an alkali -to explain how neutralisation reactions are used in different situations 	<ul style="list-style-type: none"> - To describe how light travels and how we see things - To describe how we see things that are not sources of light - To represent reflection using light ray diagrams - To describe transmission and absorption - To represent refraction with a ray diagram - To explain refraction - To describe how light refracts through a triangular prism - To explain the effect of coloured filters - To describe how objects appear different colours - To relate changes in the loudness and pitch of a sound to changes in vibration - To interpret oscilloscope readings - To describe how sound travels in different medium - To explain how we sense sounds
Skills	<ul style="list-style-type: none"> - Use scientific diagrams and models to explain proven theories - Identify scientific evidence that has been used to support or refute ideas 	<ul style="list-style-type: none"> - Present information in scientific diagrams - Decide what observations to make and how to measure them - Recognise and control variables - Collect accurate and reliable data - Present data in a line graph 	<ul style="list-style-type: none"> -interpret circuit diagram -represent circuits using scientific diagrams -identify hazards and risk -carry out a neutralisation reaction -justify a method for collecting data -carry out simple titration 	<ul style="list-style-type: none"> - Construct ray diagrams to show how light reflects off mirrors, forms images and refracts. - Use ray diagrams to describe how light passes through lenses and transparent materials. - Describe the amplitude and frequency of a wave from a

				<p>diagram or oscilloscope picture.</p> <ul style="list-style-type: none"> - Use drawings of waves to describe how sound waves change with volume or pitch. <p>Revision</p>
Assessment	<p>Life cycles HOT task</p> <p>To compare the life cycles of plants and an animals</p>	End of topic test	Exam style test	Exam style test
T6 Knowledge	<p>Life cycles Big ideas 7 8</p> <ul style="list-style-type: none"> - To compare the life cycles of different animals - To compare the life cycles of different types of mammals - To describe changes in humans as they develop to old age - To present and compare data on gestation - To describe the life cycle of flowering plants - To identify the parts of a flower - To compare sexual and asexual reproduction in plants 	<p>Healthy bodies Big idea 7</p> <ul style="list-style-type: none"> - To describe the seven nutrient groups - To describe a balanced diet - To explain why a balanced diet is important - To describe how scientific ideas in the past have contributed to our understanding today - To describe the organs of the circulatory system - To explain how the circulatory system supports a healthy body - To explain the effect of exercise on the circulatory system 	<p>Forces and speed Big idea 3</p> <ul style="list-style-type: none"> - To represent forces with free body diagrams - Identify forces in unfamiliar situations - To describe and calculate resultant force - To explain the effect of resultant forces on motion - To describe the relationship between weight and mass - To calculate speed using the speed equation - To apply the speed equation in unfamiliar situations - To plan an investigation - To carry out a reliable investigation - To present data in a line graph and determine a relationship 	<p>Universe Big idea 2 6</p> <ul style="list-style-type: none"> - To describe the objects that can be seen in the night sky - To explain why we see objects in the Solar System and why they appear to move as they do - To describe and explain the link between distance from the Sun and temperature of the planets - To explain why places on Earth experience different daylight hours and seasons <p>Water rockets</p> <ul style="list-style-type: none"> - To relate force and pressure to gases - To explore how gas pressure can be used to create motion - To apply understanding of forces and gas pressure to a water rocket design - To test and evaluate rockets based on performance

Skills	<ul style="list-style-type: none"> - make careful observation - present observations in scientific diagrams - systematically and safely complete a flower dissection - present data in a bar graph - draw conclusions from data and discuss causal relationships 	<ul style="list-style-type: none"> - Identify scientific evidence that has been used to support or refute ideas - Explain which variables need to be controlled and why - Make a prediction using scientific knowledge - Take measurements with accuracy and precision - Present data in an appropriate graph - Report findings as a conclusion and identify causal relationships and explanations - Evaluate the degree of trust in results 	<ul style="list-style-type: none"> - present data appropriately in tables, charts and graphs - interpret data to suggest relationships between two variables and to draw conclusions - Use the speed calculation to calculate speed/journey time/distance in a range of situations. - develop a hypothesis - describe what makes data accurate and precise - calculate a mean from repeat measurements - describe the steps in evaluating data - suggest ways to improve a practical investigation 	<ul style="list-style-type: none"> - use models and diagrams to explain abstract phenomena - evaluate and minimise risk - take a design from planning through to production using STEM skills - Evaluate performance and suggest improvements
Assessment	End of topic test	End of topic test	Exam style test	End of Key Stage 3 assessment

Extra curricular opportunities:

Year 5 – Explorer Dome in school to support learning of Earth and Space - T5

Year 6 – Trip to Winchester Science Centre - T1

Year 7 – Medical Mavericks in school to support learning in biology and provide career information