Long Term Plan: Year 9 2023-2024



"Science is simply the word we use to describe a method of organising our curiosity."

The programme for KS3 (years 7-9) sees a single* teacher following the curriculum roadmap for each class. All teachers teach the same unit to aid sequencing and consistency with teaching and learning.

*There are few classes which are split between staff - but again, the same unit is delivered by both staff.

There are two data collection points for all KS3 students, which will then be analysed with a subsequent KS3 Standardisation Meeting.

Topic	Unit title	Key knowledge/ Content to learn and retain	Essential skills to acquire (subject & generic)	Anticipated misconceptions	Links to previous KS	Links to future KS	Opportunity for stretch for high prior attainers	
One	Cells & DNA	Prokaryotic compared to eukaryotic cells Microscopy Cell specialisation and differentiation The cell cycle, although details of the stages of mitosis is not required The use of stem cells and the ethical aspects of stem cell use	Practical Skills: Using light microscopes correctly Scientific Skills: Drawing and labelling scientific diagrams Changing the subject of, and substituting into, simple equations with three terms	That all animal cells look like the model animal cell often used to teach this topic, teaching must be careful that students understand that most animal cells are specialised That people grow as their cells get bigger as opposed to replication of cells	KS3 students to study the basic structure from animal plant and bacterial cells, including the function of most organelles, cell specialisation. Students carried out some basic work with microscopy	The cell as the fundamental unit of life is studied in both GCSE Biology, Applied human biology and Alevel biology This content leads to: Y10: Organisation Y10 - Infection & response Y11 - Ecology Y11 - Inheritance, variation and evolution	Students to compare stem cells extracted from bone marrow and from embryos, looking at which kind of cells these can differentiate into and considering why	
SMSC & British Values	The ethics surrounding the use of stem cells in medical research and in the treatment of certain diseases such as dementia British values in science							
Cultural	Students explore	the ethical issues surrounding use ste	m cells, including why different people may hold	different views on their use				

Capital	
Career Link	As cells are fundamental to biology this unit opens doors to careers in any biological medical or ecological field
Lilik	https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html
	More information <u>here</u> .

	Atomic Structure	The structure of the atom, including the mass and charge of subatomic particles. The history of the atom, including key moments in the development of the nuclear model Isotopes and atomic structure	Practical Skills: Investigating group I metals Potential to use models to explore the atom Scientific Skills: Using data to make predictions. The use of timelines Extended writing Reading for comprehension	Students often underestimate just how small atoms are, and how much of them is empty space. Students often mix up the names of the scientists responsible for each discovery.	In year 7 students studied the general arrangement of the periodic table and the dalton model of the atom	Y9 - The periodic table Y9 - Atoms and radiation Y9 - Energy changes Y10 - 5.3 Quantitative Chemistry Y10 - 5.4 Chemical	Considering why the results of the Gold Foil Experiment lead to the development of the nuclear model of the atom.
						changes Y10 - Rates of reaction Y11 - Chemical analysis	
British	British values in science The contribution of British scientists to scientific understanding.						
Cultural T	The historical imp	portance of the various figures that ha	ave contributed to the development of understa	nding of the atom.			

Link	https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html More information here.								
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Three	Energy Stores	Stores, Pathways and energy transfers. Kinetic, Gravitational and Elastic energy calculations. Heat transfer and insulation	Practical Skills: Investigating specific heat capacity Scientific Skills: Changing the subject of simple equations with three terms. Evaluation of an equation involving multiplication, division, squares and square roots Record accurate results in an appropriate format Present and interpret data in tabular and graphical form.	Students often speak of "types" of energy. This is fundamentally incorrect. Students must talk about energy in the context of stores and pathways	This unit builds directly from year seven study of energy stores and pathways.	Y9 - Power and energy Y9 - Energy in living organisms Y9 - Atoms and radiation Y10 - 6.2 Electricity Y11 - 6.6 Waves	Students could be asked to consider more complex energy transfers involving more than two stores. Changing the subject of energy equations to calculate theoretical maximum speed		
SMSC & British Values	British values		rday changes that can be made to promote the us	se of more sustainable resources					
Cultural Capital	The ubiquity of en	ergy means that problems can be fra	med in a variety of familiar and unfamiliar contex	its					
Career Link	https://www.bbc. https://www.pear More information	son.com/uk/educators/schools/subj	t-use-science/1, https://www.bradfordacademy ect-area/science/why-science-matters/your-fu	.co.uk/wp-content/uploads/2019/ uture-in-stem-a-z.html	/10/CEIAG-in-the-Curriculur	m-Science.pdf,			
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Four	Transport Systems	Diffusion – the process of diffusion, examples of where it happens Factors affecting the rate of diffusion Exchange surfaces – how our bodies are adapted for efficient diffusion Osmosis – the process of osmosis, examples of where it happens Active transport - the process of active transport, examples of where it happens	Practical Skills: Investigate the effect of temperature on the rate of diffusion Investigate the effect of concentration on the rate of diffusion Investigate the effect of surface on the rate of diffusion Investigate the effect of concentration on the rate of concentration on the rate of osmosis Scientific Skills: Record data in tables Present data in graphs	Diffusion and osmosis are the same thing. Active transport only occurs when something has to move upwards	KS3 students looked at diffusion and factors which affect the rate of.	Y9 - Energy in living organisms Y10 - Infection and Response Y10 - Reflex arc and neurotransmitter movement	Cross subject links to Chemistry High Prior attainers can attempt to draw the osmosis graph without scaffolding
SMSC & British Values	British values Students may		certain diseases and how that impacts	s the efficiency of transport	systems		
	Students explore	issues with the digestive or respirator	ry system and how these affect the efficiency of	transport systems in animals.			
Cultural Capital							
Career Link	https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html More information here.						

Торіс	Unit title	Key knowledge/ Content to learn and retain	Essential skills to acquire (subject & generic)	Anticipated misconceptions	Links to previous KS	Links to future KS	Opportunity for stretch for high prior attainers
Five	Periodic table	The arrangement of the periodic table Trends in reactivity of groups	Practical Skills: • Demo – Group I metals in water Scientific Skills:	Students often mix up the names and data of the scientists responsible for each discovery of the periodic table	In year 7 students studied the general arrangement of the periodic table and the	Y9 - The periodic table Y9 - Atoms and	Considering the results of each investigation and how it lead to the development of the

	one, seven and zero.	 Using data to make predictions. The use of timelines Extended writing Reading for comprehension 		dalton model of the atom	radiation Y9 - Energy changes Y10 - 5.3 Quantitative Chemistry Y10 - 5.4 Chemical changes Y10 - Rates of reaction Y11 - Chemical analysis	periodic table		
SMSC & British Values	British values in science The contribution of Scientists to scientific understanding.							
Cultural Capital	The historical importance of the various figures that have contributed to the development of the periodic table							
Career Link		https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html More information here.						

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Six	Power and Energy	Renewable and non-renewable resources.	Practical Skills: Demo/ modelling gravitational, kinetic and elastic potential energy Scientific Skills: Changing the subject of simple equations with three terms. Evaluation of an equation involving multiplication, division, squares and square roots	Students often frame renewable and non-renewable in terms of "able to be used again" rather than in terms of the finite or infinite pool of resources.	This unit builds directly from year seven study of energy stores and pathways.	Y9 - Energy in living organisms Y9 - Atoms and radiation Y10 - 6.2 Electricity Y11 - 6.6 Waves	Students could be asked to use data on efficiency and cost to evaluate appliances

			Record accurate results in an appropriate format Present and interpret data in tabular and graphical form.				
SMSC & British Values	British values in science Cost of living crisis - students to relate information of appliances to understanding how these link to cost						
Cultural Capital	Cost of living crisis - students to relate information of appliances to understanding how these link to cost						
Career Link	https://www.pears	https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html More information here.					

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Seven	Energy in living organisms	Photosynthesis reaction — including equations Rate of photosynthesis — including limiting factors Use of glucose in plants and factors affecting the rate of photosynthesis Aerobic and anaerobic respiration, including word and symbol equations The effects of exercise on the rate of respiration, with reference to heart and breathing rate Bodily metabolism-	Practical Skills: Investigate the effect of light intensity on the rate of photosynthesis Scientific Skills: Drawing graphs Analysing graphs Writing and balancing chemical equations Drawing and extrapolating lines of best fit	That plants breathe Students may struggle to link the factors that affect the rate of photosynthesis to the factors that affect the rate of an enzyme controlled Confusion between the term respiration and the act of breathing, which should be referred to with the term ventilation	The year three program of study includes learning that plants and make their own food, although students will not have used the term photosynthesis Students were introduced to the idea of photosynthesis in year eight when they look at plants as the foundation of the most food chains	YII - Ecology	Students could consider how The optimal conditions for photosynthesis might differ for plants that live in different environments and how this could be achieved biologically Students could link photosynthesis and respiration as part of a wider nutrient cycle

SMSC & British Values	British values in science Plants are fundamental to human existence, forming the basis of food chains which support us. Delicate balance that exists between the existence of plants and animals The effects of exercise on the body, and why it is important that you are regularly physically active
Cultural Capital	The correct meaning of the term metabolism which is often misused in popular culture Leading healthy lifestyles – how easy is this to achieve for all global communities?
Career Link	https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html More information here.

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Eight	Atoms and radiation	The development of the atom Alpha, Beta and Gamma radiation; how these alter the nucleus and the properties of these types of radiation Activity and half life	Practical Skills: • Modelling half-life (skittles or breadsticks) Scientific Skills: Record accurate experimental data Present and interpret data in tabular and graphical form. Extended writing Calculating the gradient of a graph	That Alpha radiation does not cause damage to cells. That gamma decay affects changes in the nucleus.	This will be the first-time students have studied radiation, but the history of the atom as studied in Year 9 chemistry builds up into this unit.	The standard model and interaction between subatomic particles are studied in the first year of A- Level Physics	Construction of decay equations. Calculation of half-life using standard form	
SMSC & British Values	British values in science The impact of radiation and how we can stay safe while using it. The ethics of nuclear power							

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Cultural Capital

The use of radioactivity and nuclear power globally; including the approach of the UK and other nations Links to current energy crisis

Career Link

https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html

	More information here.											
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Nine	Energy changes in chemical reactions	Endothermic and Exothermic Reactions Reaction pathways Bond Energy and bond energy calculations	Practical Skills: Investigate endo and exothermic reactions Scientific Skills: Interpreting data presented in both graphical and tabular form. Using laboratory equipment and glassware Recording accurate data Calculating a mean Changing the subject of an equation Using data to evaluate and compare	Mislabelling of the activation energy and overall energy change on reaction profile diagrams. Students often miscalculate bond energies by doing products - reactants rather than reactants - products	This unit builds directly from the energetics unit, studied in year 8; extending students prior knowledge of endothermic and exothermic reactions to explore why this is the case	Students at A-Level will study energetics in more detail, looking calorimetry, Hess' Law and more complex enthalpy calculations	Students may be challenged to find a missing bond enthalpy if given the overall energy change for a reaction.					
SMSC & British Values		British values in science Mathematical problems can be put into real world contexts to explore a variety of concepts and scenarios										
Cultural Capital	Mathematical problems can be put into real world contexts to explore a variety of concepts and scenarios											
Career Link	https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html More information here.											
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Ten	Forces and their	Scalar and vector	Practical Skills:	Students often state that an object will be still if there is no	This unit builds directly from the study of forces	Forces and mechanics forms a unit at A-	Resolving forces in situations where they					

	interactions	Vector diagrams Contact and non-contact forces Gravity Resultant forces Work done and energy transfer Forces and elasticity	Investigate relationship between force and extension of a spring Scientific Skills: Changing the subject of simple equations with three terms. Simple multiplication and division Record accurate results in an appropriate format Present and interpret data in tabular and graphical form. Calculate the gradient of a line	force acting upon it, so it is important to stress that if it is moving it will remain moving.	and motion at key stage three; extending students' knowledge to look at more quantitative analysis and the affect of forces in more complex	Level, where the same concepts will be covered in more depth	are not parallel or perpendicular		
SMSC & British Values	British values in science Working safely in a lab and respecting each other's workspace								
Cultural Capital	The ubiquity of forces means that problems can be framed in a variety of familiar and unfamiliar contexts								
Career Link	https://www.bbc.co.uk/bitesize/tags/zjb8f4j/jobs-that-use-science/1, https://www.bradfordacademy.co.uk/wp-content/uploads/2019/10/CEIAG-in-the-Curriculum-Science.pdf, https://www.pearson.com/uk/educators/schools/subject-area/science/why-science-matters/your-future-in-stem-a-z.html More information here.								