
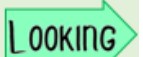



## Year 8 Topics

In year 7 we teach the following modules over the course of the year. Each module draws on prior learning from KS2 and builds on understanding from the KS2 programme of study. Each module develops and deepens the Core knowledge that will underpin all areas of the curriculum at KS3 and KS4.

Topic Introduction to science	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> L ADDERING <i>...that (Declarative) ... how to (Procedural)</i>	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
<p>This unit introduces students to general science practices – safety, variables, equipment etc. This ensures that all students have the same level of knowledge.</p>	<p> Linking</p> <p>KS2 Simple experiments may have been carried out during KS2. Some emphasis may have been placed on variables.</p> <p> Looking</p> <p>Practical skills will continue to develop across the year groups/key stages</p>	<p><u>Safety in the lab</u> <i>...that</i> science classrooms are very different from 'normal' classrooms <i>... how to</i> identify hazards in a science lesson</p> <p><u>Variables</u> <i>...that</i> there are many variables in an experiment <i>... how to</i> identify variables in an unknown experiment</p> <p><u>Risk assessments</u> <i>...that</i> experiments have risks associated with them <i>... how to</i> reduce risks during experiments</p> <p><u>Reacting different metals with an acid investigation</u> <i>... how to</i> identify risks in an experiment <i>... how to</i> safely gather experimental data <i>... how to</i> display experimental data</p> <p><u>Investigating the effect of concentration on rate of reaction</u> <i>... how to</i> identify risks in an experiment <i>... how to</i> safely gather experimental data <i>... how to</i> display experimental data</p>	<p>Hazard, Risk, Laboratory, Risk Assessment</p> <p>Independent Variable, Dependant Variable, Control Variable, Fair Test</p> <p>Hazard, Risk, Control, Risk Assessment</p> <p>Independent Variable, Dependant Variable, Control Variable, Fair Test, Safety glasses, Tripod, Bunsen burner, Beaker, Thermometer, Tripod</p> <p>Independent Variable, Dependant Variable, Control Variable, Fair Test</p>	<p>a) <b>Numeracy</b> Reading scales Taking measurements Graph drawing skills</p> <p>b) <b>Literacy</b> Keywords explicitly taught where necessary and shared on KG slide</p> <p>c) <b>Reading</b> Reading practical instructions</p> <p>d) <b>Cultural Capital/Careers</b> Any science career will require knowledge of these basic science skills</p> <p>e) <b>Cross curricular knowledge links</b> Health and safety links in multiple subjects e.g. technology</p> <p>f) <b>Misconceptions</b> <i>Bar charts do not need gaps</i> – INCORRECT the DO require gaps between bars, histograms do not.</p>


## Science Topics

In year 8 we teach the following modules over the course of the year. Each module draws on prior learning from **KS2** and builds on understanding from the **KS2** programme of study. Each module develops and deepens the Core knowledge that will underpin all areas of the curriculum at **KS3** and **KS4**.

Topic Periodic Table and Elements	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> <i>...that (Declarative) ....</i> <i>how to (Procedural)</i> L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
<p>The modern periodic table has changed since Mendeleev's original table, yet both the first tables and the modern table are important for the same reason:</p> <p>The periodic table organizes elements according to similar properties so you can tell the characteristics of an element just by looking at its position on the table.</p>	<p><b>KS2</b> <b>Materials</b> describe the simple physical properties of a variety of everyday materials; find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching.</p>  <p><b>KS4</b> PAPER 1: Atomic structure and the periodic table;</p> <p>PAPER 1: Quantitative chemistry</p> <p>PAPER 1: Bonding, structure, and the properties of matter</p>	<ol style="list-style-type: none"> <li>1. Elements and atomic number</li> <li>2. Atomic number and mass number</li> <li>3. Electronic Configuration</li> <li>4. Periodic Table</li> <li>5. Group 1 elements reactivity</li> <li>6. Group 7 elements reactivity</li> </ol>	<p>Atoms, periodic table, Proton, Neutron, Electron, orbital, nucleus,</p> <p>Proton, Neutron, Electron, orbital, nucleus, atomic number, mass number</p> <p>Proton, Neutron, Electron, orbital, nucleus, atomic number, mass number</p> <p>Element, Group, Period, Mass Number, Atomic Number, Metal, Non-metal</p> <p>Lithium, Sodium, Potassium, Rubidium, Caesium, reactivity, alkali, hydrogen</p> <p>Halogen, reactivity, displacement, Fluorine, Chlorine, Bromine, Iodine, Astatine</p>	<p>a) <b>Numeracy</b></p> <ul style="list-style-type: none"> <li>• Calculating number of protons, electrons, and neutrons.</li> <li>• Electronic configuration diagrams</li> </ul> <p>b) <b>Literacy</b></p> <ul style="list-style-type: none"> <li>• Spelling practice of keywords on literacy HWK</li> <li>• Keywords explicitly taught where necessary and shared on knowledge goal slide</li> </ul> <p>c) <b>Reading</b></p> <ul style="list-style-type: none"> <li>• Introduction to topic task</li> <li>• Read like a scientist HWK on how Mendeleev constructed the periodic table.</li> </ul> <p>d) <b>Cultural Capital/Careers</b></p> <ul style="list-style-type: none"> <li>• Introduction lesson to topic linked careers in chemical technician and Pharmacologist.</li> </ul> <p>e) <b>Cross curricular knowledge links</b></p> <ul style="list-style-type: none"> <li>• Maths – calculations</li> </ul> <p>f) <b>Misconceptions</b> XXXX</p>


## Science Topics

In year 8 we teach the following modules over the course of the year. Each module draws on prior learning from **KS2** and builds on understanding from the **KS2** programme of study. Each module develops and deepens the Core knowledge that will underpin all areas of the curriculum at **KS3** and **KS4**.

Topic <b>Chemical reactions</b>	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know...</i> <i>...that (Declarative)</i> <i>... how to (Procedural)</i> <b>L ADDERING</b>	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
<p>Most substances are not pure elements, but compounds or mixtures containing atoms of different elements. They have different properties to the elements they contain.</p> <p>Use particle diagrams to classify a substance as an element, mixture or compound and as molecules or atoms. Name simple compounds using rules: change non-metal to –ide; mono, di, tri prefixes; and symbols of hydroxide, nitrate, sulfate and carbonate</p> <p>Combustion is a reaction with oxygen in which energy is transferred to the surroundings as heat and light. Chemical changes can be described by a model where atoms and molecules in reactants rearrange to make the products and the total number of atoms is conserved.</p>	<p><b>KS2</b> <b>Materials</b> explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.</p>  <p><b>KS4</b> PAPER 1: Bonding, structure, and the properties of matter  PAPER 1: Chemical changes  PAPER 1: Energy changes</p>	<p>1. Chemical reactions and physical change</p> <p>2. Compounds and mixtures</p> <p>3. Naming chemical compounds</p> <p>4. Fire Triangle</p> <p>5. Combustion</p> <p>6. Reactivity series and displacement reactions</p>	<p>Chemical reaction, physical change, new product, change state, solid, liquid, gas</p> <p>Element, compound, mixture, chemical bond, molecules,</p> <p>chloride, sulphate, nitrate, hydrogen, chemical reaction</p> <p>Heat, fuel, oxygen, burning, combustion, extinguish</p> <p>Heat, fuel, oxygen, burning, combustion, compounds, reactants, products,</p> <p>Reactivity, displacement, reactive, chemical reactions, reactants, products</p>	<p>a) <b><u>Numeracy</u></b></p> <ul style="list-style-type: none"> <li>Recording data</li> <li>Balancing equations</li> </ul> <p>b) <b><u>Literacy</u></b></p> <ul style="list-style-type: none"> <li>Spelling practice of keywords on literacy HWK</li> <li>Keywords explicitly taught where necessary and shared on knowledge goal slide</li> </ul> <p>c) <b><u>Reading</u></b></p> <ul style="list-style-type: none"> <li>Introduction to topic task</li> </ul> <p>d) <b><u>Cultural Capital/Careers</u></b></p> <ul style="list-style-type: none"> <li>Introduction lesson to topic linked careers in pyrotechnic engineer and a biochemist.</li> </ul> <p>e) <b><u>Cross curricular knowledge links</u></b></p> <ul style="list-style-type: none"> <li>Maths – balancing equations</li> </ul> <p>f) <b><u>Misconceptions</u></b> Students often have difficulty distinguishing between physical and chemical changes. It is important to emphasize to students that chemical changes result in new substances being formed that are likely to have different properties from the substances that existed before the reaction took place</p>



## Science Topics

In year 8 we teach the following modules over the course of the year. Each module draws on prior learning from **KS2** and builds on understanding from the **KS2** programme of study. Each module develops and deepens the Core knowledge that will underpin all areas of the curriculum at **KS3** and **KS4**.

Topic	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> <i>...that (Declarative) .... how to (Procedural)</i> L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
Digestive system				
<p>In this section we will learn about the human digestive system which provides the body with nutrients.</p> <p>Students need to be able to recognise the importance of each nutrient in the body and plan a healthy diet.</p>	<p><b>KS2</b> <b>Animals Including Humans</b> identify, name, draw and label the basic parts of the human body and say which part of the body is associated with each sense.</p> <p>identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat; describe the simple functions of the basic parts of the digestive system in humans;</p> <div style="text-align: center;">  </div> <p>KS4 YR10: Paper 1 Organisation – Digestion and enzymes</p>	<p><b>1. <u>Balanced Diet</u></b> ..that a balanced diet consists of 7 components ..that each component has its own role in keeping the body healthy</p>	Balanced, unbalanced, protein, carbohydrates, fats, vitamins, minerals, water, fibre.	<p>a) <b><u>Numeracy</u></b></p> <ul style="list-style-type: none"> <li>recording data</li> <li>presenting data in tables and graphs</li> <li>making conclusions from data</li> </ul> <p>b) <b><u>Literacy</u></b></p> <ul style="list-style-type: none"> <li>Spelling practice of keywords on literacy HWK</li> <li>Keywords explicitly taught where necessary and shared on knowledge goal slide</li> </ul> <p>c) <b><u>Reading</u></b></p> <ul style="list-style-type: none"> <li>Introduction to topic task</li> <li>Read like a scientist HWK on how scientists discovered digestive enzymes.</li> </ul> <p>d) <b><u>Cultural Capital/Careers</u></b></p> <ul style="list-style-type: none"> <li>Introduction lesson to topic linked careers in food scientist and dietician.</li> </ul> <p>e) <b><u>Cross curricular knowledge links</u></b></p> <ul style="list-style-type: none"> <li>Maths – graphs</li> <li>Food technology – balanced diet</li> <li>Citizenship – healthy eating</li> </ul> <p>f) <b><u>Misconceptions</u></b></p> <ul style="list-style-type: none"> <li>Digestion only takes place, or begins, in the stomach. This is incorrect, digestion begins in the mouth and continues to the small intestine.</li> <li>Digestion is the process which releases usable energy from food. This is incorrect - digestion allows the breakdown and absorption of food molecules. respiration uses the glucose absorbed to release usable energy for cells.</li> </ul>
		<p><b>2. <u>Food labels and energy</u></b> ..that different people need different amounts of energy ..how to read food labels correctly</p>	Energy, Calories, Kilojoules, malnourished, starvation, obesity	
		<p><b>3. <u>Food tests</u></b> ..how to test food to find out what they contain</p>	Benedict's, Biuret, iodine, emulsion, qualitative	
		<p><b>4. <u>Deficiency diseases</u></b> ..that if we don't have balanced diet, it can lead a various deficiency diseases</p>	Scurvy, beri beri, kwashiorkor, anaemia,	
		<p><b>5. <u>The digestive system</u></b> ..that the digestive system is made of different organs which work together to allow the breakdown and absorption of food.</p>	Digestion, mouth, stomach, small intestine, large intestine, oesophagus, mechanical, chemical.	
		<p><b>6. <u>Digestive enzymes</u></b> ..that enzymes are important as they speed up the breakdown of our food</p>	Enzyme, substrate, Protease, lipase, amylase, salivary gland, pancreas,	
		<p><b>7. <u>Casein Trypsin</u></b> ..that temperature can affect the rate of digestion ..how to investigate the effect of temperature on the rate of digestion</p>	Casein, Trypsin, Enzyme, substrate, rate, variables,	



## Science Topics

In year 8 we teach the following modules over the course of the year. Each module draws on prior learning from **KS2** and builds on understanding from the **KS2** programme of study. Each module develops and deepens the Core knowledge that will underpin all areas of the curriculum at **KS3** and **KS4**.

Topic CONTACT FORCES	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know...</i> ...that (Declarative) ... how to (Procedural) <b>LADDERING</b>	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
<p>When the resultant force on an object is zero, it is in equilibrium and does not move, or remains at constant speed in a straight line. One effect of a force is to change an object's form, causing it to be stretched or compressed. In some materials, the change is proportional to the force applied.</p> <p>Pressure acts in a fluid in all directions. It increases with depth due to the increased weight of fluid, and results in an upthrust. Objects sink or float depending on whether the weight of the object is bigger or smaller than the upthrust.</p> <p>Different stresses on a solid object can be used to explain observations where objects scratch, sink into or break surfaces.</p>	<p> <b>LINKING</b></p> <p>KS2 : <b>FORCES</b> compare how things move on different surfaces; notice that some forces need contact between 2 objects, but magnetic forces can act at a distance;</p> <p>identify the effects of air resistance, water resistance and friction, that act between moving surfaces;</p> <p> <b>LOOKING</b></p> <p>KS4 GCSE Physics Paper 2 Forces</p>	<ol style="list-style-type: none"> <li>1. <b>Type of forces</b> ... that all forces have an opposite force ... that forces are measured in Newtons using a newton meter.</li> <li>2. <b>Balanced and unbalanced forces</b> ... that forces are balanced when opposite forces are equal ... that forces are unbalanced when opposite forces are not equal</li> <li>3. <b>Resultant Forces</b> ... how to draw and interpret force diagrams ... how to calculate resultant force</li> <li>4. <b>Friction</b> ...that friction is the force opposing motion, caused by the interaction of surfaces moving over one another. ... that depending on the situation, friction can be beneficial or problematic.</li> <li>5. <b>Investigating friction</b> ... how to investigate the effect of different surfaces on friction</li> <li>6. <b>Air resistance and drag</b> ...that air resistance or drag is friction which occurs between a solid and a fluid (liquid/gas)</li> <li>7. <b>Stretching and Drag</b> ...that compression is a force involving the squashing or pushing together of two objects.</li> <li>8. <b>Calculating Pressure</b> ... how to calculate pressure ... that pressure is ratio of force to surface area. ... that pressure is measured in <math>N/m^2</math></li> <li>9. <b>Pressure in liquids and gases</b> ... that pressure changes with depth in liquids ... that atmospheric pressure is the pressure caused by the weight of the air above a surface.</li> </ol>	<p>Contact force, non-contact force, Newton, Newton meter</p> <p>Newtons, resultant force, equilibrium, balanced, unbalance</p> <p>Newtons, resultant force, equilibrium, balanced, unbalance</p> <p>Friction, Newton, resultant force, equilibrium</p> <p>Friction, Newton, resultant force, equilibrium</p> <p>Friction, Newton, resultant force, equilibrium, aerodynamic.</p> <p>deformation, tension,, Newton, resultant force, equilibrium</p> <p>Pressure, surface area, Force, Mass, N, <math>m^2</math>, <math>N/m^2</math></p> <p>Pressure, depth, liquids, weight, upthrust, atmospheric pressure</p>	<p>a) <b>Numeracy</b></p> <ul style="list-style-type: none"> <li>• recording data</li> <li>• Calculating resultant forces</li> <li>• Measuring newtons</li> <li>• Line graph skills</li> </ul> <p>b) <b>Literacy</b></p> <ul style="list-style-type: none"> <li>• Spelling practice of keywords on literacy HWK</li> <li>• Keywords explicitly taught where necessary and shared on knowledge goal slide</li> </ul> <p>c) <b>Reading</b></p> <ul style="list-style-type: none"> <li>• Introduction to topic task</li> <li>• Read like a scientist HWK on Isaac Newton</li> </ul> <p>d) <b>Cultural Capital/Careers</b></p> <ul style="list-style-type: none"> <li>• Introduction lesson to topic linked careers in plumber and civil engineer.</li> </ul> <p>e) <b>Cross curricular knowledge links</b></p> <ul style="list-style-type: none"> <li>• Maths – graphs</li> </ul> <p>f) <b>Misconceptions</b></p> <ul style="list-style-type: none"> <li>• If objects are moving, forces are always unbalanced. This is incorrect - forces are balanced if the object is moving at a constant speed.</li> </ul>


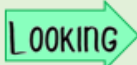
## Science Topics

In year 8 we teach the following modules over the course of the year. Each module draws on prior learning from **KS2** and builds on understanding from the **KS2** programme of study. Each module develops and deepens the Core knowledge that will underpin all areas of the curriculum at **KS3** and **KS4**.

Topic <b>Evolution</b>	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know...</i> <i>...that (Declarative) ... how to (Procedural)</i> L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
<p>Natural selection is a theory that explains how species evolve and why extinction occurs.</p> <p>Biodiversity is vital to maintaining populations. Within a species variation helps against environment changes, avoiding extinction. Within an ecosystem, having many different species ensures resources are available for other populations, like humans.</p>	<p> <b>LINKING</b></p> <p><b>Evolution and Inheritance</b></p> <ul style="list-style-type: none"> <li>recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago;</li> <li>identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.</li> </ul> <p> <b>LOOKING</b></p> <p><b>KS4</b> YR10: Paper 2 Inheritance and evolution</p>	<p><b>1. Evolution</b> <i>...that</i> evolution is the gradual change of a species over time to better suit their environment</p> <p><b>2. Natural selection</b> <i>...that</i> evolution is the gradual change of a species over time to better suit their environment <i>...that</i> evolution occurs due to the natural selection</p> <p><b>3. Evidence of evolution</b> <i>...that</i> fossils are the remains of organisms from millions of years ago. <i>...that</i> fossil can be formed in many ways</p> <p><b>4. Fossil record</b> <i>...that</i> fossil record shows how a species has changed over time.</p> <p><b>5. Extinction</b> <i>...that</i> extinction is the permanent loss of species <i>...that</i> extinction can be caused by lots of different things.</p>	<p>Evolution, species, adaptation, environment, offspring</p> <p>Evolution, species, mutation, environment, offspring, survival, breeding,</p> <p>Evolution, Fossil, Decay, Evidence, remains,</p> <p>Evolution, Fossil, Decay, Evidence, remains, transition species</p> <p>Extinction, species, biodiversity,</p>	<p>a) <b>Numeracy</b></p> <ul style="list-style-type: none"> <li>Timeline task</li> </ul> <p>b) <b>Literacy</b></p> <ul style="list-style-type: none"> <li>Spelling practice of keywords on literacy HWK</li> <li>Keywords explicitly taught where necessary and shared on knowledge goal slide</li> </ul> <p>c) <b>Reading</b></p> <ul style="list-style-type: none"> <li>Introduction to topic task</li> <li>Read like a scientist HWK on Charles Darwin</li> </ul> <p>d) <b>Cultural Capital/Careers</b></p> <ul style="list-style-type: none"> <li>Introduction lesson to topic linked careers in Archaeologist and Museum Curator</li> </ul> <p>e) <b>Cross curricular knowledge links</b></p> <ul style="list-style-type: none"> <li>History – fossils and evidence for life from the past</li> </ul> <p>f) <b>Misconceptions</b></p> <ul style="list-style-type: none"> <li>Organisms can ADAPT to their environment to survive. This is incorrect adapting to their environment is evolution, adaptation is a SPECIAL FEATURE the animal has which helps it survive.</li> </ul>

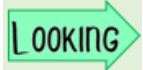
## Science Topics

In year 8 we teach the following modules over the course of the year. Each module draws on prior learning from **KS2** and builds on understanding from the **KS2** programme of study. Each module develops and deepens the Core knowledge that will underpin all areas of the curriculum at **KS3** and **KS4**.

Topic Chemical change	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know...</i> <i>...that (Declarative) .... how to (Procedural)</i> L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
<p>Energy is conserved in chemical reactions, so the total amount of energy in the universe at the end of a reaction is the same as it was before the reaction.</p> <p>When a chemical reaction happens, energy is transferred either to or from the surroundings.</p> <p>This pair of extremes allows us to utilise a specific type of reaction for a particular purpose.</p>	<p></p> <p>KS2 <b>Materials</b> identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses;</p> <p>explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.</p> <p></p> <p>KS4 PAPER 1: Chemical changes Energy changes</p>	<p><b>1. Endothermic and Exothermic reactions</b> <i>...that</i> processes which release energy to their surroundings are called exothermic reactions <i>...that</i> processes which take in energy from their surroundings are called endothermic reactions</p> <p><b>2. Endothermic and exothermic carousel</b> <i>...how to</i> identify exothermic and endothermic change</p> <p><b>3. Understanding energy change graphs</b> <i>...that</i> energy change graphs can be used to represent the energy changes which take place in a chemical reaction.</p> <p><b>4. Conservation of mass</b> <i>...that</i> the mass at the start of a reaction is always present at the end of a reaction.</p> <p><b>5. Different materials</b> <i>...that</i> the mass at the start of a process is always present at the end of a reaction.</p>	<p>Exothermic, endothermic, reactant, product, heat, energy, released, absorbed, surroundings</p> <p>Exothermic, endothermic, reactant, product, heat, energy, temperature, change, results</p> <p>Exothermic, endothermic, reactant, product, heat, energy, released, absorbed, surroundings, profile, break, make</p> <p>Mass, increase, decrease, electronic balance, reactant, product, element, compound, mixture, reaction, exothermic, endothermic</p> <p>Composite, matrix, fibre, property, physical, malleable, flexible, waterproof, conductor, insulator, sonorous, brittle, flammable, Thermosetting,</p>	<p>a) <b>Numeracy</b></p> <ul style="list-style-type: none"> <li>recording data</li> <li>presenting data in tables and graphs</li> <li>making conclusions from data</li> </ul> <p>b) <b>Literacy</b></p> <ul style="list-style-type: none"> <li>Spelling practice of keywords on literacy HWK</li> <li>Keywords explicitly taught where necessary and shared on knowledge goal slide</li> </ul> <p>c) <b>Reading</b></p> <ul style="list-style-type: none"> <li>Introduction to topic task</li> <li>Read like a scientist HWK on endothermic and exothermic reactions.</li> </ul> <p>d) <b>Cultural Capital/Careers</b></p> <ul style="list-style-type: none"> <li>Introduction lesson to topic linked careers in Chemical Engineer and Heating and ventilation engineer</li> </ul> <p>e) <b>Cross curricular knowledge links</b></p> <ul style="list-style-type: none"> <li>Maths – graphs and calculations</li> </ul> <p>f) <b>Misconceptions</b></p> <ul style="list-style-type: none"> <li>Make it clear that enthalpy refers to heat energy</li> <li>Refer to exothermic and endothermic as a process rather than a reaction</li> </ul>



## Science Topics

In year 8 we teach the following modules over the course of the year. Each module draws on prior learning from **KS2** and builds on understanding from the **KS2** programme of study. Each module develops and deepens the Core knowledge that will underpin all areas of the curriculum at **KS3** and **KS4**.

Topic Breathing, respiration and movement	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> <i>...that (Declarative)</i> <i>.... how to (Procedural)</i> <b>LADDERING</b>	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
<p>To understand how structure of the lungs carry out efficient gas exchange.</p> <p>To understand how energy is released from our food ready to be used for biochemical processes</p> <p>To understand how we move.</p>	<p><b>KS2</b> <b>Animals Including Humans</b></p> <p>describe the importance for humans of exercise, eating the right amounts of different types of food, and hygiene.</p> <p>identify that humans and some other animals have skeletons and muscles for support, protection and movement.</p> <p>identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood;</p> <p>recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function</p> <p>describe the ways in which nutrients and water are transported within animals, including humans.</p> <p></p> <p>KS4 PAPER 1: Organisation PAPER 1: Bioenergetics</p>	<p><b>1. Aerobic respiration</b> <i>... that</i> aerobic respiration is chemical reaction between oxygen and glucose to release energy <i>... that</i> the body has specialised systems to deliver the reactants to cells and remove the waste products</p> <p><b>2. The breathing system</b> <i>... that</i> the breathing system consists of many different organs working together <i>... that</i> the alveoli are specialised to maximise diffusion of oxygen into the lungs</p> <p><b>3. Circulatory System</b> <i>... that</i> the circulatory system is a double pump system <i>... that</i> the heart has 4 chambers and each has a different blood vessel attached.</p> <p><b>4. Effects of exercise on the body</b> <i>... that</i> breathing rate and heart rate change during exercise <i>.... how to</i> measure pulse rate to observe these changes</p> <p><b>5. Anaerobic respiration</b> <i>... that</i> anaerobic respiration is chemical reaction which involves the breakdown of glucose without oxygen to release energy</p> <p><b>6. Skeletal system</b> <i>... that</i> the bones can have common and scientific names <i>... that</i> the skeleton system has 4 important roles</p> <p><b>7. Movement: joints and muscles</b> <i>... that</i> joints and muscles are needed to help the body move.</p> <p><b>8. Factors that can affect health</b></p>	<p>Oxygen, glucose, respiration, chemical reaction, carbon dioxide, water, energy,</p> <p>Mouth, trachea, bronchus, bronchioles, alveoli, diaphragm, breathing.</p> <p>Atria, Ventricle, Arteries, Veins, capillaries, blood</p> <p>Exercise, heart rate, pulse, breathing rate,</p> <p>Oxygen, glucose, respiration, chemical reaction, lactic acid, oxygen debt.</p> <p>Bone marrow, skeleton, bones, support, movement</p> <p>Antagonistic muscle pair, joints, muscles, ligaments, tendons, cartilage,</p> <p><b>NEW LESSON ON SMOKING, VAPING, ALCOHOL, OBESITY, DRUGS</b></p>	<p>a) <b>Numeracy</b></p> <ul style="list-style-type: none"> <li>Measuring pulse rate and calculating difference.</li> <li>Interpreting graphs showing breathing rates</li> </ul> <p>b) <b>Literacy</b></p> <ul style="list-style-type: none"> <li>Spelling practice of keywords on literacy HWK</li> <li>Keywords explicitly taught where necessary and shared on knowledge goal slide</li> </ul> <p>c) <b>Reading</b></p> <ul style="list-style-type: none"> <li>Introduction to topic task</li> <li>Read like a scientist HWK on circulatory system</li> </ul> <p>d) <b>Cultural Capital/Careers</b></p> <ul style="list-style-type: none"> <li>Introduction lesson to topic linked careers in personal training and doctor</li> </ul> <p>e) <b>Cross curricular knowledge links</b></p> <ul style="list-style-type: none"> <li>Maths – calculations</li> </ul> <p>f) <b>Misconceptions</b></p> <p>Respiration is the same as breathing. This is incorrect: breathing is the use of muscles to change lung volume and therefore pressure to draw air into the lungs. Respiration is a chemical reaction which occurs in all cells to released energy stored in glucose.</p>


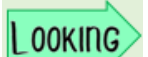
## Science Topics

In year 8 we teach the following modules over the course of the year. Each module draws on prior learning from **KS2** and builds on understanding from the **KS2** programme of study. Each module develops and deepens the Core knowledge that will underpin all areas of the curriculum at **KS3** and **KS4**.

Topic Waves	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> ...that (Declarative) ... how to (Procedural) LADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
<p>When a wave travels through a substance, particles move to and fro.</p> <p>Energy is transferred in the direction of movement of the wave.</p> <p>Waves of higher amplitude or higher frequency transfer more energy.</p> <p>A physical model of a transverse wave demonstrates it moves from place to place, while the material it travels through does not, describes the properties of speed, wavelength and reflection.</p>	<p> <b>Linking</b></p> <p><b>KS2</b> <b>LIGHT</b> use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye; explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes;</p> <p><b>SOUND</b> identify how sounds are made, associating some of them with something vibrating; recognise that vibrations from sounds travel through a medium to the ear;</p> <p> <b>Looking</b></p> <p><b>KS4</b> Year 9 Biology paper 1 – Bioenergetics photosynthesis</p>	<p><b>1. Types of waves</b> ...that a wave is an oscillation (or vibration) that transfers energy. ...that energy is transferred in the direction of movement of the wave.</p> <p><b>2. Measuring Waves</b> ...that amplitude is the height of the wave from rest ...that wavelength is the distance from peak to peak ...how to calculate the speed of a wave</p> <p><b>3. Transverse waves</b> ...that in transverse wave the oscillations move up and down, perpendicular to the direction of the wave.</p> <p><b>4. EM spectrum</b> ...that EM spectrum consist of different types of waves arrange from longest to shortest wavelength. ...that the shorter the wavelength the more energy in the wave and therefore more dangers</p> <p><b>5. Longitudinal waves</b> ...that in longitudinal waves the oscillations move left and right, parallel to the direction of the wave.</p> <p><b>6. Ultrasound waves</b> ...that ultrasounds are sound waves with a frequency above 50,000 Hz ...that ultrasounds have many uses.</p>	<p>Vibrations, transfer, energy, oscillations, longitudinal, transverse</p> <p>Oscillations, perpendicular, direction, peak, trough, amplitude, wavelength,</p> <p>Oscillations, perpendicular, direction, peak, trough, amplitude, wavelength,</p> <p>Wavelength, frequency, electromagnetic, visible, radio waves, microwaves, Infra-red, ultra violet, X ray, Gamma rays</p> <p>Oscillations, parallel, direction, longitudinal, sound,</p> <p>Transmission, reflection, Absorption, Ultra sound,</p>	<p><b>a) Numeracy</b></p> <ul style="list-style-type: none"> <li>Wave speed calculations</li> <li>presenting data in tables and graphs</li> <li>making conclusions from data</li> </ul> <p><b>b) Literacy</b></p> <ul style="list-style-type: none"> <li>Spelling practice of keywords on literacy HWK</li> <li>Keywords explicitly taught where necessary and shared on knowledge goal slide</li> </ul> <p><b>c) Reading</b></p> <ul style="list-style-type: none"> <li>Introduction to topic task</li> </ul> <p><b>d) Cultural Capital/Careers</b></p> <ul style="list-style-type: none"> <li>Introduction lesson to topic linked careers in radiographer and wind turbine technician</li> </ul> <p><b>e) Cross curricular knowledge links</b></p> <ul style="list-style-type: none"> <li>Maths – calculations, rearranging formula, units of measurement.</li> </ul> <p><b>f) Misconceptions</b> All waves need particles. This is incorrect, transverse waves do not require particle hence why light can travel through space.</p>



## Science Topics

In year 8 we teach the following modules over the course of the year. Each module draws on prior learning from **KS2** and builds on understanding from the **KS2** programme of study. Each module develops and deepens the Core knowledge that will underpin all areas of the curriculum at **KS3** and **KS4**.

Topic Heating and Cooling	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know...</i> <i>...that (Declarative) ... how to (Procedural)</i> L ADDERING	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
<p>The thermal energy of an object depends upon its mass, temperature and what it's made of.</p> <p>When there is a temperature difference, energy transfers from the hotter to the cooler object.</p> <p>Thermal energy is transferred through different pathways, by particles in conduction and convection, and by radiation.</p>	<p> <b>Linking</b></p> <p>KS2 Plants <b>MATERIALS</b> observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C)</p> <p> <b>Looking</b></p> <p>KS4 Paper 1: Energy</p>	<p><b>1. States of matter, temperature and heat</b> <i>... that</i> temperature and heat are different <i>... that</i> the 3 states of matter have different particle arrangements due to the amount thermal energy they have</p> <p><b>2. Conduction</b> <i>...that</i> conduction is the transfer of thermal energy by the vibration of particles</p> <p><b>3. Convection</b> <i>...that</i> convection is the transfer of thermal energy when particles in a heated fluid rise.</p> <p><b>4. Radiation</b> <i>...that</i> radiation is the transfer of thermal energy as a wave from all hot objects.</p> <p><b>5. Insulation practical</b> <i>...that</i> a thermal insulator is a material that allows heat to travel slowly through it <i>...that</i> a thermal conductor is a material that allows heat to travel quickly through it.</p>	<p>temperature, thermal energy, conduction, solid</p> <p>Thermal conductor, thermal insulator, temperature, thermal energy, conduction, solid</p> <p>Convection, temperature, thermal energy, liquid, gas</p> <p>Radiation, temperature, thermal energy</p> <p>Thermal conductor, thermal insulator, temperature, thermal energy, conduction, convection, radiation</p>	<p>a) <b>Numeracy</b></p> <ul style="list-style-type: none"> <li>recording data</li> <li>making conclusions from data</li> <li>Numeracy HWK</li> </ul> <p>b) <b>Literacy</b></p> <ul style="list-style-type: none"> <li>Spelling practice of keywords on literacy HWK</li> <li>Keywords explicitly taught where necessary and shared on knowledge goal slide</li> </ul> <p>c) <b>Reading</b></p> <ul style="list-style-type: none"> <li>Introduction to topic task</li> </ul> <p>d) <b>Cultural Capital/Careers</b></p> <ul style="list-style-type: none"> <li>Introduction lesson to topic linked careers in HVAC engineers and architect</li> </ul> <p>e) <b>Cross curricular knowledge links</b></p> <ul style="list-style-type: none"> <li>Maths – data handling</li> <li>DT – evaluation of suitable materials</li> </ul> <p>f) <b>Misconceptions</b></p> <ul style="list-style-type: none"> <li>Difference between heat and temperature</li> <li>Heat always rises – this is incorrect, Warm particles tend to rise within a fluid because of density difference within the fluid.... but in conduction direction does not matter... and heat radiation is given out equally in all directions</li> </ul>

## Science Topics

In year 8 we teach the following modules over the course of the year. Each module draws on prior learning from **KS2** and builds on understanding from the **KS2** programme of study. Each module develops and deepens the Core knowledge that will underpin all areas of the curriculum at **KS3** and **KS4**.

Topic <b>Inheritance</b>	Rationale (layering, Why this why now?)	Knowledge goals: <i>You need to know....</i> <i>...that (Declarative) .... how to (Procedural)</i> <b>L ADDERING</b>	Key Tier 3 vocabulary	Core skills and enrichment opportunities.
<p>Inherited characteristics are the result of genetic information, in the form of sections of DNA called genes, being transferred from parents to offspring during reproduction.</p> <p>Chromosomes are long pieces of DNA which contain many genes.</p> <p>Gametes, carrying half the total number of chromosomes of each parent, combine during fertilisation.</p>	<p></p> <p><b>KS2</b> <b>Animals Including Humans</b></p> <ul style="list-style-type: none"> <li>notice that animals, including humans, have offspring which grow into adults;</li> <li>describe the changes as humans develop to old age.</li> </ul> <p><b>Evolution and Inheritance</b></p> <ul style="list-style-type: none"> <li>recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents;</li> </ul> <p></p> <p><b>KS4</b> <b>YR10: Paper 2</b> Inheritance and evolution</p>	<p><b>1. Types of variation</b> <i>...that</i> variation is the differences within a species <i>...that</i> variation is caused by differences in genes or environment</p> <p><b>2. DNA organisation and structure</b> <i>...that</i> DNA is a chemical that our chromosomes are made from <i>...that</i> DNA is the instruction guide to make proteins which control our characteristics</p> <p><b>3. Sex inheritance</b> <i>...that</i> females have XX chromosome and males have XY chromosomes <i>.... how to</i> predict the probability of a mother having a child who is male or female</p> <p><b>4. Patterns of inheritance</b> <i>...that</i> an allele is a different version of the same gene. <i>.... how to</i> predict the probability of a child inheriting a characteristic.</p> <p><b>5. Inherited diseases</b> <i>...that</i> genetic diseases are caused by mutations and cannot be cured <i>.... how to</i> predict the probability of a child inheriting a genetic disease.</p> <p><b>6. Genetic Engineering</b> <i>...that</i> genetic engineering involves the changing of an organisms DNA <i>...that</i> genetic engineering and genetic modification is the same thing</p>	<p>Genetic, environmental, characteristics, variation, species</p> <p>Deoxyribonucleic acid, chromosomes, genes, alleles, nucleus</p> <p>genotype, phenotype, dominant, recessive, punnet square,</p> <p>Alleles, genotype, phenotype, dominant, recessive, punnet square, heterozygous, homozygous</p> <p>Cystic Fibrosis, Polydactyly, heterozygous, homozygous, pedigree tree</p> <p>Genetic modification, Genes, DNA, Enzymes, Characteristics, Plasmids</p>	<p><b>a) Numeracy</b></p> <ul style="list-style-type: none"> <li>analysis of punnet square outcomes expressed as ratios and/or percentages.</li> </ul> <p><b>b) Literacy</b></p> <ul style="list-style-type: none"> <li>Spelling practice of keywords on literacy HWK</li> <li>Keywords explicitly taught where necessary and shared on knowledge goal slide</li> </ul> <p><b>c) Reading</b></p> <ul style="list-style-type: none"> <li>Introduction to topic task</li> <li>Read like a scientist HWK on Watson and Cricks</li> </ul> <p><b>d) Cultural Capital/Careers</b></p> <ul style="list-style-type: none"> <li>Discover of DNA by Watson and Crick</li> <li>Introduction lesson to topic linked careers in landscape genetic counsellor and a forensic scientist.</li> </ul> <p><b>e) Cross curricular knowledge links</b></p> <ul style="list-style-type: none"> <li>Maths – probability, ratios, percentages</li> </ul> <p><b>f) Misconceptions</b></p> <ul style="list-style-type: none"> <li>All mutations are harmful - This is incorrect. Mutations can lead to changes which help an organism survive.</li> <li>If a parent has a trait/genetic disease their child will always inherit it –This is incorrect as it depends on the parental genotypes.</li> </ul>

