Year: 8
Science Topic: Waves, Sound and Light

	Foundation	Developing	Secure	Mastering	Mastering +
Demonstrating knowledge	• Use scientific ideas when describing waves. • Use slinky spring models to describe longitudinal and transverse waves. • Identify scientific evidence that is being used to support or refute the existence of waves	• Use ideas on wavelength and frequency when describing transverse and longitudinal waves. • Explain waves and answer questions by drawing on abstract ideas or models. • Identify the use of evidence and creative thinking by scientists in the development of ideas on waves	• Use abstract ideas on wavelength and frequency as well as slinky spring models to explain processes or phenomena. • Identify the strengths and weaknesses of these. • Explain how new scientific evidence is discussed and interpreted by the scientific community and how this may lead to changes in scientific ideas	• Make explicit connections between abstract ideas on wavelength and frequency and slinky spring models in explaining processes or phenomena, systematically deciding the importance of each. • Explain the processes by which ideas and evidence are accepted or rejected by the scientific community	• Students show a level of knowledge and understanding which is beyond the expectations of a year >>> student.
Applying and communicating in science	• Select appropriate ways of presenting waves data. • Use terms such as frequency, wavelength and amplitude to communicate about waves. • Use correct units when studying waves.	• Distinguish between opinion and scientific evidence about the nature and behaviour of waves. • Use appropriate units and equations when studying wave properties. • Suggest how collaborative approaches to specific experiments or investigations may improve the evidence collected.	• Choose appropriate diagrams to communicate light waves and wave calculations appropriate to the data. • Distinguish between data and information from primary sources, secondary sources and simulations, and present them in the most appropriate form. • Present data to support hypotheses about the behaviour of waves	• Explain how information or evidence from various sources may been manipulated in order to influence interpretation of wave behaviour. • Effectively represent abstract ideas using appropriate symbols and wave diagrams to present explanations and arguments. • Explain how scientists have collaborated to develop ideas on waves and their behaviour	
Investigative skills	• Select appropriate equipment to investigate reflection and refraction of light. • Make simple ray diagrams when investigating reflection and refraction • Identify possible risks to themselves and others. • Suggest improvements to their working methods, giving reasons	• Recognise significant variables in light investigations, selecting the most suitable to investigate. • Explain why particular pieces of equipment are appropriate to draw ray diagrams of reflection and refraction. • Make, and act on, suggestions to control obvious risks to themselves and others. • Evaluate the effectiveness of their working methods, making practical suggestions for improving them	• Apply scientific knowledge and understanding in the planning of investigations on the behaviour of light, including making predictions. • Justify their method choice and make accurate observations to inform ray diagrams. • Independently recognise a range of familiar risks and take action to control them. • Evaluate the ray diagrams and comment on accuracy	• Formulate hypotheses using information from a range of sources. • Explain how to minimise sources of error when investigating light. • Recognise the need for risk assessments and consult, and act on, appropriate sources of information. • Explain ways of modifying working methods to improve reliability. • Present data on the behaviour of waves to support hypotheses	
Maths skills	• Identify patterns in data. • Draw straightforward conclusions from data and ray diagrams. • Identify scientific evidence they have used in drawing conclusions on waves. • Use simple equations to input data to calculate speed, frequency and wavelength, changing the units where appropriate	• Decide on the most appropriate formats to present sets of scientific data, such as using tables or ray diagrams. • Interpret data from ray diagrams and comment on accuracy. • Provide straightforward explanations for inaccuracies in ray diagrams. • Draw valid conclusions that utilise more than one piece of supporting evidence.	• Suggest reasons based on scientific knowledge and understanding for any limitations or inconsistencies in ray diagrams. • Select and manipulate data and information and use them to contribute to conclusions. • Draw conclusions that are consistent with the evidence they have collected and explain them using scientific knowledge and understanding. • Make valid comments on the quality of their ray diagrams in light investigations • Be able to rearrange equations to calculate wave speed, frequency and wavelength • Present data (their own or a secondary source) using tables and diagrams	• Identify quantitative relationships between variables, using them to inform conclusions and make further predictions on wave behaviour. • Assess the strength of evidence, deciding whether it is sufficient to support a conclusion. • Be able to rearrange equations and input data with various different units when calculating wave speed, frequency and wavelength • Produce ray diagrams and tables using your own data, or from secondary sources	

Year: 8
Science Topic: Periodic table & Innovative materials

	Foundation	Developing	Secure	Mastering	Mastering +
Demonstrating knowledge	• Recognise key areas of the periodic table, namely metals and non-metals, the noble gases and groups 1, 2 and 7. • Give examples of innovative materials and link properties of products to the choice of material.	• Describe how repeating patterns in the elements led to the development of the periodic table. • Stage that groups show trends in how quickly they react. • Compare suitability of materials and give examples of products made from ceramics, polymers, composites and nano-materials.	• Describe trends in reactivity and use it to make predictions about other elements in the group • Explain how scientific evidence led to the development and acceptance of Mendeleev's periodic table • Identify strengths and weaknesses of historical models for the periodic table • Describe reasons for designing new materials and the influence that new materials have had on key products	• Explain the trend in reactivity of Group 1 and Group 7 elements. • Explain how different pieces of evidence supported Mendeleev's predictions for the periodic table • Explain the benefits of innovative materials. • Evaluate the impact of innovative materials on financial cost, health, environmental cost and ethical considerations.	• Students show a level of knowledge and understanding which is beyond the expectations of a year >>> student.
Applying and communicating in science	• Select appropriate ways of presenting scientific data when investigating the properties of materials. • Use appropriate scientific forms of language to communicate scientific ideas. • Use symbols, group numbers and period numbers from the periodic table to describe the position of elements.	• Distinguish between opinion and scientific evidence to support the strength of theories for the development of the periodic table. • Suggest how collaborative approaches to an investigation on the properties of materials may improve the evidence collected.	• Choose forms to communicate qualitative or quantitative data appropriate to the data and the purpose of the communication when describing properties of materials. • Present data to support hypotheses in the investigations of properties of materials.	• Effectively interpret different kinds of graphs to present explanations for the use of innovative materials and natural/synthetic materials. • Explain how Dalton, Newlands and Mendeleev contributed to the development of the periodic table.	
Investigative skills	• Decide when it is appropriate to carry out fair tests in investigations. • Select appropriate equipment to address specific questions under investigation. • Make sets of observations or measurements, identifying the ranges and intervals used. • Identify possible risks to themselves and others. • Suggest improvements to their working methods, giving reasons	• Recognise significant variables in investigations, selecting the most suitable to investigate. • Explain why particular pieces of equipment are appropriate for the question under investigation. • Repeat sets of observations or measurements in case of error, selecting suitable ranges and intervals. • Make, and act on, suggestions to control obvious risks to themselves and others. • Evaluate the effectiveness of their working methods, making practical suggestions for improving them	• Apply scientific knowledge and understanding in the planning of an investigation and making predictions, identifying significant variables, including independent, dependent and control variables. • Justify their method choice and number of observations/measurements. Collect data, choosing appropriate ranges, numbers and values for measurements and observations. • Independently recognise a range of familiar risks and take action to control them. • Evaluate data to identify sources of error	• Formulate a hypothesis using ideas based on the properties and uses of materials. • Explaining why some variables cannot readily be controlled and planning appropriate approaches to investigations to take account of this. • Explain how to take account of sources of error in order to collect reliable data. • Recognise the need for risk assessments and consult, and act on, appropriate sources of information. • Explain ways of modifying working methods to improve reliability. • Present data to support a hypothesis	
Maths skills	• Identify patterns in data presented in tables and line graphs. • Draw straightforward conclusions from data. • Identify scientific evidence they have used in drawing conclusions. •	• Decide on the most appropriate formats to present sets of scientific data, such as using line graphs for continuous variables. • Interpret data in a variety of formats, recognising obvious inconsistencies and anomalies. • Provide straightforward explanations for differences in repeated observations or measurements.	• Suggest reasons based on scientific knowledge and understanding for any limitations or inconsistencies in evidence collected. • Select and manipulate data and information and use them to contribute to conclusions. • Draw conclusions that are consistent with the evidence they have collected and explain them using scientific knowledge and understanding. • Make valid comments on the quality of their data. • Present data using results tables and graphs.	• Identify quantitative relationships between variables, using them to inform conclusions and make further predictions. • Assess the strength of evidence, deciding whether it is sufficient to support a conclusion. • Produce graphs and tables using your own data and compare the reproducibility of it using others' results.	

Science Topic: Y8 Variation, Classification and Inheritance

	Acquiring	Developing	Securing	Mastering	Mastering +
Demonstrating knowledge	• Recognise terms related to, classification and inheritance • Represent the topic using simple physical models • Use evidence/knowledge of variation, classification and inheritance and food to answer questions or to support findings	• Use key features correctly when describing the classification of organisms • Represent the topics using simple physical models • Find and use evidence/knowledge of variation, classification and inheritance to answer questions or to support findings	• Use abstract ideas or detailed models when describing variation, classification and inheritance • Explain these topics and suggest solutions to problems by drawing on scientific ideas or models • Recognise questions relating to the topic that do not yet have definitive answers	• Use abstract ideas, models or multiple factors when explaining variation, classification and inheritance • Identify the strengths and weaknesses of models of classification and inheritance • Describe some scientific evidence that supports or refutes particular ideas or arguments relating to the topic	• Students show a level of knowledge and understanding which is beyond the expectations of a year >>> student.
Applying and communicating in science	• Use scientific terms related to variation and inheritance when communicating • Identify simple advantages of working together on investigations • Suggest improvements to their working methods • Identify some things relating to variation and inheritance that some people may disagree with	• Select appropriate ways of presenting scientific data • Correctly use scientific terms related to variation and inheritance • Identify some ethical implications of research in variation and inheritance • State whether or not data supports the hypothesis	• Use evidence rather than opinion to support or challenge scientific arguments relating to variation, classification and inheritance • Suggest how collaborative approaches to investigations may improve the evidence collected • Appreciate the power, limitations and ethical implications of research in this topic	• Communicate data relating variation, classification and inheritance in appropriate tables and graphs • Distinguish between data and information from primary sources, secondary sources and simulations, and present them in the most appropriate form • Explain and evaluate the power, limitations and ethical implications of research in this topic • Present data to support hypotheses	
Investigative skills	• Identify one or more control variables in investigations on variation • Select equipment or information sources from those provided to address a question or idea • Make some accurate observations relevant to variation • Recognise obvious risks when prompted	• Decide when it is appropriate to carry out fair tests in investigations on variation • Select appropriate equipment to investigate variation • Make sets of observations on variation experiments • Identify possible risks to themselves and others • Suggest improvements to their working methods, giving reasons	• Recognise significant variables in investigations on variation • Explain why particular pieces of equipment or information sources are appropriate for the ideas under investigation • Make, and act on, suggestions to control obvious risks to themselves and others • Evaluate the effectiveness of their working methods, making practical suggestions for improving them	• Apply scientific knowledge and understanding in the planning of investigations on variation - making predictions, identifying significant variables, including independent, dependent and control variables • Justify method choice for variation investigations • Collect accurate observations • Independently recognise a range of familiar risks and take action to control them	
Maths skills	• Identify straightforward patterns in observations and data from variation investigations • Present findings from these investigations • Use simple equations to interpret data on variation	• Identify patterns in data and observations from variation investigations • Draw straightforward conclusions from observations and data on variation • Identify scientific evidence they have been used in drawing conclusions	• Decide on the most appropriate formats to present findings from variation investigations • Interpret data and observations from these investigations • Draw valid conclusions that utilise supporting evidence from various sources	• Select information from secondary sources as well as from investigations on variation to contribute to conclusions • Draw conclusions from the evidence collected and explain them using scientific knowledge • Present data from investigations on variation in an appropriate table and graph	

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Year: 8
Science Topic: Domestic and Static Electricity and Heat Transfer

	Foundation	Developing	Secure	Mastering	Mastering +
Demonstrating knowledge	• Use scientific ideas when describing electricity and heat. • Use simple models to describe electricity and heat. • Identify scientific evidence that is being used to support or refute the theories of electricity and heat transfer.	• Use ideas on current, potential difference and power to describe electricity. • Explain electricity and heat and answer questions by drawing on abstract ideas or models. • Identify the use of evidence and creative thinking by scientists in the development of ideas on electricity	• Use abstract ideas on electricity and heat as well as relevant models to explain processes or phenomena. • Identify the strengths and weaknesses of these. • Explain how new scientific evidence is discussed and interpreted by the scientific community and how this may lead to changes in scientific ideas	• Make explicit connections between abstract ideas on electricity and heat as well as appropriate models in explaining processes or phenomena, systematically deciding the importance of each. • Explain the processes by which ideas and evidence are accepted or rejected by the scientific community	• Students show a level of knowledge and understanding which is beyond the expectations of a year >>> student.
Applying and communicating in science	• Select appropriate ways of presenting data on electricity. • Use terms such as electron, current, potential difference and power to communicate about electricity. • Use correct units when studying electricity and heat.	• Distinguish between opinion and scientific evidence about the nature and behaviour of electricity and heat. • Use appropriate units and equations when studying the properties of electricity. • Suggest how collaborative approaches to specific experiments or investigations may improve the evidence collected.	• Choose appropriate diagrams to communicate electricity and heat as well as calculations appropriate to the data. • Distinguish between data and information from primary sources, secondary sources and simulations, and present them in the most appropriate form. • Present data to support hypotheses about the behaviour of electricity and heat.	• Explain how information or evidence from various sources may been manipulated in order to influence interpretation of electrical and heat behaviour. • Effectively represent abstract ideas using appropriate symbols and circuit diagrams to present explanations and arguments. • Explain how scientists have collaborated to develop ideas on electric and heat and their behaviours	
Investigative skills	• Select appropriate equipment to investigate static electricity. • Record basic results when investigating power. • Identify possible risks to themselves and others. • Suggest improvements to their working methods, giving reasons	• Recognise significant variables in heat and electricity investigations, selecting the most suitable to investigate. • Explain why particular pieces of equipment are appropriate to measure electrical phenomena. • Make, and act on, suggestions to control obvious risks to themselves and others. • Evaluate the effectiveness of their working methods, making practical suggestions for improving them	• Apply scientific knowledge and understanding in the planning of investigations on the behaviour of electricity, including making predictions. • Justify their method choice and make accurate observations to inform results. • Independently recognise a range of familiar risks and take action to control them. • Evaluate the results and comment on accuracy	• Formulate hypotheses using information from a range of sources. • Explain how to minimise sources of error when investigating electricity. • Recognise the need for risk assessments and consult, and act on, appropriate sources of information. • Explain ways of modifying working methods to improve reliability. • Present data on the behaviour of electricity to support hypotheses	
Maths skills	• Identify patterns in data. • Draw straightforward conclusions from data and heat transfer diagrams. • Identify scientific evidence they have used in drawing conclusions on electricity and heat. • Use simple equations to input data to calculate energy, power, potential difference and current, changing the units where appropriate	• Decide on the most appropriate formats to present sets of scientific data, such as using tables or diagrams. • Interpret data from results tables and comment on accuracy. • Provide straightforward explanations for inaccuracies in results. • Draw valid conclusions that utilise more than one piece of supporting evidence.	• Suggest reasons based on scientific knowledge and understanding for any limitations or inconsistencies in results. • Select and manipulate data and information and use them to contribute to conclusions. • Draw conclusions that are consistent with the evidence they have collected and explain them using scientific knowledge and understanding. • Make valid comments on the quality of their results in electricity investigations • Be able to rearrange equations to calculate energy, power, potential difference and current. • Present data (their own or a secondary source) using tables and diagrams	• Identify quantitative relationships between variables, using them to inform conclusions and make further predictions on electricity behaviour. • Assess the strength of evidence, deciding whether it is sufficient to support a conclusion. • Be able to rearrange equations and input data with various different units when calculating energy, power, potential difference and current. • Produce results tables and graphs using your own data, or from secondary sources	

Year: 8
Science Topic: Respiration and Movement

	Foundation	Developing	Secure	Mastering	Mastering +
Demonstrating knowledge	• State what respiration, joints, the skeleton and muscles are used for. • Use simple models to describe how joints allow movement. • Identify the change in limewater from clear to cloudy white when respiration has occurred.	• State the word equation for aerobic and anaerobic respiration. • Describe how muscles and bones work together to allow movement. • Explain processes how muscles, joints and bones allow movement by referring to diagrams. • Recognise that respiration is a very complex process and the full details are not understood at KS3. • Identify the use of evidence and creative thinking by scientists in the development of understanding respiration and movement.	• Explain how respiration changes with availability of oxygen. • Identify the strengths and weaknesses of models for how joints, muscles and bones work together to allow movement. • Describe some scientific evidence that supports the knowledge that water and carbon dioxide are produced during respiration.	• Can label a blank diagram of a muscle system in the body and explain how antagonistic pairs work together. • Explain respiration as a transfer of energy types, from chemical to heat, sound etc. • Explain how higher energy content in foods leads to more respiration.	• Students show a level of knowledge and understanding which is beyond the expectations of a year 8 student.
Applying and communicating in science	• Use the terms 'respiration' and 'breathing' correctly. • Use scientific and mathematical conventions when communicating information about respiration and movement. • Identify some limitations and ethical implications of science.	• Use evidence about carbon dioxide or oxygen levels to support arguments that respiration has occurred. • Use key terms correctly when describing respiration and movement. • Suggest how pooling results or repeating experiments can improve data about respiration and movement. • Appreciate the ethical implications of working with living organisms during respiration or movement investigations.	• Use the correct units when referring to how much energy is found in different types of food. • Explain and evaluate the implications of muscle and joint damage and what can be done to support patients. • Explain why the concentrations of gases like oxygen and carbon dioxide are different in inhaled and exhaled air. • Present data to support hypotheses about investigations into energy content of different foods.	• Explain how information or evidence from various sources may been manipulated in order to influence interpretation. • Represent aerobic and anaerobic respiration using symbol equations. • Evaluate claims made about the effects of exercise on the body. • Explain and evaluate the power, limitations and ethical implications of joint replacements.	
Investigative skills	• State in simple terms how a fair test can be carried out • Identify one or more control variables from a list. • Select appropriate equipment or information sources to investigate how much energy is found in different foods. • Make sets of observations or measurements, identifying the ranges and intervals used. • Identify possible risks to themselves and others. • Suggest improvements to their working methods, giving reasons	• Be able to identify variables involved in food energy investigations, selecting the most suitable to investigate. • Explain why particular pieces of equipment or information sources are appropriate for the questions or ideas under investigation. • Repeat sets of observations or measurements in case of error, selecting suitable ranges and intervals. • Make, and act on, suggestions to control obvious risks to themselves and others. • Evaluate the effectiveness of their working methods, making practical suggestions for improving them	• Apply scientific knowledge and understanding in the planning of investigations and making predictions, identifying significant variables, including independent, dependent and control variables. • Justify their method choice and number of observations/measurements. Collect data, choosing appropriate ranges, numbers and values for measurements and observations. • Independently recognise a range of familiar risks and take action to control them. • Evaluate data to identify sources of error.	• Formulate hypotheses using information from a range of sources. • Identify key variables in complex contexts, explaining why some cannot readily be controlled and planning appropriate approaches to investigations to take account of this. • Explain how to take account of sources of error in order to collect reliable data. • Recognise the need for risk assessments and consult, and act on, appropriate sources of information. • Explain ways of modifying working methods to improve reliability. • Present data to support hypotheses about energy content in different foods.	
Maths skills	• Identify patterns in data presented in various formats, including line graphs. • Draw straightforward conclusions from data presented in various formats. • Identify scientific evidence they have used in drawing conclusions.	• Decide on the most appropriate formats to present sets of scientific data, such as using line graphs for continuous variables. • Interpret data in a variety of formats, recognising obvious inconsistencies. • Provide straightforward explanations for differences in repeated observations or measurements. • Draw valid conclusions that utilise more than one piece of supporting evidence, including results tables and line graphs	• Suggest reasons based on scientific knowledge and understanding for any limitations or inconsistencies in evidence collected. • Select and manipulate data and information and use them to contribute to conclusions. • Draw conclusions that are consistent with the evidence they have collected and explain them using scientific knowledge and understanding. • Make valid comments on the quality of their data. • Present data (their own or a secondary source) using results tables and graphs	• Explain how data can be interpreted in different ways and how unexpected outcomes could be significant. • Identify quantitative relationships between variables, using them to inform conclusions and make further predictions. • Assess the strength of evidence, deciding whether it is sufficient to support a conclusion. • Produce graphs and tables using your own data, or from secondary sources	

Year: 8
Science Topic: Reactions of acids and Describing reactions

	Foundation	Developing	Secure	Mastering	Mastering +
Demonstrating knowledge	• To understand what neutralisation is. • To understand that acids react with alkalis, metals and carbonates To understand that there are different types of chemical reactions • To know the main ideas behind combustion, displacement, oxidation/reduction and thermal decomposition reactions. • That the rate of a chemical reaction is the speed at which reactants are used up/products formed.	• To predict the products from a given set of acids and alkali/metal/carbonate • Explain what a neutralisation reaction is and that a salt is formed in the process. • Describe a combustion, oxidation/reduction, displacement and thermal decomposition reaction • Describe the differences between exothermic and endothermic reactions. • Recognise the factors that affect the rate of a reaction i.e. temperature, concentration, surface area and catalyst.	• To be able to choose a suitable acid + alkali/metal/carbonate to create a specific salt. • Describe and explain the steps required for the production of a soluble pure salt • Use the collision theory to describe how reactions occur generally	• To understand that all acids contain hydrogen and alkalis are hydroxides and that these combine to form water. • Use the collision theory to explain how temperature, concentration, surface area and catalysts affect the rate of reaction	• To understand the idea that acids provide H^+ ions and alkalis have OH^- ions which forms the basis of neutralisation reactions • To understand the idea that reactions involve energy changes when bonds are broken and formed
Applying and communicating in science	• To be able to describe what they see in a chemical reaction between acid + alkali/metal/carbonate. • To describe what they see in other types of reaction e.g. combustion, thermal decomposition, redox and displacement. • To understand that a word equation shows the reactants and products. • To be able to write a word equation given the names of reactants and products. • To appreciate that acid rain can affect buildings and living things •	• To be able to write a symbol equation for a reaction between acid + alkali/metal/carbonate. • Write symbol equations for other types of chemical reaction • To understand some of the acids responsible for acid rain and their environmental effects • To be able to explain what they see in all types of chemical reactions	• To be able to balance chemical equations. • To be able to process data on the effects of acid rain. • Use a flow diagram to represent the stages in the production of a soluble salt • Use particle diagrams to represent the collision theory • Know the difference between primary and secondary information in relation to chemical reactions	• Use particle diagrams to show the effects of changing temperature, concentration, surface area and catalysts on the rate of reaction • Know when to use particle diagrams, flow diagrams and equations to communicate information in the best way	

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Investigative skills	• To be able to use indicators to test for acids + alkalis. • Make sets of observations or measurements, identifying the pH of various solutions. • Identify possible risks to themselves and others in the use of acids/alkalis. • Select appropriate equipment to investigate neutralisation or rates of reaction • Suggest improvements to their working methods, giving reasons	• To be able to predict the products for a given acid reaction. • Recognise significant variables in investigations, selecting the most suitable. • Explain why particular pieces of equipment are appropriate to follow neutralisation or collect gas in rates of reaction experiments • Repeat sets of measurements in case of error, selecting suitable ranges and intervals • Make, and act on, suggestions to control obvious risks of acids and bases and other chemicals • Evaluate the effectiveness of their methods, making practical suggestions for improvement.	• Apply scientific knowledge and understanding of different types of reactions in order to plan investigations and make predictions on the products formed., identifying significant variables including independent, dependent and control variables • Choose an appropriate method for investigating the rate of reaction, identifying the range, numbers and values for measurement. • Independently recognise a range of familiar risks and take action to control them • Evaluate data collected to identify sources of error	• Formulate hypotheses for a range of reactions using information from a range of sources • Identify key variables in a range of chemical reactions and explain how some cannot readily be controlled, planning appropriate investigations to take this into account • Be able to collect reliable data, taking into account sources of error. • Recognise the need for risk assessments, consulting and taking note of appropriate source of information • Explain ways of modifying working methods to improve reliability • Present data to support hypotheses.	
Maths skills	• Being able to work out the strength of acids/alkalis given the pH number • Identify patterns in data presented in various formats, including line graphs, for rate of reaction experiments • Draw straightforward conclusions from data presented in various formats .	• Decide on the most appropriate formats to present, e.g. change in pH or CO_2 production or effect of changing variables on the rate of reaction • Interpret data in a variety of formats, recognising obvious inconsistencies. • Provide straightforward explanations for differences in repeated observations or measurements. • Draw valid conclusions that utilise more than one piece of supporting evidence, including results tables and line graphs •	Suggest reasons why investigations involving the collection of gas may end up with anomalous results Draw appropriate graphs from data collected during neutralisation or rates of reaction experiments Draw conclusions that are consistent with the evidence they have collected and explain them using scientific knowledge and understanding. Make valid comments on the quality of the data Use knowledge of collision theory to explain the evidence collected	• Explain how data can be interpreted in different ways and how unexpected outcomes could be significant. • Be able to use numerical information from graphs to support conclusions • Assess the evidence collected to decide if it is sufficient to support a conclusion. • Produce graphs and tables using primary and secondary data	

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Year: 8
Science Topic: Breathing and Circulation

	Acquiring	Developing	Securing	Mastering	Mastering +
Demonstrating knowledge	Identify the main parts of the breathing and circulatory system. Represent the circulation of blood using a figure of 8. Identify scientific evidence that is being used to support or refute ideas or arguments.	Describe the journey that blood takes through the body. Represent the action of breathing by referring to a bell jar. Describe how the breathing system was developed by dissecting fish and smaller organisms.	Describe where oxygenated and deoxygenated blood can be found in the body. Identify the strengths and weaknesses of the bell jar model when describing ventilation. Describe how oxygen enters muscle and tissues from the blood. Describe how animals have adapted to breathe on land and in water.	Explain in detail how red blood cells carry oxygen in the blood, around the body, to the areas that need it. Explain why breathing becomes deeper and faster during exercise. Describe how asthma and emphysema can develop, linking it to external factors.	Students show a level of knowledge and understanding which is beyond the expectations of a year >>> student.
Applying and communicating in science	Select appropriate ways of presenting results from investigations into how breathing changes during exercise. Use appropriate scientific forms of language to communicate a change in ventilation. Use correct units when referring to breathing rate and heart rate. Identify some limitations and ethical implications of dissections.	Use evidence rather than opinion to support or challenge scientific arguments about breathing and circulation. Use appropriate scientific and mathematical conventions and terminology to communicate ideas about how breathing and circulation change during exercise. Suggest how pooling results during exercise investigations may improve the evidence collected. Appreciate the ethical implications of dissections.	Identify lack of balance in the presentation of information or evidence. Represent data about how breathing and circulation change during exercise, using line graphs and bar graphs. Describe parts of the heart after completion of the heart dissection. Distinguish between data and information from primary sources, secondary sources and simulations, and present them in the most appropriate form. Explain and evaluate the ethical implications of dissections. Present data to support hypotheses about the changes in breathing and circulation during exercise.	Explain how information or evidence about the benefits of exercise or the dangers of smoking from various sources may been manipulated in order to influence interpretation. Effectively represent circulation of blood using appropriate symbols, flow diagrams and different kinds of graphs to present explanations and arguments. Explain and evaluate the ethical implications of: heart dissections and or secondary smoking in public environments	
Investigative skills	Decide when it is appropriate to carry out fair tests in investigations. Select appropriate equipment to investigate how breathing changes during exercise. Make sets of observations or measurements, identifying the ranges and intervals used. Identify possible risks to themselves and others during heart dissections. Suggest improvements to their working methods, giving reasons	Recognise significant variables in investigations, selecting the most suitable to investigate. Explain why oxygen monitors, heart rate monitors and lung volume bags are appropriate for the questions or ideas under investigation. Repeat sets of observations or measurements in case of error, selecting suitable ranges and intervals. Make, and act on, suggestions to control obvious risks to themselves and others. Evaluate the effectiveness of their working methods, making practical suggestions for improving them.	Apply scientific knowledge and understanding in the planning of investigations and making predictions, identifying significant variables, including independent, dependent and control variables. Justify their method choice and number of observations/measurements. Collect data, choosing appropriate ranges, numbers and values for measurements and observations. Independently recognise a range of familiar risks and take action to control them. Evaluate data to identify sources of error.	Formulate hypotheses using information from a range of sources. Identify key variables in complex contexts, explaining why some cannot readily be controlled and planning appropriate approaches to investigations to take account of this. Explain how to take account of sources of error in order to collect reliable data. Recognise the need for risk assessments and consult, and act on, appropriate sources of information. Explain ways of modifying working methods to improve reliability. Present data to support hypotheses about how breathing changes during exercise.	

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Maths skills	Identify patterns in data about deaths from smoking and body changes during exercise presented in various formats, including line graphs. Draw straightforward conclusions about the benefits of exercise and smoking from data presented in various formats. Identify scientific evidence they have used in drawing conclusions.	Decide on the most appropriate formats to present sets of scientific data, such as using pie charts to represent deaths from smoking, or line graphs to represent changes in heart rates and breathing rates. Interpret data in a variety of formats, recognising obvious inconsistencies. Provide straightforward explanations for differences in repeated observations or measurements. Draw valid conclusions that utilise more than one piece of supporting evidence, including results tables and line graphs.	Suggest reasons based on scientific knowledge and understanding for any limitations or inconsistencies in evidence collected. Select and manipulate data and information and use them to contribute to conclusions. Draw conclusions about the dangers of smoking or effects of exercise, that are consistent with the evidence they have collected and explain them using scientific knowledge and understanding. Make valid comments on the quality of their data. Present data (their own or a secondary source) using results tables, pie charts and graphs	Explain how data can be interpreted in different ways and how unexpected outcomes could be significant. Identify quantitative relationships between number of cigarettes smoked and diseases/deaths or exercise and heart rate / breathing rate, using them to inform conclusions and make further predictions. Assess the strength of evidence, deciding whether it is sufficient to support a conclusion. Produce graphs and tables using your own data, or from secondary sources	

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Year: 8
Science Topic: Application of Forces and Exploring Space

	Foundation	Developing	Secure	Mastering	Mastering +
Demonstrating knowledge	• Realise that a see-saw with different weights on either side could balance, if the heavier weight is closer to the pivot. • Can give examples of the three types of levers • Can predict whether an object will float or sink from knowledge of its density compared to that of water. • Can describe how an eclipse occurs • Describe the formation, lifecycle and death of a star in simple terms • Describe some simple models of the solar system • Can recall some of the uses of artificial satellites. • Simple relation between gravity and planet size	• Can apply the principle of moments to determine whether an object is balanced. • Appreciate why someone may wish to use a lever, and explain the operation of some typical levers. • Can give examples of situations in which a high or a low pressure is required. • Describe the formation, lifecycle and death of a star and understand key terms such as protostar, fusion, and supernova • Describe some earlier models of the solar system and explain how evidence has disproved them • Describe some of the methods used by scientists to gather new evidence about space • 'Describe some uses for artificial satellites and space stations	• Can apply the principle of moments to determine and unknown force or distance. • Can explain how levers work • Can explain the effect of a differing internal and external pressure on an object. • Know that upthrust is equal to the weight of water displaced by an object. • Can describe how the tilt of the earth's axis gives rise to the seasons. • Are able to describe how the moon's orbit gives rise to the phases of the moon. • Describe the formation, lifecycle and death of a star using key terms such as protostar, fusion, and supernova • Understand the meaning of the term 'light year'. • Appreciate that human understanding of the solar system has developed over time. • Understand why space exploration has mainly involved robots rather than humans • Identify the strengths and weaknesses of particular models.	• Can explain how levers work and extrapolate the process to unknown situations • Can explain upthrust in terms of the water pressure at differing depths on an object. • Can explain with detail how the seasons are caused by the tilt of the Earth and its orbit around the Sun • Can explain with detail how the phases of the Moon are caused by its position relative to the Sun • Describe in order all stages of a stars' lifecycle using keywords and specialist vocabulary. • Describe some of the challenges to space travel and exploration • Relationships between mass, weight and planet size • Explain how different pieces of evidence support accepted scientific ideas or contribute to questions that science cannot fully answer. • Explain the processes by which ideas and evidence are accepted or rejected by the scientific community	• Students show a level of knowledge and understanding which is beyond the expectations of a year >>> student.
Applying and communicating in science	• Select appropriate ways of presenting scientific data. • Use appropriate scientific forms of language to communicate scientific ideas and processes. • Use scientific and mathematical conventions when communicating information or ideas. • Identify some limitations and ethical implications of science	• Distinguish between opinion and scientific evidence in contexts related to science, and use evidence rather than opinion to support or challenge scientific arguments. • Use appropriate scientific and mathematical conventions and terminology to communicate abstract ideas. • Suggest how collaborative approaches to specific experiments or investigations may improve the evidence collected. • Appreciate the power, limitations and ethical implications of science	• Identify lack of balance in the presentation of information or evidence. • Choose forms to communicate qualitative or quantitative data appropriate to the data and the purpose of the communication. • Distinguish between data and information from primary sources, secondary sources and simulations, and present them in the most appropriate form. • Explain and evaluate the power, limitations and ethical implications of science. • Present data to support hypotheses	• Explain how information or evidence from various sources may been manipulated in order to influence interpretation. • Effectively represent abstract ideas using appropriate symbols, flow diagrams and different kinds of graphs to present explanations and arguments. • Explain how scientists with different specialisms and skills have contributed to particular scientific or technological developments. • Explain and evaluate the power, limitations and ethical implications of science	

Investigative skills	• Decide when it is appropriate to carry out fair tests in investigations. • Select appropriate equipment or information sources to address specific questions or ideas under investigation. • Make sets of observations or measurements, identifying the ranges and intervals used. • Identify possible risks to themselves and others. • Suggest improvements to their working methods, giving reasons	• Recognise significant variables in investigations, selecting the most suitable to investigate. • Explain why particular pieces of equipment or information sources are appropriate for the questions or ideas under investigation. • Repeat sets of observations or measurements in case of error, selecting suitable ranges and intervals. • Make, and act on, suggestions to control obvious risks to themselves and others. • Evaluate the effectiveness of their working methods, making practical suggestions for improving them	• Apply scientific knowledge and understanding in the planning of investigations and making predictions, identifying significant variables, including independent, dependent and control variables. • Justify their method choice and number of observations/measurements. Collect data, choosing appropriate ranges, numbers and values for measurements and observations. • Independently recognise a range of familiar risks and take action to control them. • Evaluate data to identify sources of error	• Formulate hypotheses using information from a range of sources. • Identify key variables in complex contexts, explaining why some cannot readily be controlled and planning appropriate approaches to investigations to take account of this. • Explain how to take account of sources of error in order to collect reliable data. • Recognise the need for risk assessments and consult, and act on, appropriate sources of information. • Explain ways of modifying working methods to improve reliability. • Present data to support hypotheses	
Maths skills	• Can use the following equations: turning moment of a force = force × distance from pivot • Can use the following equation: pressure = force ÷ area • Identify patterns in data presented in various formats, including line graphs. • Draw straightforward conclusions from data presented in various formats. • Identify scientific evidence they have used in drawing conclusions.	• Can use the following equations: turning moment of a force = force × perpendicular distance from pivot and is able to re-arrange it to obtain any unknown quantity • Can use the following equation: pressure = force ÷ area and is able to re-arrange it to obtain any unknown quantity • Decide on the most appropriate formats to present sets of scientific data, such as using line graphs for continuous variables. • Interpret data in a variety of formats, recognising obvious inconsistencies. • Provide straightforward explanations for differences in repeated observations or measurements. • Draw valid conclusions that utilise more than one piece of supporting evidence, including results tables and line graphs	• Can use the following equations: turning moment of a force = force × perpendicular distance from pivot and is able to re-arrange it to obtain any unknown quantity, and express it using multiples and sub-multiples • Can use the following equation: pressure = force ÷ area and is able to re-arrange it to obtain any unknown quantity, and express it using multiples and sub-multiples • Suggest reasons based on scientific knowledge and understanding for any limitations or inconsistencies in evidence collected. • Select and manipulate data and information and use them to contribute to conclusions. • Draw conclusions that are consistent with the evidence they have collected and explain them using scientific knowledge and understanding. • Make valid comments on the quality of their data. • Present data (their own or a secondary source) using results tables and graphs	• Explain how data can be interpreted in different ways and how unexpected outcomes could be significant. • Identify quantitative relationships between variables, using them to inform conclusions and make further predictions. • Assess the strength of evidence, deciding whether it is sufficient to support a conclusion. • Produce graphs and tables using your own data, or from secondary sources	

Year: 8
Science Topic: Extracting Metals & Earth and Atmosphere

	Acquiring	Developing	Securing	Mastering	Mastering +
Demonstrating knowledge	• Can use the reactivity series to compare reactions of given examples. • Are able to state some properties of metals. • Can describe the layers of the Earth. • Can describe rocks as igneous, sedimentary or metamorphic. • Understand the composition of the atmosphere. • Are able to state that humans can have impact on the Earth and the importance of recycling.	• Can describe methods of extraction, including reacting with carbon and electrolysis, and can relate the properties of metals to this wide range of uses. • Can describe changes in the rock cycle. • Understand the atmosphere has changed over time and the atmosphere has different layers. • Can summarise the carbon cycle and how humans may affect this. • Are able to relate recycling to reducing a product's carbon footprint.	• Are able to relate the method of extraction to the position on the reactivity series. • Can use word equations to show the chemical reactions that occur during extraction. • Can describe the composition of the atmosphere and the importance of ozone. • Are able to relate carbon dioxide levels to global warming and how humans can impact carbon dioxide levels.	• Can explain the properties of metals based on their atomic structure and bonding. • Can explain changes in the Earth using the idea of convection currents, reactive molecules in the Earth's upper atmosphere and the effect of carbon dioxide levels on global temperatures. • Evaluate evidence of human impact and give balanced views on factors affecting a product's carbon footprint.	• Students show a level of knowledge and understanding which is beyond the expectations of a year >>> student.
Applying and communicating in science	• Select appropriate ways of presenting scientific data when investigating extraction of metals. • Use appropriate scientific forms of language to explain displacement reactions. • Use percentages when communicating information about the atmosphere.	• Distinguish between opinion and scientific evidence to support changes in the earth and atmosphere. • Suggest how collaborative approaches to specific experiments or investigations may improve the evidence collected. • Appreciate the power, limitations and ethical implications of science	• Identify lack of balance in the presentation of information or evidence for global warming. • Choose words equations to communicate qualitative. • Distinguish between data and information from primary sources, secondary sources and simulations, and present them in the most appropriate form. • Present data to support hypotheses when investigating changes to the atmosphere.	• Explain how information or evidence from various sources may been manipulated in order to influence interpretation when investigating global warming. • Effectively represent abstract ideas using appropriate symbols, flow diagrams and different kinds of graphs to present explanations and arguments for the changes in the atmosphere. • Explain and evaluate the power, limitations and ethical implications of science	
Investigative skills	• Select appropriate information sources to address specific questions or ideas under investigation. • Make observations of measurements identifying patterns I reactivity.	• Recognise significant variables in investigations, selecting the most suitable to investigate. • Explain why particular pieces of equipment or information sources are appropriate for the questions or ideas under investigation. • Repeat sets of observations using different combination of chemicals.	• Apply scientific knowledge and understanding of investigations and making predictions. • Justify their method choice and number of observations/measurements. Collect data, choosing appropriate ranges, numbers and values for measurements and observations.	• Formulate hypotheses using information from a range of sources. • Explain how to take account of sources of error in order to collect reliable data. • Explain ways of modifying working methods to improve reliability. [• Use data to support hypotheses	
Maths skills	• Identify patterns in data presented in various formats, including line graphs. • Draw straightforward conclusions from data presented in various formats. • Identify scientific evidence they have used in drawing conclusions.	• Decide on the most appropriate formats to present sets of scientific data, such as using line graphs for continuous variables. • Interpret data in a variety of formats, recognising obvious inconsistencies. • Provide straightforward explanations for differences in repeated observations or measurements. • Draw valid conclusions that utilise more than one piece of supporting evidence, including results tables and line graphs	• Suggest reasons based on scientific knowledge and understanding for any limitations or inconsistencies in evidence collected. • Select and manipulate data and information and use them to contribute to conclusions. • Draw conclusions that are consistent with the evidence they have collected and explain them using scientific knowledge and understanding. • Make valid comments on the quality of their data. • Present data (their own or a secondary source) using results tables and graphs	• Identify quantitative relationships between variables, using them to inform conclusions and make further predictions. • Assess the strength of evidence, deciding whether it is sufficient to support a conclusion. • Produce graphs and tables using your own data, or from secondary sources	

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