

**SCIENCE KS3**  
**MASTERY CURRICULUM**

**List of Topics**

<b>BIOLOGY</b>
B1 – Movement and Cells B2 – Interdependence and Plant Reproduction B3 – Variation and Human Reproduction B4 – Breathing and Digestion B5 – Respiration and Photosynthesis B6 – Evolution and Inheritance

<b>CHEMISTRY</b>
C1 – Particle Model and Separating Mixtures C2 – Periodic Table and Elements C3 – Earth’s Structure C4 – Reactions of Metals, Non-metals, Acids and Alkalis C5 – Climate and Earth Resources C6 – Chemical Energy and Types of Reaction

<b>PHYSICS</b>
P1 – Forces P2 – Electricity P3 – Energy P4 – Heating and Cooling P5 – Waves P6 – Magnetism and Electromagnetism P7 – Motion P8 – Space Physics

# SCIENCE KS3 – YEAR 7

## MASTERY CURRICULUM STATEMENTS

Topic	Emerging	Developing	Securing	Mastering	Mastering*
C1	Give examples of substances that are in the solid, liquid and gas state.	Name some properties of solids, liquids and gases.	Compare the properties of solids, liquids and gases.	Draw particle diagrams to demonstrate the differences between the arrangement of particles in solids, liquids and gases, and describe their different properties.	Use particle diagrams to explain the differences in energy and forces between the particles in different states of matter, accounting for differences in their properties.
	Recognise that some substances can change state.	Name changes of state and give examples.	Use correct terminology and the particle model to describe changes of state, including evaporation.	Interpret data relating to melting and boiling points.	Explain data relating to melting and boiling points in terms of intermolecular forces.
	Recognise that some say-to-day substances can be more concentrated or more dilute.	Describe situations where pressure has an effect.	Describe what is meant by the terms 'concentration' and 'pressure'.	Describe the effects of changing concentration and pressure in terms of particles.	Explain the effects of changing concentration and pressure in terms of particles, and apply to processes such as diffusion and gas compression.
	Recognise that mixtures are two or more substances mixed together.	Describe how to separate sand from water.	Describe some methods to separate mixtures.	Select and explain appropriate separation techniques.	Explain the choice and method of separation using correct terms.
	Recognise that when sugar is mixed with water, something happens to the sugar.	Recognise that substances can mix with water up to a certain limit.	Define solvent, solute, solution and soluble.	Interpret solubility graphs to compare solubility of different solutes and describe the effect of temperature on solubility.	Explain solubility and the effect of temperature in terms of particles and intermolecular forces.
	Describe what happens to a mixture of water and salt when left in the sun.	Recognise that condensation happens when water vapour cools down.	Describe the process of distillation.	Explain the physical processes involved in distillation.	Identify the uses and advantages of distillation.
	Recognise that some liquids are a mixture of different substances.	Describe how to use simple chromatography to separate ink from a pen.	Identify mixtures using chromatography.	Explain how to separate a mixture using chromatography.	Use chromatograms to explain the composition of mixtures; compare chromatography and DNA analysis.

## MASTERY CURRICULUM STATEMENTS

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P1	State that to move an object we need to apply a force.	Recognise that forces can have different sizes.	Represent forces using force diagrams.	Describe the size and direction of forces using force diagrams.	Explain how the size and direction of forces determines their effects.
	Recognise that a forces can change the shape of some materials like, for example, paper.	Describe what happens to some materials when subjected to forces.	Describe how materials behave when subjected to forces of tension or compression.	Explain the relationship between the amount of change in shape and the size of the force.	Explain that, in some materials, the change is proportional to the force applied.
	State the difference between walking on ice or on sand.	Recognise that friction can have a positive effect.	Explain that friction is a contact force opposing the direction of movement.	Identify factors which affect the size of frictional and drag forces.	Evaluate how well a design reduces frictional or drag forces.
	Recognise that some animals are adapted to their environment in order to counteract the effect of pressure (camels and polar bears, for example).	Describe how snow shoes facilitate walking on snow, relating this to pressure.	Describe the causes and effects of varying pressure on and by solids.	Explain how force and area can be varied to alter the pressure applied.	Calculate the pressure applied by a solid from the force applied and the contact surface area.
	Recognise that divers deal with different pressures as depth changes.	Describe how pressure changes with depth.	Describe the variation of pressure in liquids with depth and the effects of this.	Explain the variation of pressure with depth in liquids.	Identify the causes and implications of variation of pressure with depth.
	Recognise that some objects can float and others sink in water.	Describe density as a result of amount of particles in a certain space.	Explain why some objects float and others sink.	Use the concepts of density, displacement and upthrust in explaining floating and sinking.	Apply ideas about density and upthrust to predict the outcomes of various situations.
	Recognise that mountaineers have to deal with different pressure as height changes.	Recognise that atmospheric pressure decreases with height.	Describe how atmospheric pressure varies with height; state some implications of variations in pressure.	Explain why atmospheric pressure varies with height; describe how the effects of pressure are used and dealt with.	Identify some implications of pressure variation in situations such as weather patterns and high altitude activities.
	Recognise that animals who live in water need some adaptations to be able to survive the different pressures.	Recognise that when we are deep in the water, the water exerts pressure all around us.	Recognise that pressure acts in a fluid in all directions.	Explain how liquids are used in hydraulic systems to transmit forces.	Carry out calculations relating to hydraulic systems in which the applied forces are increased.
	Describe what happens to an object when subjected to one force.	Recognise that there may be several forces acting on an object.	Identify different forces acting upon an object.	Calculate the resultant force of several forces acting in the same direction.	Relate the resultant force to the motion of the object.
	Recognise that forces can have different sizes.	Recognise that forces can have different directions.	Identify the direction that a force is acting in.	Represent the direction of forces in a diagram.	Use a force diagram to identify a resultant force.

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<b>B1</b>	Recognise that humans and other animals have a skeleton.	State what could happen if we did not have a skeleton.	Identify the main bones of the skeleton.	Describe the functions of the skeleton.	Explain how different parts of the skeleton are adapted to carry out particular functions.
	Recognise that bones meet at certain points in the body – the joints.	Describe some types of joints.	Describe the role of skeletal joints.	Identify some different joints and explain the role of tendons and ligaments in joints.	Compare the movement allowed at different joints and explain why different types of joints are needed.
	Recognise the existence of muscles.	Identify some muscles in the human body.	Recall that muscles contract to move bones at joints.	Identify muscles that contract to cause specific movements.	Explain how muscles work antagonistically to bring about movement, and evaluate a model.
	Recognise that everything that all living organisms have units called cells.	State some parts of animal and plant cells.	Recognise and label basic and specialised animal cells and plant cells.	Describe the functions of the nucleus, cell membrane, mitochondria, cytoplasm, cell wall, vacuole and chloroplast.	Compare and contrast the similarities and differences between specialised animal cells and plant cells.
	Recognise that some living organisms are very small.	Recognise that some living organisms are made up of only one cell.	Describe unicellular organisms – including yeast, bacteria, euglena, paramecium and amoeba – as being either prokaryotes or eukaryotes.	Describe the function of specialised parts of different unicellular organisms.	Explain how different structures help organisms to survive.
	Recognise that the human body is made up of different systems.	Recognise that each system has a specific purpose in the body.	Put the terms cell, tissue, organ and organ system in order of hierarchy, naming some common tissues, organs and organ systems in humans.	Explain the terms cell, tissue, organ and organ system and the function of some of the main organ systems in the body.	Explain the relationship between different organs of the body and predict the consequences of damage to specific organs.
	Recognise that there are more things than what we can see with the naked eye.	Recognise that cells are very small and cannot be seen with the naked eye.	Recall that a microscope magnifies an image and allows us to see objects not visible to the naked eye.	Describe and demonstrate how to observe animal and plant cells under the microscope and explain observations.	Explain the importance of the development of microscopy techniques, using examples.

## MASTERY CURRICULUM STATEMENTS

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C2	Recognise that different substances are made of different materials.	Give examples of different substances and materials.	Give some examples of elements, locate them in the periodic table and use the table to identify metals and non-metals.	Give examples of elements and explain how they are organised in the periodic table.	Define elements, and link the organisation of the periodic table to element features, and explain how scientists organised the periodic table.
	Recognise that materials have different properties.	Give examples of properties of metals.	Recall that group 1 contains metals with similar chemical and physical properties, the alkali metals. Name some examples of alkali metals.	Describe the properties of the Group 1 metals as soft, reactive metals. Explain how their properties affect their uses. Recall that there are patterns of some properties within Group 1.	Identify patterns in the chemical and physical properties of the Group 1 metals, for example, melting point, boiling point and reactivity. Use data to place an unknown element within group 1 and make predictions about properties of elements within the group.
	Recognise that materials have different properties.	Give examples of properties of non-metals.	Recall that group 7 contains gases with similar chemical and physical properties, the halogens. Name some examples of halogens.	Describe the properties of the Group 7 halogens as colourful gases that react with other elements to form salts. Describe the uses of halogens. Recall that there are patterns of some properties within Group 7.	Identify patterns in the chemical and physical properties of the Group 7 halogens, for example, melting point, boiling point and reactivity. Use data to place an unknown element within group 7 and make predictions about properties of elements within the group.
	Recognise the existence of compounds like carbon dioxide and water.	Give examples of other compounds, like salt (sodium chloride).	Describe an example of a compound and represent a chemical reaction using a simple model.	Explain how compounds can be formed and explain a chemical reaction using simple models.	Make links between simple models of compounds and chemical symbols.
	Recognise that everything is made of particles.	Identify elements that form simple compounds.	Define elements, atoms and compounds. Recall that elements combine to form compounds and these compounds have different properties to the elements that they contain.	Use chemical formulae to represent simple compounds and identify elements within compounds from their formulae.	Use formulae to determine proportions of atoms of each element present within a compound and predict the names of unfamiliar compounds using formulae and naming rules.
	Recognise the existence of different materials like ceramic, for example.	Identify what is the best material for a certain function.	Describe what is meant by 'polymer', 'ceramic' and 'composite' with examples.	Describe the properties of polymers, ceramics and composites, using examples, and relate these to their uses.	Use models to explain how polymers, ceramics and composites are formed and explain how this affects their properties.

## MASTERY CURRICULUM STATEMENTS

Topic	Emerging	Developing	Securing	Mastering	Mastering*
P2	Recognise some components of an electric circuit.	Recognise that an electric circuit only works if it is complete.	Recognise arrangements of electric circuit components in series and in parallel.	Use circuit diagrams to construct real series and parallel circuits and vice versa.	Suggest the advantages of series and parallel circuits for particular applications.
	Recognise that batteries have different 'Volts' inscribed on them.	Know that voltage is a measure of the size of 'push' that causes a current to flow.	Describe what is meant by current, voltage and resistance.	Apply a range of models and analogies to describe current, voltage and resistance.	Evaluate different models and analogies for explaining current, voltage and resistance.
	Recognise some components of an electric circuit.	Describe an electric circuit as a loop of wire with its ends connected to an energy source.	Know that a complete circuit is needed for current to flow.	Know that current is a movement of electrons and is therefore a flow of charge.	Know that current is divided between the loops in a parallel circuit.
	Know that the word 'resistance' means 'to oppose'.	Recognise that the amount of resistance can vary widely.	Know that resistance reduces the current flowing.	Explain the idea of resistance, using models such as water flow in pipes.	Understand that resistance is the ratio of voltage to current.
	Know that the terms current, voltage and resistance are related to electric circuits.	Know that voltage is a measure of the size of 'push' that causes a current to flow.	Understand that voltage is also called potential difference and this makes current flow around a circuit.	Understand that in a series circuit the potential difference is shared by the components.	Understand that potential difference is the amount of energy transferred from the battery to the charge or from the charge to the components.
	Know that the terms current, voltage and resistance are related to electric circuits.	Recognise that the size of the voltage and the size of resistance both determine how much current flows.	Describe the relationship between current, voltage and resistance in a qualitative way.	Use data to identify a pattern between current, voltage and resistance.	Use data and the mathematical relationship between current, voltage and resistance to carry out calculations.
	Recognise that static electricity is a common phenomenon.	Give examples of situations where static electricity has an effect.	Describe the effect that a charged object has on other charged objects.	Explain what is meant by an electrostatic field.	Suggest how objects may become electrostatically charged.
	Recognise that static electricity is a common phenomenon.	Know that static charge can have different effects.	Know the two types of static charge.	Explain how electron transfer can result in either type of charge.	Explain the operation of a circuit using the idea of electrons moving from the negative to the positive terminals of a power supply.
	Recognise that static electricity is a common phenomenon.	Recognise that friction can cause static electricity.	Describe how friction between objects may cause electrostatic charge through the transfer of electrons.	Explain various examples of electrostatic charge; use ideas of electron transfer to explain different effects.	Explain why some electrostatic charge mechanisms are more effective than others.
	Recognise that electricity is an essential necessity of today's life.	Give examples if appliances that need electricity to function/	Recognise that electricity is generated in a variety of ways.	Describe advantages and disadvantages of various ways of generating electricity.	Use data to evaluate social, economic and environmental consequences of a particular way of generating electricity.
	Recognise that electricity is an essential necessity of today's life.	Recognise that some ways of producing electricity are environmentally better than others.	Give examples of renewable and non-renewable energy resources.	Explain the advantages and disadvantages of renewable and non-renewable energy resources.	Explain the challenges involved in moving towards a more renewable energy supply system.

## MASTERY CURRICULUM STATEMENTS

Topic	Emerging	Developing	Securing	Mastering	Mastering*
<b>B2</b>	Recognise that all living things depend on one another to survive.	State that a food chain shows how each living thing gets food for energy.	Describe and give examples of a simple food web.	Define producers, consumers and decomposers and give examples of each in different food webs.	Describe how changes in the population of one organism can influence other organisms in the food web.
	Recognise that bees are vital in pollinating fruit crops.	Describe what pollination is.	Describe the role of insects in fruit crop production.	Explain why artificial pollination is used for some crops.	Explain what is meant by 'food security' and explain the risks posed by monoculture on food security.
	Recognise that organisms are not isolated in their environment.	Recognise that all organisms cause changes in the environment where they live.	Recall ways in which organisms can affect their environment.	Explain how changes in predator and prey populations affect each other.	Use data and models to predict changes to predator and prey populations based on their interdependence.
	Recognise that chemicals are used in agriculture.	Recognise artificial fertilisers, insecticides and pesticides as chemicals used in agriculture.	Give examples of toxins and describe how toxins pass along a food chain.	Explain how toxins accumulate in food chains.	Evaluate the advantages and disadvantages of using pesticides.
	Recognise that the different parts of plants have a specific role.	Recognise flowers as the reproductive organs of flowering plants.	Describe the roles of different parts of a flowering plant in reproduction.	Explain the differences in wind-pollinated and insect-pollinated plants.	Discuss the strengths and weaknesses of wind pollination and insect pollination.
	Recognise that bees are vital in pollinating fruit crops.	Describe what pollination is.	Recognise that pollination and fertilisation are both part of plant reproduction but are two different processes.	Describe the stages of fertilisation in plants, including the role of the pollen tube.	Describe the fate of flower structures following fertilisation and the formation of seeds and fruit.
	Recognise that seeds are important in plant reproduction.	Describe how dispersal of seeds allow plants to colonise new areas.	Recognise different seed-dispersal methods and relate these to the structures of the seeds.	Identify key variables that need to be controlled when investigating the effect of seed design on seed dispersal.	Explain the advantages and disadvantages of different seed-dispersal mechanisms.

## SCIENCE KS3 – YEAR 8

### MASTERY CURRICULUM STATEMENTS

Topic	Emerging	Developing	Securing	Mastering	Mastering*
<b>P3</b>	Recognise that energy is essential to life.	State how we get energy in our bodies.	Describe how jobs get done, using an energy model where energy is transferred from one store to another.	Explain that energy is transferred from one store to another when change happens.	Explain that all changes, physical or chemical, result in a transfer of energy.
	Recognise that energy is essential to life.	Recognise that energy can be stored.	Recall that energy is measured in joules.	Explain that it is sometimes better to measure energy in kilojoules or kilowatt hours.	Carry out calculations of quantities of stored and transferred energy.
	Recognise that energy is essential to life.	Recognise that energy can be stored, but transferred from one store to another.	Describe what is meant by rate of energy transfer.	Identify the rate at which electrical appliances transfer energy (their power rating), using the correct units (watts and kilowatts).	Compare rates of energy transferred when electrical appliances are used.
	Recognise that appliances have a certain power rating.	Recognise that the higher the power of an appliance, the quicker energy is transferred.	Use the power rating of an appliance to calculate the amount of energy transferred.	Compare the energy uses of different appliances.	Calculate the cost of energy usage: cost = power (kW) x time (hours) x cost (pence per kWh).
	Recognise that energy is essential to life.	Recognise that energy can be stored, but transferred from one store to another.	Recognise that energy is transferred by a range of different processes.	Interpret and draw energy transfer diagrams for a range of different energy transfers.	Use Sankey diagrams to explain a range of energy changes and demonstrate that all energy is always accounted for.
	Recognise that energy is essential to life.	Recognise that energy can be stored, but transferred from one store to another.	Identify simple energy transfers that involve gravitational potential, elastic, kinetic, thermal and chemical energy.	Explain how energy is transferred using elastic, chemical and gravitational potential energy.	Analyse changes in gravitational potential energy in different situations.
	Recognise that sometimes appliances release heat, sound or light to the surroundings, and that these are not useful.	Give examples of dissipated energy.	Identify how appliances that transfer energy result in some energy being dissipated, reducing the useful energy.	Suggest ways in which energy dissipation in a process could be reduced.	Suggest ways in which a home energy bill could be reduced.
	Recognise that energy is essential to life.	State how we get energy in our bodies.	Understand that food is a fuel.	Explain that food labels provide information about the different amounts of energy in various foods.	Explain that energy is transferred from the chemical energy store when we perform physical activities.
	Recognise that a force can transfer energy.	Recognise that work is done when a force is used to transfer energy.	Explain how work done is related to force and distance.	Compare work needed to move objects different distances.	Calculate work done from force applied and horizontal distance moved.
	Recognise that a force can transfer energy.	Recognise that work is done when a force is used to transfer energy.	Know that work done is measured in joules.	Explain that doing work involves the transfer of energy.	Explain how different situations in which work is done involve different amounts of energy being transferred.
	Recognise that there are different types of machines.	Recognise that machines make work easier, as they reduce the force needed.	Identify input and output forces from machines and know that they make work easier by reducing the force needed.	Explain using a diagram how a lever makes a job easier.	Compare and contrast different levers in terms of forces required and distances moved.
	Recognise that there are different types of machines.	Recognise that machines make work easier, as they reduce the force needed.	Recognise levers, pulleys and wheels as examples of machines.	Identify how different types of machines make work easier.	Suggest which type of machine would be suitable to make work easier in a particular context.

## MASTERY CURRICULUM STATEMENTS

Topic	Emerging	Developing	Securing	Mastering	Mastering*
<b>C3</b>	Recognise the Earth as a big planet, made up of different types of material.	State the layers of the Earth.	Name the layers that make up the Earth and recall that the Earth's surface is made of plates that move about.	Describe the characteristics of each layer of the Earth and recall that tectonic plates move very slowly.	Explain that earthquakes, volcanic eruptions and the formation of mountains can happen where tectonic plates meet; explain how volcanic activity changes the surface of the Earth.
	Recognise the existence of different types of rocks.	Recognise that rocks can be grouped together based on their appearance, such as whether they have grains or crystals.	Describe how igneous, sedimentary and metamorphic rocks are formed; give examples and describe how they can change from one type to another.	Describe the features and properties of different types of rocks, including crystals in igneous rocks, recrystallization in metamorphic rocks and layers (burying fossils) in sedimentary rocks.	Explain the processes involved in the rock cycle and link these to how the rocks are formed.
	Recognise that Earth's rocks are continually changing.	Recognise that Earth's rocks are continually changing due to weathering, erosion and large Earth movements.	Describe what is meant by weathering and erosion.	Identify causes of weathering and erosion.	Explain how weathering and erosion affect rocks.

## MASTERY CURRICULUM STATEMENTS

Topic	Emerging	Developing	Securing	Mastering	Mastering*
B3	Recognise that living things are classified into broad groups according to observable characteristics, similarities and differences.	Give examples of groups of living things and the criteria for the specific grouping.	Identify some features of different organisms of the same species.	Explain the difference between continuous and discontinuous variation.	Use data to explain whether variation is continuous or discontinuous and to investigate correlations between varying features.
	Recognise that the millions of plants and animals on Earth are all different from each other.	Give examples of variation between species.	Identify examples of variation caused by inheritance and of variation caused by the environment in which the organism lives.	Explain how a mix of genes from our parents means that siblings are different.	Discuss the relationship between inherited features and the environment, and describe how many features are caused by a combination, with examples.
	Recognise that the millions of plants and animals on Earth are all different from each other.	Give examples of variation between species and between individuals.	Recognise that variation within a species can help that species to survive.	Use examples to describe how variation within a species can be an advantage if the environment changes.	Make predictions about changes within a species to changes to external conditions.
	Recognise the need for a male and a female reproductive systems.	Describe the male gamete as the sperm cell.	Name the main parts of the male human reproductive system.	Describe the structures and functions of the main parts of the male human reproductive system; describe how fertility problems may arise.	Explain how the male reproductive structures are designed for fertilisation; describe methods to combat infertility.
	Recognise the need for a male and a female reproductive systems.	Describe the female gamete as the egg cell.	Name the main parts of the female human reproductive system.	Describe the structures and functions of the main parts of the female human reproductive system; describe how fertility problems may arise.	Explain how the female reproductive structures are designed for fertilisation; describe methods to combat infertility.
	Recognise that a foetus changes during pregnancy.	Recognise that a foetus originates from the union between a male and a female sex cells.	Recall the stages in development as a change from a single fertilised egg to an embryo and foetus.	Compare the growth of the foetus at different stages. Describe the role of the mother in protecting the developing foetus.	Describe the functions of different supporting structures of the mother.
	Recognise that a foetus cannot take in its own food and oxygen, and relies on the mother to supply it with essential chemicals and nutrients.	Recognise the placenta as the organ that allows the foetus to receive all that they need.	Identify substances passed on from a mother that will either help or harm her developing foetus.	Describe how substances pass to and from a developing foetus and describe the effects of different factors on a developing foetus.	Apply knowledge of effects of substances on advice given to pregnant women, considering validity of evidence.
	Recognise that there are substances that can be harmful to the unborn baby.	Describe how what we now know about smoking is different from what people knew until the 1950s.	Identify bias in a claim and link it to claims about smoking in pregnancy.	Explain what it means to critique a claim, and give examples of evidence to support a claim about the effects of smoking in pregnancy.	Justify an opinion about smoking in pregnancy using evidence to support the opinion and to defend against an alternative opinion.

## MASTERY CURRICULUM STATEMENTS

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<b>P4</b>	Know that objects can present varied temperatures.	Know what is used to measure temperature, and the units for it.	Know that thermal energy store is the amount of energy stored in a material due to the vibration of its particles.	Know that the thermal energy store of an object depends upon its mass, temperature and material.	Explain why an object's temperature may change if it is heated or cooled.
	Know that objects can present varied temperatures.	Recognise that thermal energy can be transferred from one object to another.	Know that when there is a temperature difference, energy is transferred from the hotter to the cooler object.	Use ideas about energy transfer to explain observations about changing temperature.	Explain what a temperature/time graph shows about the energy transferred.
	Know that objects can present varied temperatures.	Recognise that thermal energy can be transferred from one object to another.	Know that energy is transferred through different pathways, by particles in conduction and convection, and by radiation.	Explain how a particular type of insulation works in terms of conduction, convection and radiation.	Compare and contrast the transfer of energy by conduction, convection and radiation.
	Know that objects can present varied temperatures.	Recognise that thermal energy transfer relates to the movement of particles.	Describe how particles in a fluid move when heated.	Explain how convection results in energy being transferred.	Explain, using diagrams, how convection currents flow in unfamiliar situations.
	Recognise that some materials are better at transferring thermal energy.	Describe what insulators and conductors are.	Explain the difference between conductors and insulators in relation to how quickly energy travels through them.	Explain how to prevent energy loss by conduction, convection and radiation.	Evaluate a claim about the effectiveness of insulation in a particular context.

## MASTERY CURRICULUM STATEMENTS

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C4	Recognise that materials can be grouped based on their properties such as hardness, solubility, conductivity and response to magnets.	Recognise that many useful materials, including plastics, wood and metals, have uses that exploit their properties.	Identify some common properties of metal elements and non-metal elements and their uses.	Classify metals and non-metals using their properties.	Identify similarities and differences between metals and how these relate to their uses; compare and contrast properties of metals and non-metals.
	Recognise that changes occur when materials are mixed.	Describe a chemical reaction as a change in which new products are made.	Identify oxidation reactions.	Explain why oxidation is a reaction.	Use models and word equations to explain changes during oxidation reactions.
	Recognise that changes occur when materials are mixed.	Describe a chemical reaction as a change in which new products are made.	Give uses of displacement reactions.	Use models to explain displacement and relate it to the reactivity series.	Write word equations to represent displacement reactions.
	Recognise that materials can be grouped based on their properties.	Recognise that some acids and alkalis can be dangerous, but others can be useful.	Identify some everyday substances that contain acids and alkalis.	Explain what all acids have in common and what all alkalis have in common.	Evaluate the hazards posed by some acids and alkalis and know how these risks may be reduced.
	Recognise the importance of identifying chemical substances.	Describe an indicator as a substance that has different colours in an acid and in an alkali.	Give an example of an indicator and state why indicators are useful.	Explain what an indicator is and analyse results when using an indicator.	Compare the effectiveness of different indicators.
	Recognise that 'neutralise' is equivalent to 'cancel out'.	Describe that neutralisation is a chemical reaction where an acid and alkali are mixed together.	Describe some examples of neutralisation.	Describe the changes to indicators when acids and alkalis are mixed.	Explain the changes to indicators in terms of pH when acids and alkalis are mixed.
	Recognise that 'neutralise' is equivalent to 'cancel out'.	Describe that neutralisation is a chemical reaction where an acid and alkali are mixed together.	Recognise that water is one product of neutralisation.	Explain the formation of salt and water during neutralisation, giving some examples of common salts.	Predict the reactants or products of different neutralisation reactions.
	Recognise that 'neutralise' is equivalent to 'cancel out'.	Describe that neutralisation is a chemical reaction where an acid and alkali are mixed together.	Describe what indigestion remedies are and explain how they work.	Design an investigation to compare the effectiveness of indigestion remedies.	Analyse data about indigestion remedies to decide which remedy is the most effective.

## MASTERY CURRICULUM STATEMENTS

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P5	Recognise that if we push and pull the end of a slinky, or we throw a pebble onto a lake, we make waves..	Recognise that waves can be different.	Recognise the difference between longitudinal and transverse waves.	Describe the properties of different transverse and longitudinal waves.	Compare and contrast properties of sound waves, waves in water and light waves.
	Recognise that if we push and pull the end of a slinky, or we throw a pebble onto a lake, we make waves..	Recognise that light and sound are examples of waves.	Recall that energy is transferred by waves.	Explain that some waves carry more energy than others.	Relate ideas about some waves carrying more energy to frequency and amplitude.
	Recognise that sounds are vibrations.	Recognise that sound waves transfer energy.	Recognise that sound energy is transferred by waves and describe how sound waves are made in different situations.	Explain how longitudinal waves carry sound. Relate the terms frequency, wavelength and amplitude to sounds.	Interpret and devise wave diagrams to represent different sounds of different frequency and amplitude.
	Recognise that sounds are only possible when a vibration occurs.	Recognise that sound waves transfer energy, but particles are needed for the sound to travel through.	Know that sound consists of vibrations in a medium.	Know that sound travels faster in some media than others.	Understand that the denser the medium, the faster the sound travels.
	Recognise that sounds are only possible when a vibration occurs.	Recognise that sound waves transfer energy, but particles are needed for the sound to travel through.	Recognise an echo as a reflection of sound.	Recognise that some materials are good at reflecting sound and others can absorb it.	Explain what is meant by reflection and absorption of sound.
	Recognise that sounds are vibrations.	Recognise that sound is an example of a wave.	Know that sound can be represented by a waveform.	Explain how the waveform represents the amplitude and wavelength of the sound.	Interpret waveforms for different sounds.
	Recognise that sounds are vibrations.	Recognise that the human ear relies on a combination of processes and mechanisms.	Understand that we hear sound because of vibrations travelling through a medium.	Explain that we can hear a certain range of frequencies.	Suggest how various ear problems might affect a person's hearing.
	Recognise that sounds are vibrations.	Recognise that the human ear relies on a combination of processes and mechanisms.	Describe the effect that changing the frequency has on sound.	Understand that human ears can detect a certain range of frequencies.	Explain the difference between sound and ultrasound.
	Recognise that light carries energy.	Recognise that light can pass through some materials and be blocked by others.	Recognise that light can be reflected by some materials and absorbed by others.	Explain the differences between transparent, translucent and opaque materials.	Use diagrams to explain the difference between specular reflection and scattering.
	Recognise that light travels as waves.	Recognise that light waves travel in a straight line.	Describe the ray model of light, using the idea that light travels in straight lines.	Explain the difference between reflection and refraction, and describe what happens when light waves are refracted.	Use ray diagrams to explain reflection and refraction.
	Recognise that light carries energy.	Recognise that light travels as waves.	Use the conventions of a ray diagram correctly.	Use a ray diagram to show what happens when light is reflected.	Use a ray diagram to show what happens when light is refracted.
	Recognise the eyes as the organs that allow us to see.	Recognise that our eyes adjust to different light and/or at a different distance.	Recognise convex and concave lenses.	Explain how convex and concave lenses affect light.	Explain how lenses can be used to correct defects of vision.
	Recognise the rainbow as a process that involves sunlight and droplets of water.	Recognise that sunlight is made up of light waves of different wavelengths.	Describe the formation of a spectrum from white light.	Explain how white light can be split into a continuous spectrum of colours, called the visible spectrum.	Use the concepts of reflection and absorption of light to explain why some materials (transparent, translucent and opaque) are coloured.
	Recognise that light carries energy.	Recognise that light can pass through some materials and be blocked by others.	Explain how shadows are formed.	Explain how solar and lunar eclipses occur.	Explain why eclipses may be total or partial.
	Recognise the rainbow as a process that involves sunlight and droplets of water.	Recognise that sunlight is made up of light waves of different wavelengths.	Describe how light of different colours varies in terms of frequency.	Explain how various colours can be obtained by using the three primary colours.	Explain how the colour of an object is affected by the colour of light it is illuminated with.
	Recognise the rainbow as a process that involves sunlight and droplets of water.	Recognise that sunlight is made up of light waves of different wavelengths.	Describe the effect that changing the frequency has on the colour of light.	Understand that human eyes can detect a certain range of frequencies.	Explain how ultraviolet differs from visible light.

## MASTERY CURRICULUM STATEMENTS

Topic	Emerging	Developing	Securing	Mastering	Mastering*
<b>B4</b>	Recognise that animals, including humans, need air to survive.	Describe the mechanism of breathing as taking air in and out of our lungs.	Recall that the ribs and diaphragm bring about breathing.	Describe how movement of the ribs and diaphragm bring about breathing and describe the changes in volume of the chest.	Explain how changes in pressure in the chest bring about breathing.
	Recognise that animals, including humans, need air to survive.	Recognise that the air around us contain oxygen.	Define gas exchange and describe why it is needed in the lungs.	Identify features of the gas exchange system in humans.	Explain how parts of the gas exchange system are adapted to their function and distinguish between breathing and respiration.
	Recognise that animals, including humans, need air to survive.	Recognise that the breathing system can be affected by both lifestyle choices and disease, and give examples.	Describe the physical effects of disease and lifestyle on the breathing system, such as the effects of asthma and smoking.	Explain the physical effects of disease and lifestyle on the breathing system, such as the effects of asthma and smoking.	Describe how our understanding of the effects of smoking have changed over time and explain the role of bias in the process.
	Recognise that humans need food to survive.	Recognise that nutrients from digestion are transported round the body in the blood.	Recall the components of a healthy diet and know that it is unhealthy to eat too much or too little.	Describe the role of some of the components of a healthy diet and name examples of deficiency diseases.	Describe the causes and effects of some deficiency diseases and suggest possible treatments and preventions. Describe the components of a healthy diet.
	Recognise that humans need food to survive.	Recognise that the amount of food needed differs from person to person.	List different groups of people who need different amounts of energy.	Compare the energy requirements of different people such as men and women, the elderly and pregnant women.	Explain why different people have different energy requirements and suggest how they could meet these.
	Recognise that humans need food to survive.	Recognise that each part of our digestive system has a different job to do.	Define digestion and name and locate the organs of the digestive system.	Describe the importance of digestion and describe the role of the organs of the digestive system, including the role of bacteria and enzymes.	Describe adaptations of parts of the digestive system, such as the small intestine and oesophagus and describe what happens to the small molecules following digestion.

## MASTERY CURRICULUM STATEMENTS

Topic	Emerging	Developing	Securing	Mastering	Mastering*
C5	Recognise that the Earth is surrounded by gases.	Describe the atmosphere as the gases around the Earth.	Name the main gases in the atmosphere and describe the composition of the atmosphere.	Describe how the gases in the atmosphere, and their relative proportions, have changed over time.	Explain how plants and then animals have changed the atmosphere over time using different processes.
	Recognise that living organisms depend on resources provided by the planet.	Recognise that humans change the environment where they live.	Identify natural resources that the Earth provides.	Explain how human activities limit or damage resources.	Compare the advantages and disadvantages of a human activity in terms of its impact on the environment and suggest whether or not it should be allowed.
	Recognise that global warming is a serious problem of our current times.	Describe what global warming is.	Explain how global warming affects living organisms.	Suggest why scientists have different opinions about global warming and its effects.	Evaluate the arguments for and against human activities enhancing the global warming effect.
	Know that carbon is an important element on Earth.	Recognise that human activities interfere with the carbon on Earth.	State examples of natural activities that involve reactions with carbon.	Describe the carbon cycle as natural recycling and name the different ways that carbon enters and leaves the atmosphere.	Explain how each stage of the carbon cycle affects the amount of carbon in the atmosphere.
	Know that carbon is an important element on Earth.	Recognise that human activities interfere with the carbon on Earth.	State examples of human activities that involve reactions with carbon.	Explain how human activities that involve reactions with carbon may damage the environment.	Evaluate ways of reducing the negative impact of human activities on the environment.
	Recognise that global warming is a serious problem of our current times.	Describe what global warming is.	Identify greenhouse gases.	Explain the effect of greenhouse gases on the environment.	Suggest the various impacts of reducing greenhouse gas emissions.
	Recognise that humans depend on resources provided by the planet.	Identify natural resources that the Earth provides.	State examples of metals that need to be extracted from ores.	Explain how metals can be extracted from their ores.	Evaluate the case for recycling particular metals.
	Recognise that humans have an effect on the ecosystem.	Recognise recycling as the collection and processing of waste materials to make new products.	Name some materials that can be recycled.	Describe the benefits of recycling.	Identify limitations of recycling.

## MASTERY CURRICULUM STATEMENTS

Topic	Emerging	Developing	Securing	Mastering	Mastering*
<b>B5</b>	Recognise that our body needs energy.	Recognise respiration as the process that allows us to obtain the energy we need.	Describe the purpose of respiration.	Describe and explain the process and purpose of respiration, including using an equation.	Explain the role of respiration in building up complex molecules.
	Recognise that our body needs energy.	Recognise respiration as the process that allows us to obtain the energy we need.	Define anaerobic respiration and give examples of sports that use anaerobic respiration.	Explain why some sports rely mainly on aerobic respiration while others require anaerobic respiration.	Describe and explain the effects on the body of anaerobic respiration and explain 'oxygen debt'.
	Recognise that living things need energy.	Recognise respiration as the process that allows all living things to obtain the energy we need.	Identify some living things that carry out anaerobic respiration.	Describe some applications of anaerobic respiration (fermentation).	Analyse data linked with a fermentation investigation and suggest improvements.
	Recognise that plants cannot take in food as animals do.	Recognise that plants make their own food.	State that green plants need sunlight to grow and to make food.	Identify water and carbon dioxide as the raw materials for photosynthesis, and glucose and oxygen as the products.	Explain the chemical changes involved in photosynthesis and the roles of light and chlorophyll.
	Recognise leaves as organs of plants.	Recognise that leaves have a complex structure that allows them to photosynthesise and make glucose.	Describe how gases enter and leave a leaf and how light energy for photosynthesis is captured.	Describe how cells in the leaf and root are adapted for their functions.	Relate and explain how the structure of palisade, mesophyll and guard cells allows them to perform their function.
	Recognise that plants make their own food.	Recognise photosynthesis as the process that leads to the production of glucose.	Describe how levels of light, temperature and carbon dioxide affect the rate of photosynthesis.	Explain how levels of light, temperature and carbon dioxide affect the rate of photosynthesis.	Apply learning about the factors affecting photosynthesis to solve problems.
	Recognise that plants need minerals to grow.	Recognise that minerals are taken in by the roots.	Name some of the nutrients needed by plants and supplied by fertilisers; state how they enter the plant dissolved in soil water.	Explain why nutrients are needed by plants, how spreading manure adds them to the soil and how water passes through the plant.	Explain how mineral deficiencies affect plants and how different factors affect the rate of transpiration.

## SCIENCE KS3 – YEAR 9

### MASTERY CURRICULUM STATEMENTS

Topic	Emerging	Developing	Securing	Mastering	Mastering*
P6	Recognise that magnetic forces act at a distance.	Recognise that a magnet produces a magnetic field.	Represent magnetic fields using lines to show strength and direction.	Use field lines to help explain how the field around a magnet varies.	Predict the pattern of field lines between two magnets placed near each other.
	Recognise that magnetic forces act at a distance.	Recognise that a magnet produces a magnetic field.	Explain how the force on a magnetic object is related to the strength of the magnet.	Explain how the force on a magnetic object is related to the distance from the magnet.	Predict the effect of a magnetic field on a magnetic object placed in or rolled through the field.
	Recognise that magnets have two poles.	Describe if two magnets will attract or repel each other, depending on which poles are facing.	Describe the forces between like poles and between unlike poles.	Explain how a compass responds to the Earth's magnetic field.	Explain how the Earth's magnetic field can be used to aid navigation.
	Recognise that magnetic forces act at a distance.	Describe an electromagnet as a temporary magnet.	Recognise that a current flowing through a wire causes a magnetic field.	Explain how the strength of the field depends upon the current flow, the material in the core and the number of coils.	Use a diagram to explain how to change the strength of an electromagnet.
	Recognise that magnetic forces act at a distance.	Describe an electromagnet as a magnet that depends on an electric current.	Explain the difference between permanent and non-permanent magnets.	Describe different applications of permanent magnets and electromagnets.	Compare and contrast the use of magnets and electromagnets in different applications, such as a circuit breaker.
	Recognise that magnetic forces act at a distance.	Describe an electromagnet as a magnet that depends on an electric current.	Describe how to test the strength of a magnet and an electromagnet.	Design investigations to compare different methods of making magnets and testing the strength of electromagnets.	Explain the variables that affect the strengths of magnets and electromagnets.

## MASTERY CURRICULUM STATEMENTS

Topic	Emerging	Developing	Securing	Mastering	Mastering*
C6	Recognise a chemical reaction as a process that leads to the formation of new chemicals.	Recognise that energy is involved in chemical reactions.	Describe what is meant by the term exothermic reaction, with examples.	Explain the energy changes taking place during an exothermic reaction.	Use energy-level diagrams to compare the energy in the reactants and products of exothermic reactions, explaining the energy changes in the particles.
	Recognise a chemical reaction as a process that leads to the formation of new chemicals.	Recognise that energy is involved in chemical reactions.	Describe what is meant by the term endothermic reaction, with examples.	Explain the energy changes taking place during an endothermic reaction.	Use energy-level diagrams to compare the energy in the reactants and products of endothermic reactions, explaining the energy changes in the particles.
	Recognise a chemical reaction as a process that leads to the formation of new chemicals.	Recognise that energy is involved in chemical reactions.	Describe the endothermic reaction that takes place in a cold pack.	Plan an investigation including selecting a range of values and intervals.	Design a suitable results table and draw a suitable graph to investigate a correlation.
	Recognise that energy is involved in chemical reactions.	Recognise that many chemical reactions are too slow to allow our survival.	Describe what a catalyst is and give examples.	Interpret data to explain how a catalyst affects a reaction.	Explain how a catalyst works.
	Recognise that some changes are reversible and others are irreversible.	Recognise that some changes are physical, and others are chemical.	Identify changes during a reaction, relate these to reactants and products.	Make accurate observations, explain them using a simple model and a word equation and explain differences between chemical and physical changes in terms of atoms.	Explain observations using word equations, relate chemical symbols to a simple particle model and use the correct terms and simple models to explain the differences between chemical and physical changes.
	Recognise that fuels are used to release energy.	Give examples of fuels.	Identify fuels used in different applications.	Carry out an experiment to compare the energy in different fuels.	Analyse data linked with the energy content of different fuels and make a conclusion.
	Recognise a chemical reaction as a process that leads to the formation of new chemicals.	Recognise combustion and thermal decomposition as chemical reactions.	Identify combustion and thermal decomposition reactions.	Explain why combustion is a chemical reaction; explain the differences between oxidation and thermal decomposition.	Use models and word equations to explain changes during combustion and thermal decomposition reactions.
	Recognise a chemical reaction as a process that leads to the formation of new chemicals.	Recognise combustion and thermal decomposition as chemical reactions.	Summarise the reactants and products of complete combustion.	Compare the reactants and products of complete and incomplete combustion.	Explain the Law of Conservation of Mass and how it can be proven.

## MASTERY CURRICULUM STATEMENTS

Topic	Emerging	Developing	Securing	Mastering	Mastering*
<b>P7</b>	Recognise speed as how fast something is moving.	Recognise that speed depends on time and distance.	Explain how to find the speed of an object.	Explain the concept of speed and how the formula for speed is derived.	Apply understanding of the speed formula to explain how speed cameras work.
	Recognise speed as how fast something is moving.	Describe that speed is measured in units such as metres per second and kilometres per hour.	Collect data about distance travelled and time taken for different journeys.	Present data collected or given as distance-time graphs.	Construct distance-time graphs for complex journeys.
	Recognise that speed depends on time and distance.	Identify, on a distance-time graph, when an object is stationary or moving.	Describe features of distance-time graphs.	Analyse distance-time graphs to describe an object's movement at different stages in a journey.	Explain distance-time graphs for complex journeys, including where and object travels at different speeds and accelerates at different rates.
	Recognise that speed depends on time and distance.	Describe relative motion as the comparison of the movement of two objects.	Describe a situation where objects are travelling at different speeds.	Apply the idea of relative speed to two objects involved in overtaking or collision.	Apply the concept of relative motion to several moving objects in a variety of situations.
	Recognise that forces can be applied to objects.	Compare sizes and directions of different forces applied to an object.	Recall that if the forces on an object cancel out that it is in equilibrium.	Explain that if the resultant force is zero, the object will remain at rest or continue to travel in a straight line at a steady speed.	Apply ideas about resultant forces and equilibrium to unfamiliar contexts.

## MASTERY CURRICULUM STATEMENTS

Topic	Emerging	Developing	Securing	Mastering	Mastering*
<b>B6</b>	Recognise that organisms of a certain species have changed over time.	Give examples of changes in organisms.	Describe why species change over time and give examples.	Describe the Theory of Natural Selection in evolution and explain the role of variation within a species and competition for resources.	Describe some of the work of Charles Darwin and explain how it supports the theory of evolution.
	Recognise that there are millions of different species on Earth.	Give examples of the different groups of individuals.	Define biodiversity in terms of numbers of different species and in terms of variation within species.	Describe the importance of high biodiversity in preserving species and in preserving resources for humans.	Explain the effects of a lack of biodiversity on an ecosystem.
	Recognise that some species are no longer existent.	Recognise the importance of fossils in finding out about extinct species.	Define extinction and describe some causes of extinction.	Describe how we can prevent extinction, for example, using gene banks and captive breeding.	Describe a theory to explain the extinction of dinosaurs and suggest how evidence is used to support the theory.
	Recognise that individuals are different because of information contained in their cells.	Recognise the nucleus as the organelle that contains the genetic information.	Describe chromosomes and their role in transferring hereditary information to offspring.	Explain the relationship between chromosomes, genes and DNA; explain why offspring of the same parents may look very different.	Explore the role of scientists in the discovery of DNA and evaluate the relative importance of their contributions.
	Recognise that individuals are different because of information contained in their cells.	Recognise that the genetic makeup of an individual depends on the gametes from both parents.	Describe how fertilised egg cells contain half of the chromosomes from each parent with a random mix of genetic information from each parent.	Explain how every new individual produced by sexual reproduction is genetically unique.	Explain the impact of slight 'changes' to DNA passed on from parents to offspring.
	Recognise that individuals are different because of information contained in their cells.	Recognise that the genetic makeup of an individual depends on the gametes from both parents.	Recognise that we have different versions of genes and define dominant and recessive.	Recall the stages in using a genetic diagram to explore variation in offspring for a particular trait.	Use genetic diagrams to predict the probability of offspring inheriting a particular characteristic and describe a use in genetic counselling.

## MASTERY CURRICULUM STATEMENTS

Topic	Emerging	Developing	Securing	Mastering	Mastering*
P8	Recognise that objects are subject to forces.	Recognise gravity as a force.	Identify gravity as a pulling force and recognise that mass and weight are not the same.	Describe what is meant by mass, explain how gravity forces affect weight, explain why weight varies from planet to planet and explain the term 'weightless'.	Explain weight as a gravitational attraction between masses which decreases with distance; explain the difference between mass and weight.
	Recognise that objects are subject to forces.	Recognise gravity as a force.	Identify gravity as a non-contact force.	Explain the difference between contact and non-contact forces.	Compare gravity with other forces.
	Recognise that objects are subject to forces.	Recognise gravity as a force.	Recall the units of mass and force.	Recall the units of gravitational field strength.	Explain why gravitational field strength has those units.
	Recognise weight as a force.	Describe weight and mass.	Explain how mass affects weight.	Use the formula $\text{weight} = \text{mass} \times \text{gravitational field strength}$ to determine weight.	Use the formula $\text{weight} = \text{mass} \times \text{gravitational field strength}$ to determine mass.
	Recognise weight as a force.	Describe weight and mass.	Explain what causes an object to have weight.	Describe how gravity affects the weight of an object.	Explain the relationship between gravitational field and the weight of an object.
	Recognise weight as a force.	Describe weight and mass.	Describe how an object's weight can vary.	Predict how an object's weight would vary depending on its position in relation to large bodies such as planets.	Use the concept of a gravitational field to explain various phenomena, including the orbits of planets around stars.
	Recognise that the Earth moves around the Sun and around itself.	Recognise that the Earth's rotation defines the day length.	Describe the relative motion of the Earth, Moon and Sun.	Explain how the motion of the Earth relative to the Sun causes day length and year length.	Explain how the relative motion of the Earth, Moon and Sun affects how we see objects from the Earth.
	Recognise that the Earth moves around the Sun and around itself.	Recognise that the Earth's rotation defines the day length.	Explain how the Earth is tilted upon its axis.	Explain how the tilt of the Earth on its axis causes seasonal changes.	Explain the effects of the tilt on a planet's axis being greater or less.
	Recognise that the Earth is very far from the Sun.	Describe light year as the unit to measure distances across the Universe.	Recall the time taken for light to reach Earth from the Sun and from the next nearest star.	Explain the choice of units used for measuring distances in space.	Explain how observations of stars are affected by the scale of the Universe.
	Recall that the Sun is our nearest star.	Recognise that there is an unimaginable number of other stars in the Universe.	Describe what a galaxy is.	Explain what has been learned from the observation of galaxies.	Explain the importance of the discovery of exoplanets.