

	Emerging a student whose understanding of the Y8 Science skills is still emerging will be able to:	Developing a student who is developing their Y8 Science skills will be able to:	Secure a student who is secure in the skills in the Y8 Science curriculum will be able to:	Mastered a student who has mastered the skills in the Y8 Science curriculum will be able to:
Book 2, Chapter 3 Explaining physical changes	Represent particles as circles. Understand that a theory starts as an idea. Label a diagram with correct changes of state. Understand that hot air rises. Identify some objects that float and some that sink. Identify solutions as more or less concentrated. Understand that smells can spread across a room. Identify whether a chemical reaction has taken place.	Compare the properties of solids, liquids and gases. Recognise how theories are developed. Use correct terminology and the particle model to describe changes of state, including evaporation. Describe how solids, liquids and gases behave when heat is applied to them. Describe a model that can be used to represent particles. Make predictions about floating and sinking using ideas about density. Describe what is meant by the terms 'concentration' and 'pressure'. Describe how diffusion occurs in liquids and gases. Describe features of physical and chemical changes, recognising how mass is	Draw circle diagrams to demonstrate the differences between the arrangement of particles in solids, liquids and gases, and describe their different properties. Use observations to develop hypotheses. Interpret and explain data relating to melting and boiling points. Describe applications and problems caused by thermal expansion. Apply and adapt models to make them more suitable for use. Use the particle model to explain the density differences between gases and calculate density of solids. Calculate concentrations of solutions. Explain observations relating to diffusion in terms of particles. Use ideas about particles to describe	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. Change hypotheses in the light of new evidence and use this evidence to develop theories. Use the particle model to explain latent heat and how impurities affect melting and boiling points. Use the particle model to explain expansion in solids, liquids and gases. Evaluate the strengths and limitations of particle models. Use the particle model to explain factors relating to density. Use ideas about particles to explain the effects of pressure. Make predictions, using ideas about particles, about factors affecting the rate of diffusion. Apply the particle model to explain physical and chemical changes, taking conservation of mass into account.

Book 2, Chapter 1 Getting the energy your body needs

Understand that our bodies are supported by a skeleton. Recognise that our skeleton is made of many bones joined together. Know that muscles can contract and relax. Understand that some muscles are stronger than others. Understand that chemical reactions in the body release energy. Identify what chemicals are needed for respiration. Understand that if you exercise with not enough oxygen your muscles will ache.

Identify the main bones of the skeleton. Describe the role of skeletal joints. Recall that muscles contract to move bones at joints. Investigate the strengths of different muscles and draw a conclusion. Describe some medical problems that can arise with the skeletal system. Describe the purpose of respiration. Describe aerobic respiration in plants. Describe where in a cell respiration takes place. Define anaerobic respiration and give examples of sports that use anaerobic respiration. Identify some living things that carry out anaerobic respiration and identify some applications.

Describe the functions of the skeleton. Identify some different joints and explain the role of tendons and ligaments in joints. Identify muscles that contract to cause specific movements. Plan and carry out an investigation to compare strengths of muscles and analyse the results using a graph. Describe some treatments for a range of problems with the skeletal system. Describe and explain aerobic respiration using a word equation. Identify evidence for aerobic respiration in plants and animals. Explain how mitochondria are adapted for respiration. Explain why some sports rely mainly on aerobic respiration while **others require anaerobic respiration**. Describe and explain some evidence to show the products of anaerobic respiration and plan an investigation into fermentation.

Explain how different parts of the skeleton are adapted to carry out particular functions. Compare the movement allowed at different joints and explain why different types of joints are needed. Explain how muscles work antagonistically to bring about movement and evaluate a model. Plan and carry out a fair investigation, analyse the data and evaluate the procedure. Explain how diagnosis and treatment of problems with the skeletal system have changed over time. Explain the role of respiration in building up complex molecules. Evaluate the quality of evidence for aerobic respiration in plants and animals. Analyse data to compare and explain the numbers of mitochondria in different cells. Describe and explain the effects on the body of anaerobic respiration and explain 'oxygen debt'. Plan an investigation to test a hypothesis about anaerobic respiration, analyse the data and evaluate the investigation.

**Book 2, Chapter 5
Exploring contact
and non-contact
forces**

Describe what a magnet does. Know that friction produces heat. Understand that static causes objects to stick together. Know that gravity is the force that stops us floating into space. Understand why polar bears have big feet. Identify objects that may float or that may sink.

Describe the attraction of unlike poles and repulsion of like poles; show how a magnetic field can be represented. Describe how friction between objects may cause electrostatic charge through the transfer of electrons. Describe the field around a charged object; describe some applications of static electricity. Describe the variation and effects of gravity on Earth and in space. Describe the causes and effects of varying pressure on and by solids. Describe the variation of pressure in liquids with depth and the effects of this. Suggest why some objects float and others sink. Describe how atmospheric pressure varies with height; state some implications of variations in pressure.

Identify magnetic attraction and repulsion as non-contact forces; explain how field lines indicate the direction and strength of forces. Explain various examples of electrostatic charge; use ideas of electron transfer to explain different effects. Use the idea of fields to explain various examples and applications of static electricity. Apply the concept of gravitational fields to explain the variation and effects of gravity on Earth and in space. Explain the effects of varying pressure on and by solids; calculate the pressure applied by a solid from the force applied and the contact surface area. Explain the variation of pressure with depth in liquids. Use the concepts of density, displacement and upthrust in explaining floating and sinking. Explain why atmospheric pressure varies with height; describe how the effects of pressure used and dealt with.

Apply and evaluate the concept of magnetic fields in various contexts. Explain why some electrostatic charge mechanisms are more effective than others. Compare and contrast useful and dangerous instances of static charge; compare electrostatic and magnetic fields. Apply the concept of gravitational fields in explaining gravitational effects on Earth and in space, including acceleration. Explain how force and area can be varied to alter the pressure applied. Identify the causes and implications of variation of pressure with depth. Apply ideas about density and upthrust to predict the outcomes of various situations. Identify some implications of pressure variation in situations such as weather patterns and high-altitude activities.

**Book 3, Chapter 1
Variation for
survival**

Identify some differences between species. Identify a feature that is inherited. Understand that humans breed cows to get lots of meat and milk. Identify what organisms compete for. Know that genetic information is found in the nucleus of a cell. Know that offspring get half their genetic information from their Mum and half from their Dad. Understand that clones are genetically identical to their parent. Understand that species can become extinct.

Give some examples of differences between similar species and explain how these are used to classify organisms. Identify some features of different organisms that are inherited and some that are determined by the environment in which the organism lives. Describe what selective breeding is and explain that it has produced new breeds of an organism. Identify examples of how variation causes competition for resources and causes natural selection. Describe chromosomes and their role in transferring heredity information to offspring. Describe how fertilised egg cells contain half of the chromosomes from each parent with a random mix of genetic information from each parent. Describe cloning as one parent producing new individuals and identify examples of cloning that occur naturally; describe natural cloning as asexual reproduction. Identify natural and humancaused environmental changes that have caused some spec

Explain the importance of the diversity of living organisms to life on Earth and why we have a common system for naming organisms. Explain the difference between continuous and discontinuous variation; explain why offspring from the same parents can be very different. Explain the process of selective breeding and why new breeds have been produced. Explore the theories of Lamarck, Wallace and Darwin, and explain their theories about why some organisms are better able to survive than others. Explain the relationship between chromosomes, genes and DNA; explain why offspring of the same parents may look very different. Explain how every new individual produced by sexual reproduction is genetically unique. Explain how artificial cloning is performed – for example in the creation of Dolly the sheep. Explain how the use of gene banks to preserve heredity material may prevent some endangered species from becoming extinct.

Explain how scientists can use the universal system of classification to research or discuss an organism and to understand ecological relationships between organisms. Use ideas and evidence to evaluate the importance of genetic and environmental variation. Explore and evaluate the advantages and disadvantages of selective breeding. Evaluate the impact of Darwin's theories on contemporary science. Explore the role of scientists in the discovery of DNA and evaluate the relative importance of their contributions. Explain the impact of slight 'changes' to DNA passed on from parents to offspring. Explore and evaluate the advantages and disadvantages of artificial cloning; compare and contrast asexual and sexual reproduction. Analyse and evaluate the available evidence to explain why the dinosaurs suffered mass extinction.

Book 2, Chapter 4
Explaining chemical change

Know that you have acids and alkalis in your house. Know that some chemicals change colour in acids and alkalis. Know that acids are opposite to alkalis. Know that water is not an acid or alkali. Understand that bubbles being produced show that a chemical reaction is taking place. Know that indigestion is often caused by a build-up of acid in your stomach. Know that a fuel needs heat and oxygen to burn. Know what gas is produced by combustion.

Identify some everyday substances that contain acids and alkalis. Give an example of an indicator and state why indicators are useful. Describe some examples of neutralisation. Recognise that water is one product of neutralisation. Describe the observations of reactions between acids and metal, and acids and carbonate, that tell us that a chemical change is taking place. Describe what indigestion remedies are and explain how they work. Summarise the reactants and products of complete combustion. Describe how combustion contributes to acid rain.

Explain what all acids have in common and what all alkalis have in common. Explain what an indicator is and analyse results when using an indicator. Describe the changes to indicators when acids and alkalis are mixed. Explain the formation of salt and water during neutralisation, giving some examples of common salts. Explain the general reaction between an acid and a metal, and between an acid and a carbonate, using generic equations. Design an investigation to compare the effectiveness of indigestion remedies. Compare the reactants and products of complete and incomplete combustion. Describe the effects of acid rain.

Evaluate the hazards posed by some acids and alkalis and how these risks may be reduced. Compare the effectiveness of different indicators. Explain the changes to indicators in terms of pH when acids and alkalis are mixed. Predict the reactants or products of different neutralisation reactions. Summarise specific reactions between acids and metals and between acids and carbonates using word equations and particle drawings. Analyse data about indigestion remedies to decide which remedy is the most effective. Explain the Law of Conservation of Mass and how it can be proven. Explain, using an equation, the effects of acid rain.

