

# Science

Key Stage Three Curriculum

KS3	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
7	Key ideas Chemistry and physics,	Key ideas Biology	Key ideas-Physics	Chemistry	Biology and chemistry	Chemistry
Core Knowledge:	<b>Particles</b>	<b>Cells</b>	<b>Energy Forces</b>	<b>Mixtures-</b>	<b>Reproduction- .</b> <b>Atoms</b>	<b>Periodic Table</b>
Core skills: Evaluation, Describe, explain etc	<b>Explain the processes of evaporation, condensation, diffusion, conduction and convection linked to particle model</b>	<b>Describe and explain the differences between types of cells, use of a microscope and how an organism functions.</b>	<b>Describe and explain advantages between renewable and non-renewable energy resources, energy changes in devices, draw Sankey diagrams and calculate efficiency. Explain how objects move linked to resultant forces, friction and Hooke's Law</b>	Name equipment used and describe practical methods to separate mixtures. Apply knowledge to a range of scenarios.	Define key terms linked to reproduction and atoms. Describe and explain function of male and female reproductive organs linked to fertilisation, gestation and birth. Describe, compare and evaluate theories of the atom. Use chemical equations to represent reactions.	Describe and explain differences in the Periodic table ideas. Predict and describe reactions of Group 1,7 and 0. Explain reactivity of Group 1,7 and 0
Title of Assessment Quiz.	<b>50QQ</b> <b>QWC</b>	50QQ QWC in progress test 1	50QQ QWC- progress test 2	50QQ QWC	50QQ	50QQ
Title of the Quality of Written Communication Task (QWC)	<b>QWC- Describe and explain how to work out the density of regular and irregular shape</b>	QWC- Progress test 1 Describe and explain how to make a slide of a cell sample	<b>QWC-Describe the advantages and disadvantages in using wind energy to generate electricity.</b>	QWC- Describe a method to identify colours in ink		Optional time permitting. QWC- Describe the reactivity in Group 1 and 7
Resources:	Glossary Booklet Knowledge Organiser	Glossary Booklet Knowledge Organiser	Glossary Booklet Knowledge Organiser	Glossary Booklet Knowledge Organiser	Glossary Booklet Knowledge Organiser	Glossary Booklet Knowledge Organiser
Examinations:			<b>Progress Test 1</b>			<b>Progress Test 2</b>

KS3	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2
8	Biology and chemistry	Biology	Physics	Chemistry	Chemistry	Biology
Core Knowledge:	<b>Food and nutrition</b> <b>Combustion-</b>	<b>Respiration, muscles, bones and fermentation</b>	<b>Electricity</b> <b>Waves</b>	<b>Acids and alkalis-</b> <b>Metals and their uses</b>	<b>Chemical reactions</b>	<b>Photosynthesis-</b> <b>Ecosystems</b>
Core skills: Evaluation, Describe, explain etc	Define key terms linked to digestion and combustion. Describe functions of organs in digestive system and explain processes with digestion. <b>Combustion-</b> explain what combustion is and the production of carbon dioxide by human activity and the impact on climate.	Define key terms. Describe processes and explain links between respiration, muscles, bones and fermentation.	<b>Define key terms and identify equipment used in electrical circuits. Describe trends in current, potential difference and resistance in a circuit</b> <b>Define key terms in Waves topic. Describe and evaluate waves and uses.</b>	Define key terms in acids and alkali topic and metals and their uses. Describe chemical reactions involving acids and alkali using equations. Describe and compare properties, extraction of and uses of metals.	Define key terms linked to chemical reactions. Describe chemical reactions using word and symbol equations.	Define key terms linked to photosynthesis and ecosystems. Describe and explain processes linked to photosynthesis. Describe data collection methods and analyse information.
Title of Assessment Quiz.	50QQ QWC	50QQ QWC	50QQ QWC-	50QQ QWC	50QQ	50QQ
Title of the Quality of Written Communication Task (QWC)	<b>Describe how a student could test cow's milk to show it contains protein and starch</b>	Progress test 3- Greenhouse affect		QWC Describe a method to identify a substance as alkali, acid or neutral.	Progress test 4- electricity waves	QWC- optional time permitting
Resources:	Glossary Booklet Knowledge Organiser	Glossary Booklet Knowledge Organiser	Glossary Booklet Knowledge Organiser	Glossary Booklet Knowledge Organiser	Glossary Booklet Knowledge Organiser	Glossary Booklet Knowledge Organiser
Examinations:			<b>Progress Test 3</b>			<b>Progress Test 4</b>

<b>KS3</b>	<b>Autumn 1</b>	<b>Autumn 2</b>	<b>Spring 1</b>	<b>Spring 2</b>	<b>Summer 1</b>	<b>Summer 2</b>
<b>9</b>	<i>Phy/Chem/Bio</i>	<i>Bio/Phy</i>	<i>Chem/Bio</i>	Phys/Chem	Chem/phy	Chem/Blo
Core Knowledge:	Energy+ energy resources History of the atmosphere Environmental science	Transport in animals +plants Particles	Rates of reaction Health + disease	Waves Crude oil	Chemical reactions Electromagnetic waves	Periodic Table Genetics + evolution
Core skills:	Define key terms linked to each topic Describe key features of processes, compare and evaluate situations applying scientific knowledge in a range of scenarios linked to exam style questions.	Define key terms linked to each topic Describe key features of processes applying scientific knowledge in a range of scenarios linked to exam style questions.	Define key terms linked to each topic Describe key features of processes, compare and evaluate situations, applying scientific knowledge in a range of scenarios linked to exam style questions.	Define key terms linked to each topic Describe key features of processes, compare and evaluate situations applying scientific knowledge in a range of scenarios linked to exam style questions.	Define key terms linked to each topic Describe key features and uses of processes, applying scientific knowledge in a range of scenarios linked to exam style questions.	Define key terms linked to each topic Describe key features, trends and patterns, compare and evaluate situations applying scientific knowledge in a range of scenarios linked to exam style questions.
Title of Assessment Quiz.	<b>50QQ</b>	<b>50QQ</b>	<b>50QQ</b>	<b>50QQ</b>	<b>50QQ</b>	<b>50QQ</b>
Title of the Quality of Written Communication Task (QWC)	<b>Extended exam question</b>	<b>Extended exam question</b>	<b>Extended exam question</b>	<b>Extended exam question</b>	<b>Extended exam question</b>	<b>Extended exam question</b>
Resources:	Glossary Booklet Knowledge Organiser PPQ	Glossary Booklet Knowledge Organiser PPQ	Glossary Booklet Knowledge Organiser PPQ	Glossary Booklet Knowledge Organiser PPQ	Glossary Booklet Knowledge Organiser PPQ	Glossary Booklet Knowledge Organiser PPQ
Examinations:			<b>Progress Test 5</b>			<b>Progress Test 6</b>

# Year 7 Science: Particles

## Core Knowledge And Cultural Knowledge (KNOW)

## SHOW

### **States of matter: solids, liquids and gases.**

All matter are made of particles.

State the three types of matter.

Properties of solids, liquids and gases can be described in terms of particles in motion but with differences in the arrangement and movement of these same particles: closely spaced and vibrating (solid), in random motion but in contact (liquid), or in random motion and widely spaced (gas).

Explain the properties of solids, liquids and gases based on the arrangement and movement of their particles.

- Draw the arrangement of particles in a solid, liquid and gas and label them correctly.
- Can Identify the properties of a solid, liquid and gas.
- Can explain the properties of solids, liquids and gases in terms of particle arrangement and their movement.

### **Particle theory and gas pressure.**

Describe the arrangement of particles in the three states of matter

Explain unfamiliar observations about gas pressure in terms of particles.

Draw before and after diagrams of particles to explain observations about gas pressure.

Relate to everyday objects and events

- Balloon expanding when taken out of a freezer- increase in pressure
- Heat from moving car tyres- increase in pressure

- Can describe in words the arrangement of particles, their forces of attraction and their energy.
- Can describe what gas pressure is in terms of 'particle collisions and collisions with the walls of a container'.
- Can describe how heat affects gas pressure using the terms particles, energy and spacing of particles.
- Compare before and after diagrams of a reduced volume gas container and describe the affect on gas pressure.
- Describe what happens to the size of a balloon when it is taken from freezer and explain why this occurs in terms of particles, energy, motion and collisions against the material of the balloon.
- Explain how the heat on car tyres after driving, affects particle motion and gas pressure.

### **More particle theory and diffusion.**

Describe what diffusion is in terms of particle movement with the theory of concentration gradients.

Identify diffusion only happens in fluids and not solids.

Understand why diffusion is slow.

Explain how diffusion cannot happen between solid objects.

Relate to everyday objects and events

- air freshener smell filling a room- diffusion

- State what diffusion is in terms of particles.
- Can state how particles in diffusion move down a concentration gradient.
- Identify diffusion occurs faster in gases than in liquids.
- Give an everyday example of diffusion in a gas and liquid.
- Describe why diffusion is slow in terms of particles colliding in different directions.
- Draw the diffusion of deodorant particles before and after they spread through a room.
- Explain why diffusion doesn't happen between solid materials using ideas about particle arrangement and forces of attraction.

# Year 7 Science: Particles

## Core Knowledge And Cultural Knowledge (KNOW)

## SHOW

### **Physical changes and heating and cooling curves.**

Know the changes of state and the state a substance becomes.

Identify changes of state and the state of matter at particular points on a heating and cooling curve.

Identify that a substance does not change temperature during a changes of state.

Explain changes in states in terms of changes to the energy of particles gaining or losing energy, particle movement, their forces and the particle arrangement.

Relate to everyday objects and events

- Identify if a change of state has occurred in everyday examples
- Identify the type of change of state in everyday life examples

- Can identify the state of matter a substance changes to during the different changes of state.
- Label the changes of state arrows on a diagram showing particle arrangement in the three states of matter.
- Identify whether a change of state has occurred during everyday examples such as a coffee cooling down at room temperature.
- Identify what type of change of state has occurred in everyday examples like when snowflakes turn to liquid.
- Correctly identify changes of state and the state of matter at particular points on a heating and cooling curve.
- Describe why there are flat parts/ no temperature change of a heating and cooling curve using the words forces, energy and particles.
- Describe in words the changes that take place in the movement and arrangement of particles during a change of state like melting.
- Explain why a substance can change state like water evaporating. Using ideas of energy of particles, particle movement, their forces of attraction and the particle arrangement the liquid has become.

### **Density.**

Know what density is.

Recall the units for density, volume and mass.

Describe how to measure the volume of a regular and irregular object using the appropriate lab equipment.

Produce a practical method of how to work out the density of a regular and irregular object.

Calculate density using a formula relating mass, volume and density.

Relate to everyday objects and events

- Know different materials have different particles.

- Describe in words what density is.
- Can state which material is denser between different objects like a feather and a brick.
- Know whether to classify an object as a regular or irregular shape and know why measuring the length, width and height can only be done using a ruler for regular shapes with straight sides.
- State the lab equipment needed to measure mass, volume and length of objects (balance, ruler, eureka can, measuring cylinder).
- Apply the appropriate units to mass (Kg or g), length, width and height (cm or m), volume ( $\text{cm}^3$  or  $\text{m}^3$ ) and density ( $\text{g}/\text{cm}^3$  or  $\text{Kg}/\text{m}^3$ ).
- Calculate volume of a regular object as length x width x height.
- Write a written step by step method of how to work out the density of regular and irregular objects.
- Successfully calculate the density of regular and irregular objects using the formula relating mass, volume and density.

# Year 7 Science: Particles

## Core Knowledge And Cultural Knowledge (KNOW)

## SHOW

### **Conduction.**

Describe the terms conduction.

Explain, in terms of particles, how energy is transferred by conduction.

Relate to everyday objects and events

- Know everyday examples where conduction between objects occurs.
- Identify materials as thermal conductors or insulators.
- Know everyday examples where heat transfer is either conduction or radiation.
- Why a saucepan is made of metal and the handle is made of wood or plastic.

- Know that energy is transferred from hot objects to cooler ones.
- State that solids conduct heat better than liquids and gases.
- Give everyday examples of conduction where we transfer heat to objects or objects transfer heat to us.
- Identify an object as a thermal conductor or thermal insulator.
- Identify everyday examples as heat transfer by conduction or radiation.
- Know what the term 'thermal equilibrium' means.
- Describe conduction in solids using the words particles, heat, vibrating and neighbouring particles.
- Explain why conduction occurs between two solid materials, where heat is transferred to the cooler object.

### **Convection.**

Describe the terms convection.

Know what a convection current is.

Explain, in terms of particles, how energy is transferred by convection.

Relate to everyday objects and events

- Convection currents in a fridge with a freezer compartment
- How a radiator heats a room-convection

- Know that convection is how heat is transferred in liquids and gases.
- Know that hot air rises and cool air falls.
- Describe what happens to the spacing and density of gas or liquid particles when they get warmer or cooler during convection.
- Draw and label the arrows of a convection current in everyday examples such as an immersion heater and a fridge with a freezer compartment.
- Explain in words how a convection current causes hot air to rise and cooler air to fall.

# Year 7 Science: Cells

## Core Knowledge And Cultural Knowledge (KNOW)

## SHOW

### Life processes.

Know the acronym- MRS GREN as the seven life processes.  
Identify all seven life processes are needed for something to be classed as 'alive'.

know and describe the seven life processes.

Know that the energy for all seven life processes comes from respiration.

Relate to everyday objects and events:

- Identify organisms as living or not living based on their previous knowledge.
- What animals do and which life process it refers to.
- Know that some organisms are infertile and cannot reproduce but are still living.

- Identify the correct life process given different scenarios such as an organism getting rid of waste.
- Identify an organism as 'alive' based on what they already know.
- State respiration requires oxygen to release energy from food.

### Animal and plant cells.

Know that all living things are made of cells.

Know that cells cannot be seen with the naked eye but require a microscope and that cells need to be stained so that features can be clearly seen.

State the structure of plant and animal cell.

Know the function of cell parts:- cell membrane, cytoplasm, vacuole, nucleus, chloroplasts, cell wall, mitochondria

Describe the differences between the plant and animal cells.

- Say in words what an organism is.
- Correctly label a plant and animal cell parts.
- Know which features both animal and plants have and which features only plants have.
- Describe the function of all cell parts.
- State the material a cell wall is made of.
- Compare the differences between a 'cell wall' and 'cell membrane'.
- Explain why a microscope is needed to look at cells and why cells need to be stained to view under a microscope.

### Different types of cells.

Know the definition of 'eukaryotic' or 'prokaryotic'.

Know prokaryotic cells always have a cell wall, have no nucleus or mitochondria parts.

Identify cells as 'eukaryotic' or 'prokaryotic' based on their features.

Relate to everyday objects and events:

- Scientists think prokaryotic cells developed first in history.

- Describe the root words eukaryote and prokaryote.
- Know which feature in a cell contains DNA, the genetic information.
- State that eukaryotic cells are found in organisms called eukaryotes and prokaryotic cells are found in prokaryotes.
- State that the unusual cell features like a 'flagellum' is commonly termed as a tail within prokaryotic cells like bacteria.
- State that prokaryotic cells do not have a nucleus.
- Know the two forms of DNA that exist in prokaryotic cells are circular DNA and plasmid DNA.
- Identify examples of eukaryotic and prokaryotic cells.
- Complete a venn diagram of the features of eukaryotic cells, prokaryotic cells and the features they have in common.



# Year 7 Science: Cells

## Core Knowledge And Cultural Knowledge (KNOW)

## SHOW

### The microscope.

Know the need for a microscope.

Identify the different parts of a microscope.

Identify the jobs of the parts of the microscope.

Know how to set up a microscope.

Explain the particular practise of using a light microscope.

Know how to calculate the magnification used on the microscope.

Calculate the diameter of one cell from an image of cells under the microscope.

Relate to everyday objects and events:

- Know Robert Hooke invented the microscope and the meaning behind the word 'cell'.
- Trouble shooting microscope scenarios where cells can't be seen properly.

- Define the Latin word 'cella' as a small room.
- Correctly identify the parts of a microscope.
- Describe the jobs of parts of the microscope such as the stage and clips, rough and fine focussing knobs, the objective lenses.
- Explain why cells need to be stained before viewing under a microscope.
- Explain why the lowest power magnification is used when first examining a specimen.
- Explain the importance of moving the objective lens away from the slide whilst focusing the image.
- State how to achieve a greater magnification of cells if they appear to small.
- Calculate the magnification of a microscope using the magnification of the eye piece lens X objective lens.
- Calculating the diameter of one cell from an image of cells under the microscope.

### Preparing animal and plant cells for the microscope.

Know how to prepare a plant and animal cell slides for viewing under a microscope.

Draw and label magnified images.

Describe a step by step method of viewing cells under a microscope.

Relate to everyday objects and events:

- Trouble shooting microscope scenarios where cells can't be seen properly.

- Can demonstrate how to prepare a specimen slide in a lab classroom, use a microscope correctly and focus cells independently.
- Can draw a magnified image from an independently prepared specimen slide, using a pencil with unbroken lines, drawing subcellular structures of cells with labels. Stating the magnification it was observed under.
- Describe in steps how to get a clear image of onion cells.
- Describing how to allow more light through an image.
- Describe how to make cells appear bigger in an image.

### Diffusion in cells.

State what diffusion is.

Know how diffusion of substances occurs across cell membranes from an area of high concentration to an area of low concentration.

Know the greater the differences in two concentrated areas, the faster the rate of diffusion.

Recall some of its effects.

- State that substances like glucose move from an area of high concentration to an area of low concentration by the process of diffusion.
- Identify substances that move in and out of cells by the process of diffusion.
- Explain the direction a substance will move across cell membranes by understanding that substances move from a high concentrated area to a low concentrated area.
- Identify a cell where diffusion will occur most quickly amongst other cells and substances.

# Year 7 Science: Cells

## Core Knowledge And Cultural Knowledge (KNOW)

## SHOW

### Specialised cells.

Know that different cells have different jobs.

Know that different cells are adapted to do their jobs.

Explain how these different cells have jobs to carry out different processes.

- Identify parts of a sperm cell, nerve cell, root hair cell, phloem and xylem and muscle cells are adapted to do their jobs.
- Identify how different cells have different jobs that carry out different processes my mix and match diagram.
- Explain how cells such as muscle cells and ciliated and goblet cells have different jobs in order to carry out different processes within the human body.

### Unicellular and multicellular organisms.

Know what unicellular and multicellular mean.

Identify different organisms that are unicellular.

Identify and explain features of a unicellular organism that makes it adapted to its environment for survival.

Know that plant and animals are both multicellular.

Know the main organs of a plant and human and their jobs.

Know what a tissue is and how it is different to an organ.

Multicellular organisms are composed of cells which are organised into tissues, organs and systems to carry out life processes.

Compare a human organ to a plant organ.

Explain plant tissue adaptations.

- Describe what the terms, 'unicellular and multicellular' mean.
- Identify organisms that are unicellular such as bacteria, amoeba and unicellular fungi such as yeast.
- Explain how unicellular organisms are adapted to their environment for survival.
- Identify animals and plants as being multicellular.
- Identify the job of the main organs in the human body.
- Know the definition of a tissue.
- Know the difference between a tissue and an organ.
- Identify the job of the main organs in a plant.
- Correctly order the words cells, tissues, organs, organ systems and organisms to show the sequence of various bits of an organism coming together. To also state which part would be missing in a plant.
- Explain which human organ is similar to a plant organ.
- Explain how epidermal and mesophyll tissue are adapted to help the plant survive.

### Organ systems.

Know the job of different organ systems.

Know the main organs of organ systems.

- Identify the main organs in the digestive, muscular, circulatory, respiratory, nervous, skeletal, reproductive and urinary system.
- By mix and match, identify the main job of the skeletal, respiratory, muscular, circulatory, digestive, excretory, nervous and urinary systems.

# Year 8 Science: Food and nutrition

## Core Knowledge And Cultural Knowledge (KNOW)

## SHOW

### **Balanced diets**

Know all the nutrients needed in a balanced diet.

Describe the function of each nutrient.

Classify what we eat as a particular nutrient.

Describe the benefits of a balanced diet.

Know the term deficiency disease and give examples.

Relate to everyday objects and events:

- Know why different people need different amounts of energy (factors such as age, gender, activity).
- Analysing food labels from food packaging .

- Define in words what 'nutrition' means.
- Describe the function of carbohydrates, lipids, proteins and vitamins and minerals and water.
- Identify calcium as a mineral nutrient.
- Describe the term deficiency disease and it's affects on the body for example scurvy causes problems with joints, gums and skin due to a lack of vitamin C.
- Interpreting graphs to describe daily energy requirement changes from birth to old age and between men and women.
- Interpreting food labels from food packaging and analysing the nutrients.

### **Food tests**

Know the 3 different food tests and what a positive result will give.

Be able to follow a practical procedure and produce a method.

Interpret and analyse nutrition information labels from food packaging.

Relate to everyday objects and events:

- Know that nutrition information labels on food packaging show the nutrients in food which is tested by The Food Standards Agency (FSA) to ensure that labels are correct.

- Produce a method on how to carry out food tests for starch, protein and lipids.
- Know the chemical needed to test for different nutrients in food.
- Know that a positive tests for starch will turn iodine from brown to blue/black, a positive test for protein will turn biuret solution from blue to pale purple and a positive test for lipids will give a greasy mark on white paper when held up to the light.
- Know that a higher concentration of starch in food will give a darker colour of blue/black iodine.
- Interpreting nutrition information labels from food packaging.

### **Digestion and enzymes**

Know the parts of the digestive system and their functions.

Know the difference between mechanical and chemical digestion.

Know which organs absorption, egestion and ingestion take place.

Know what an enzyme is.

Know the names of the enzymes, the food they break down and what the food is broken down into.

Know which organs produce enzymes and where they breakdown food.

Relate to everyday objects and events:

- Compare enzyme models of everyday objects like scissors cutting paper tubes and spanners twisting nuts off bolts.

- Describe in words what mechanical and chemical digestion is.
- Label a diagram of the organs within the digestive system.
- Know the function of the organs of the digestive system such as the stomach made of muscular tissue to move and churn up food and it produces hydrochloric acid to kill harmful bacteria and a low pH in order for the enzyme protease to work.
- Identify the correct food that particular enzymes breakdown.
- Know where absorption, egestion and ingestion take place in the digestive system.
- Draw a diagram to show how an enzyme helps to digest food.
- Evaluate the strengths and weaknesses of digestive enzyme models such as, 'the scissor model' and 'a spanner twisting nuts off bolts' model.

## Year 8 Science: Food and nutrition

### Core Knowledge And Cultural Knowledge (KNOW)

### SHOW

#### **Absorption and diffusion**

Know what absorption is and where it takes place.

Know what villi are, where they are found in the digestive system.

An understanding that villi and microvilli provide a larger surface area for a faster rate of absorption of food.

Know what diffusion is.

Explain how diffusion enables absorption by the small intestine.

Explain how the small intestine is adapted to its function.

Relate to everyday objects and events:

- The surface area of the small intestine is about the area of a tennis court.

- Know that a larger surface area increases the speed of absorption.
- Label parts of the villi that line the small intestinal wall.
- Explain in words how the small intestine is adapted for rapid absorption of food.
- Know the process of diffusion is how food travels across the small intestine into the blood.
- Know that a continuous fresh blood supply around the villi of the small intestine creates a concentration gradient where the concentration of food in the intestine will be higher than in the blood and therefore diffusion of food into the blood is.

#### **Drugs**

Know what a drug is.

Know that drugs can be legal or illegal.

Understand the term 'recreational drugs'.

Recall how different drugs affect the body.

Relate to everyday objects and events:

- Substance misuse due to addiction. Recommended guidance of alcohol intake for men and women is 14 units per week.

- Be able to explain why medicines are drugs.
- Identify drugs from food packaging.
- Explain how drugs can be addictive.
- Know the side effects of drugs like heroin and paracetamol.
- Explain why alcohol is termed a 'recreational drug'.
- Know the short and long term effects of alcohol.
- Explain how legal drugs like pseudoephedrine work to reduce a blocked nose and how alcohol reduces its effectiveness.

# Year 8 Science: Combustion

## Core Knowledge And Cultural Knowledge (KNOW)

## SHOW

### **Burning fuels**

Know what combustion means.

Know that fuel, heat and oxygen are needed for combustion to happen.

Know the definition of a fuel.

Know the definition of a hydrocarbon.

Understand what fossil fuels are.

Know the word equation for combustion of a fuel.

Know how to test for the products of combustion in a practical experiment.

Relate to everyday situations

- Fire triangle.
- Never use water to put out a greasy kitchen fire or electric fire.

- Write a written definition of the words fuel, hydrocarbon, combustion, fossil fuel, limewater and cobalt paper.
- Know that limewater is clear and turns cloudy white when the gas carbon dioxide is produced during a combustion practical.
- Know that cobalt chloride paper is blue and turns pink when the liquid water is produced during a combustion practical.
- Write a conclusion of a combustion experiment that tests for the products of carbon dioxide and water.

### **Pollution**

Know what complete and incomplete combustion is and their products.

Describe what a pollutant is.

Describe how pollutants are formed.

Explain how these pollutants cause problems and how their effects can be reduced.

Relate to everyday situations

- Catalytic converters fitted to car exhausts reduces harmful gases from being emitted.

- Observations on burning substances and identifying the products.
- Writing word equations on burning substances.
- Define what complete and incomplete combustion is and write a word equation for the combustion of carbon for each.
- Identify the impurities found in petrol and diesel.
- Describe what a pollutant is.
- Describe how sulphur dioxide and nitrogen oxide are formed in cars.
- Describe how burning fossil fuels in vehicle engines causes pollution.
- Describe how this pollution can be reduced.

### **Global warming**

Understand the term 'thermal energy'.

Describe what the greenhouse effect is.

Know that carbon dioxide is a greenhouse gas.

Identify what causes the greenhouse effect.

Know what climate change is.

Explain how human activity may be causing global warming.

Relate to everyday objects and events:

- The largest source of carbon dioxide released into the air is from burning fossil fuels to generate electricity and in vehicles. 36,000 million tonnes of carbon dioxide are released into the air each year. China and the USA together release more than 40 percent of this.

- Know examples of how humans burn fossil fuels and release carbon dioxide into the air.
- Know that carbon dioxide being released into the air is increasing over time.
- Describe what global warming is and why it is happening.
- Describe how global warming can impact on climate and local weather patterns.
- Explain how greenhouse gases like carbon dioxide keep the Earth warm.

# Year 8 Science: Respiration

## Core Knowledge And Cultural Knowledge (KNOW)

## SHOW

### Respiration

Recall what happens in aerobic respiration.

Know the word equation.

Know how anaerobic respiration occurs.

Compare both types of respiration in human and yeast cells.

Relate to everyday situations

- Water is a waste product of aerobic respiration which, is evident when feeling a damp patch of water vapour as you breathe out onto the back of your hand.

- Know respiration releases energy from glucose.
- Know that all living things respire at all times.
- Carry out a limewater practical by breathing out into the limewater
- Conclude the positive result of limewater turning cloudy as the presence of carbon dioxide gas.
- Complete a aerobic respiration word equation.
- Know why anaerobic respiration can occur.
- Compare anaerobic respiration in yeast and human cells.

### Lung structure

Know the structure of the lungs.

Describe the function of the organs of the gas exchange system.

Know what gas exchange is.

Describe how the alveoli air sacs are adapted to allow efficient gas exchange.

Relate to everyday situations

- Using a tree model to represent the gas exchange system.

- Label a blank diagram of the main parts of the respiratory system.
- Identify the main three reasons why the alveoli air sacs allow fast gas exchange.
- Understand that carbon dioxide being breathed out is the process of excretion.
- Evaluate an upside down tree model as a representation of the lungs.
- Identify what gas exchange is and know that oxygen enters the blood and is transported to cells for respiration.
- Know the direction oxygen and carbon dioxide move between the alveoli air sacs and the blood.
- Identify why the levels of carbon dioxide are high in the blood.
- Know that exchange happens between the alveoli and the blood by the process of diffusion.
- Explain why the lungs are adapted to do their job efficiently.

### Breathing

Understand the mechanism of breathing, such as the job of the muscles, changes in chest volume, air pressure and the direction of air movement.

Relate to everyday objects and events:

- Using a bell jar model of to represent the mechanism of breathing.
- Know that doctors or sport scientists use a spirometer to measure the volume of air breathed in and out. This is used to evaluate a person's health or performance in sport.
- Know how conditions like asthma effect breathing.
- Know how smoking effects the gas exchange system

- Fill in the blanks exercise on inhalation and exhalation which involves what the muscles do, the direction the rib cage moves, changes in volume, air pressure and the direction air moves.
- Using a bell jar model to identify which parts of the breathing system they represent.
- Mix and match activity on the process of breathing including what the muscles do to the volume of the chest and how this effects the direction air moves.
- Identify the main parts on the breathing system from an unlabelled diagram.
- Know the names of the muscles that control breathing.
- Identify which gas enters the blood from the alveoli air sacs and the gas that leaves the blood to enter the alveoli air sacs.
- Describe in words what happens to the chest cavity during inhalation.
- Know the harmful substances found in cigarettes and the diseases smoking can cause.
- Know that emphysema causes damaged alveoli air sacs which, decreases surface area and results in reduced gas exchange.
- Explain how tar causes smokers to cough more.

# Year 8 Science: Respiration

## Core Knowledge And Cultural Knowledge (KNOW)

## SHOW

### Fermentation

Know that both types of respiration occur in yeast and bacteria.

Know that fermentation is anaerobic respiration in yeast and bacteria.

Know the structure and function of bacterial cells.

Describe how unicellular bacteria reproduce by binary fission.

Describe how unicellular yeast reproduce by budding.

Compare structure, organisation and type of cell division of animal, plant and bacterial cells.

Describe and analyse a line graph of how a population of yeast changes with time.

Determine limiting factors on growth curves.

Relate to everyday objects and events:

- Describe how yeast are used in bread making during aerobic respiration.
- Describe how yeast are used in brewing beer and wine during anaerobic respiration (fermentation).
- Describe how bacteria are used to make cheese and yogurt during anaerobic respiration.

- Know what fermentation is and explain why it is anaerobic respiration.
- Identify food and drink made using yeast and explain from observations.
- Know the best conditions for yeast reproduction.
- Identify the word equations for aerobic and anaerobic respiration in yeast.
- Know the method for yeast reproduction as 'budding'.
- Know that a limiting factor is something that slows down the growth of a population.
- Carry out a practical investigation to see if dead yeast cells respire.
- Know that limewater gives a positive test for carbon dioxide gas if it turns from clear to a cloudy white colour.
- Be able to calculate the rate of growth of a yeast population from graph data.
- Know how a change in conditions can effect the rate of growth.
- Identify the point on a graph where yeast cells begin to die.

# Year 8 Science: Respiration

## Core Knowledge And Cultural Knowledge (KNOW)

## SHOW

### **Circulation**

Know what the circulatory system consists of.

Know the role of the red blood cell in transporting oxygen.

Describe the main components of blood and their functions.

Describe how blood moves around the body.

Know the parts of the heart.

Describe how the heart functions as a pump.

Know the jobs of the three main vessels in the circulatory system.

Know how oxygen, glucose and wastes are transported to and from cells.

Know how exercise requires a faster rate of respiration which increases heart beat.

Know what heart disease is and how it may lead to heart attack.

- Know the job of the circulatory system.
- Know the names of the main three blood vessels.
- Identify the features of each blood vessel.
- Identify respiration as a cell process that requires oxygen.
- Know the role of the heart in the circulatory system.
- Identify the features of the heart and their function.
- Identify unknown blood vessels in a heart diagram.
- Know which side of the heart has oxygenated and deoxygenated blood.
- Know the direction of blood flow through the heart.
- Identify the type of vessel that delivers and carries blood away from the heart.
- Identify capillaries as the blood vessel that is involved with the transport of substances to and from cells via leaky tissue fluid.
- Know the components of blood and their jobs.
- Understand that oxygen is highly concentrated in blood vessels leaving the lungs and levels of carbon dioxide is high, in vessels entering the lungs.

### **Anaerobic respiration**

Know what anaerobic respiration is and the word equation.

Know how anaerobic respiration occurs during strenuous exercise.

Describe the effects of anaerobic respiration on the body.

Describe the effects of anaerobic respiration after hard exercise (EPOC).

Relate to everyday situations

- Know why heart and breathing rate increases during exercise and why both remain high after stopping exercise.

- Know the word equation for anaerobic respiration.
- Know that exercise causes cells to respire anaerobically.
- Follow a practical procedure to investigate how muscles respond to hard exercise, draw a table of results, line graph and write a conclusion.
- Analyse a line graph on the effect of exercise on pulse rate.
- Know why pulse rate remains high after exercise.
- Compare aerobic and anaerobic respiration in terms of reactants and products.



## Year 9 Science: Energy and energy resources

Core Knowledge And Cultural Knowledge (KNOW)		SHOW
<p>State all forms of energy</p> <p>Describe energy transfers in everyday items as useful and non useful</p> <p>Display energy transfers in Sankey diagrams</p> <p>Know the Conservation of Energy Law</p> <p>Know the term dissipation</p>		<ul style="list-style-type: none"> <li>• Recognise energy types in everyday scenarios</li> <li>• Identify energy changes in a range of situations</li> <li>• Draw/complete Sankey diagrams labelling as useful and non-useful energy transfers.</li> <li>• Explain the Law of energy conservation.</li> <li>• Recognise energy is spread out into the surroundings, mainly as heat.</li> </ul>
<p>Know and use efficiency formula</p> $Efficiency = \frac{\text{useful output energy}}{\text{total input energy}}$ <p>Know and use power formula</p> $Power = \frac{\text{Work done(energy)}}{\text{Time}}$ <p>State units of Power is Watt(W)</p> <p>Know and use work done calculations</p> $Work\ done = Force \times Time$ <p>State units of Work done = Joules(J)</p>	<p>Clear link with maths- fractions and placing numbers in correct place in the formula no matter what the size of the value.</p>	<ul style="list-style-type: none"> <li>• Recall or recognise units for all calculations.</li> <li>• Calculate efficiency of every day energy changes</li> <li>• Calculate power</li> <li>• Rearrange power formula to calculate energy or work done</li> <li>• Calculate work done and rearrange formula for Work done to calculate time or Force.</li> </ul>
<p>Name renewable and non-renewable energy resources</p> <p>Define the term renewable and non-renewable</p> <p>Describe how electricity is by non-renewable energy resources</p> <p>Know advantages and disadvantages of using renewable and non-renewable resources for generating electricity</p>		<ul style="list-style-type: none"> <li>• State/recognise energy resources as renewable or non-renewable resources</li> <li>• Recall the meaning of renewable and non-renewable</li> <li>• Compare renewable and non-renewable resources used to generate electricity</li> <li>• Evaluate the use of renewable and non-renewable energy resources.</li> </ul>

## Year 9 Science: History of the atmosphere

Core Knowledge And Cultural Knowledge (KNOW)		SHOW
<p><b>The composition of the Earth's atmosphere today</b></p> <p><b>The composition of the Earth's early atmosphere</b></p> <p><b>Name greenhouse gases</b></p> <p><b>The production of carbon dioxide by human activity and the impact on climate</b></p> <p><b>Describe the term greenhouse effect and global warming.</b></p> <p><b>Interpret data</b></p>	<p><b>Link to current global environmental issues.</b></p> <p><b>Clear link to maths- describing patterns/trends in data</b></p>	<ul style="list-style-type: none"><li>• State the composition of the Earth's atmosphere today-Nitrogen, oxygen, carbon dioxide and other gases.</li><li>• Describe/explain how the atmosphere has evolved from the Early atmosphere.</li><li>• Compare the Earth's early atmosphere to atmospheres on other planets</li><li>• Recall names of greenhouse gases</li><li>• Describe/explain how carbon dioxide causes the greenhouse effect and contributes to global warming.</li></ul>

## Year 9 Science: Environmental Science

Core Knowledge And Cultural Knowledge (KNOW)		SHOW
<p><b><u>How humans use resources</u></b></p> <ul style="list-style-type: none"> <li>• know everyday uses for the Earth's natural resources</li> <li>• know synthetic replacements for Earth's natural resources</li> <li>• define the term sustainability</li> <li>• define term finite and infinite</li> </ul>	<p>Link with environmental issues of limited Earth's resources and impacts of materials on the Earth.</p>	<ul style="list-style-type: none"> <li>• Recognise materials as natural or synthetic</li> <li>• Recognise the raw material of everyday items</li> <li>• Recall definition of finite, infinite, sustainable</li> <li>• Evaluate scenarios environmentally, economically and socially.</li> </ul>
<p><b><u>Burning fuels</u></b></p> <ul style="list-style-type: none"> <li>• Know types of combustion complete and incomplete</li> <li>• Write word and balanced symbol equations for complete and incomplete combustion</li> <li>• Interpret data in form of tables and graphs</li> </ul>	<ul style="list-style-type: none"> <li>• Link to maths describing trends and patterns with data linked to combustion</li> </ul>	<ul style="list-style-type: none"> <li>• Recall definition of complete and incomplete combustion</li> <li>• Complete/write word equations for complete or incomplete combustion</li> <li>• Complete /write balanced symbol equations for complete and incomplete combustion</li> <li>• Complete tables, pie charts, bar charts and line graphs</li> <li>• Describe patterns and trends in data linked to combustion</li> <li>• Evaluate the use of fuels for combustion,</li> </ul>
<p><b><u>Atmospheric pollutants</u></b></p> <ul style="list-style-type: none"> <li>• Name atmospheric pollutants</li> <li>• Describe and explain the impact of the atmospheric pollutants on the environment</li> <li>• Define the terms, acid rain, greenhouse effect, global dimming and global warming.</li> <li>• Interpret data</li> </ul>	<p>Link with global environmental issues</p> <p>Link to maths describing trends and patterns with data linked to atmosphere pollutants</p>	<ul style="list-style-type: none"> <li>• Recall definition of acid rain, greenhouse effect, global dimming and warming</li> <li>• Recognise which atmospheric pollutant which environmental issue</li> <li>• Describe/explain how each pollutant impacts the environment.</li> <li>• Complete tables, pie charts, bar charts and line graphs</li> <li>• Describe patterns and trends in data linked to atmospheric pollutants</li> <li>• Evaluate the impact of each pollutant on the atmosphere/environment.</li> </ul>
<p><b><u>Other type of pollutants</u></b></p> <ul style="list-style-type: none"> <li>• Know function a fertiliser, pesticide and herbicide</li> <li>• Describe/explain the impact of fertiliser, pesticide and herbicide on water supplies</li> <li>• Know definition of bioindicator</li> <li>• Describe/explain how bioindicators determine pollutants</li> <li>• Interpret data</li> </ul>	<p>Link with local and global environmental issues</p>	<ul style="list-style-type: none"> <li>• Recall definitions of fertiliser, herbicide or pesticide</li> <li>• Recognise impact on water supplies by fertiliser, herbicide and pesticide</li> <li>• Describe/explain impact of these pollutants in rivers or lakes</li> <li>• Recall lichens as a bioindicator</li> <li>• Recognise which atmospheric pollutants lichens indicate</li> <li>• Complete tables, pie charts, bar charts and line graphs</li> <li>• Describe patterns and trends in data linked to water pollution</li> <li>• Evaluate the use of fertilisers, pesticides and herbicides linked to pollution caused.</li> </ul>

## Year 9 Science: Environmental Science

Core Knowledge And Cultural Knowledge (KNOW)		SHOW
<p><b><u>Biodiversity and maintaining biodiversity</u></b></p> <ul style="list-style-type: none"> <li>• Know definition of biodiversity</li> <li>• Describe/explain impact of human activities on biodiversity</li> <li>• Know reasons and impact of deforestation</li> <li>• Describe and explain why maintaining biodiversity is vital</li> <li>• Interpret data</li> </ul>	<p>Link with local and global environmental issues</p>	<ul style="list-style-type: none"> <li>• Recall definition of biodiversity</li> <li>• Recognise human activities and their impacts on biodiversity</li> <li>• Describe and /or explain the human activities impact on biodiversity</li> <li>• Give reasons for deforestation</li> <li>• Describe/explain impact of deforestation on biodiversity</li> <li>• Describe why maintaining biodiversity is vital on range of scenarios</li> <li>• Complete tables, pie charts, bar charts and line graphs</li> <li>• Describe patterns and trends in data linked to biodiversity</li> <li>• Evaluate the impact of human activities on biodiversity</li> </ul>
<p><b><u>Water treatment</u></b></p> <ul style="list-style-type: none"> <li>• Know definition of potable water and distillation</li> <li>• Know difference between potable water and pure water</li> <li>• Know methods to treat water to make it potable</li> </ul>		<ul style="list-style-type: none"> <li>• Recall definition of potable and distillation</li> <li>• Describe differences between potable and pure water</li> <li>• Describe methods of treating water to produce potable water</li> <li>• Compare methods for treating water</li> <li>• Evaluate methods for treating water</li> </ul>
<p><b><u>Waste Management</u></b></p> <ul style="list-style-type: none"> <li>• Know a variety of wastes- household, nuclear</li> <li>• Know how to identify pollutants</li> <li>• Describe methods to treat waste</li> <li>• Know consequences of waste on environments and humans</li> </ul>		<ul style="list-style-type: none"> <li>• Identify methods to treat waste</li> <li>• Describe how to treat waste produced from your home.</li> <li>• State/describe consequences of waste on environments and humans</li> </ul>

## Year 9 Science: Environmental Science

Core Knowledge And Cultural Knowledge (KNOW)		SHOW
<p><b><u>Reduce, reuse, recycle</u></b></p> <ul style="list-style-type: none"><li>• Know Earth's resources are finite</li><li>• Describe methods of reducing, recycling and reusing materials</li><li>• Explain/Evaluate impact of reducing, reusing or recycling</li><li>• Interpret data</li></ul>	<p>Link to maths describing trends and patterns with data linked to reduce, reuse and recycle</p>	<ul style="list-style-type: none"><li>• Recall definition of finite</li><li>• Describe the methods of reducing, reusing and recycling with a range of materials.</li><li>• Explain/evaluate the impact of reducing, reusing or recycling linked to a material sourced from the Earth.</li><li>• Complete tables, pie charts, bar charts and line graphs</li><li>• Describe patterns and trends in data linked to reduce, reuse or recycle</li></ul>
<p><b><u>Life cycle assessments(LCA)</u></b></p> <ul style="list-style-type: none"><li>• Know what a life cycle assessment(LCA) is</li><li>• Know the stages of a LCA</li><li>• Evaluate the use of a material</li><li>• Interpret data</li></ul>		<ul style="list-style-type: none"><li>• Recall definition of a LCA</li><li>• Recall/recognise the stages of an LCA</li><li>• Evaluate the use of a material using an LCA</li></ul>

## Year 9 Science: Transport in animals and plants

Core Knowledge And Cultural Knowledge (KNOW)		SHOW
<p><b><u>The blood</u></b></p> <ul style="list-style-type: none"> <li>• Know the components and functions of the blood</li> <li>• Know the 3 main blood vessels, their functions and differences</li> <li>• Know the structure of the heart and describe/explain how they work and treatments for heart conditions.</li> <li>• Interpret data</li> </ul>	<ul style="list-style-type: none"> <li>• Link to maths describing trends and patterns with data linked to the blood</li> </ul>	<ul style="list-style-type: none"> <li>• Recall the structure of the blood</li> <li>• Recognise/identify the function of each component in the blood</li> <li>• Recall/identify the 3 main blood vessels</li> <li>• Describe/explain the adaptations of each blood vessel</li> <li>• Compare the 3 blood vessels</li> <li>• Recall/identify the structure of the heart</li> <li>• Describe/explain adaptations for heart to work</li> <li>• Describe/explain treatments to improve a heart condition</li> <li>• Complete tables, pie charts, bar charts or line graphs</li> <li>• Describe/explain patterns and trend in data.</li> </ul>
<p><b><u>Breathing and gas exchange</u></b></p> <ul style="list-style-type: none"> <li>• Know the structure of the respiratory system</li> <li>• Know how gas exchange occurs and describe/explain how parts of the respiratory system are adapted to increase the rate of gas exchange</li> <li>• Know factors which cause impact to the respiratory system and describe consequences of these.</li> <li>• Interpret data</li> </ul>	<p>Link to maths describing trends and patterns with data linked to breathing/gas exchange</p>	<ul style="list-style-type: none"> <li>• Recall/identify parts of the respiratory system</li> <li>• Describe or explain adaptations of parts of the respiratory system</li> <li>• Describe/explain how human activities or disease can impact on the respiratory system</li> <li>• Complete tables, pie charts, bar charts or line graphs</li> <li>• Describe/explain patterns and trend in data</li> </ul>
<p><b><u>Transport in plants</u></b></p> <ul style="list-style-type: none"> <li>• Know the structure and function of tissues and organs in plants</li> <li>• Know how these tissues and/or organs are adapted to their functions.</li> <li>• Know how substances are transported in plants</li> <li>• Know term transpiration</li> <li>• Know factors which affect transpiration</li> <li>• Interpret data</li> </ul>	<p>Link to maths describing trends and patterns with data linked to transport in plants</p>	<ul style="list-style-type: none"> <li>• Recall/identify the organs/tissue in a plant</li> <li>• Recognise the functions of the organs/tissues in a plant</li> <li>• Describe/explain the functions of organs and tissues in a plant</li> <li>• Describe/explain the adaptations to organs/tissues in a plant</li> <li>• Describe or explain how substance are transported in plants</li> <li>• Recall definition of transpiration</li> <li>• Describe/explain factors which affect transpiration.</li> </ul>

## Year 9 Science: Particles and Heating

Core Knowledge And Cultural Knowledge (KNOW)		SHOW
<p><b><u>Matter</u></b></p> <ul style="list-style-type: none"> <li>• Know the 3 states of matter and their properties</li> <li>• Know how to draw the arrangement of particles in the 3 states of matter</li> <li>• Know how to use model and explain properties of a substance related to the particle arrangement</li> <li>• Know terms which describe changes of state between 3 states of matter</li> <li>• Interpret data on cooling curves</li> </ul>	<p>Link to maths describing trends and patterns with data linked to cooling curves</p>	<ul style="list-style-type: none"> <li>• Recall the 3 states of matter</li> <li>• Identify substances as solid liquid or gas</li> <li>• Draw/recognise the particle arrangement of a the 3 states of matter</li> <li>• Describe/explain the properties of a substance relative to its particle arrangement</li> <li>• Compare properties of the 3 states of matter.</li> <li>• Recall terms to describe changes of state</li> <li>• Describe/explain changes of state relative to particle arrangement</li> <li>• Complete tables, pie charts, bar charts or line graphs</li> <li>• Describe/explain patterns and trend in data.</li> </ul>
<p><b><u>Density</u></b></p> <ul style="list-style-type: none"> <li>• Know the definition</li> <li>• Know method to find volume of regular and irregular objects</li> <li>• Know how to use formula to calculate density <math>density = \frac{mass}{volume}</math></li> <li>• Know units of density as grams per cm<sup>3</sup>, g/cm<sup>3</sup></li> </ul>	<p>Link to maths in using formula and rearranging formula.</p>	<ul style="list-style-type: none"> <li>• Recall definition of density</li> <li>• Recognise/recall units for density</li> <li>• Describe or explain a method to find out volume of regular/irregular objects</li> <li>• Calculate density from data</li> <li>• Rearrange formula to calculate mass/volume from given values</li> <li>• Complete tables, pie charts, bar charts or line graphs</li> <li>• Describe/explain patterns and trend in data.</li> </ul>
<p><b><u>Heat transfer</u></b></p> <ul style="list-style-type: none"> <li>• Know the flow of heat transfer</li> <li>• Know the three methods of heat transfer- conduction, convection and radiation</li> <li>• Know to model three methods of heat transfer</li> <li>• Know how to describe /explain heat transfer in terms of particles/waves</li> <li>• Know term absorption and emission</li> <li>• Know how to describe/explain absorption and emission dependent on surface colour.</li> </ul>		<ul style="list-style-type: none"> <li>• Recall definitions of key terms</li> <li>• Identify method of heat transfer for a given object</li> <li>• Describe/explain method of heat transfer related to particle arrangement of substance.</li> <li>• Describe/explain/conclude whether substance is a good/poor absorber/emitter dependent on surface colour using data.</li> </ul>

## Year 9 Science: Particles and Heating

Core Knowledge And Cultural Knowledge (KNOW)		SHOW
<p><b><u>Insulation</u></b></p> <ul style="list-style-type: none"><li>• Know term conductor and insulator</li><li>• Know how to describe/explain what makes a good conductor relative to particle arrangement</li><li>• Know that the amount of heat energy transferred through a layer of (insulating) material depends on the temperature difference across the material, the thickness of the material, the thermal conductivity of the material.</li><li>• Know methods of home insulation</li><li>• Know how to describe/explain how home insulation works relative to conduction, convection/radiation.</li><li>• Interpret data</li></ul>	<ul style="list-style-type: none"><li>• Link to maths describing trends and patterns with data linked to insulation data</li></ul>	<ul style="list-style-type: none"><li>• Recall definitions of key terms</li><li>• Describe/explain whether a substance is a good/poor conductor/insulator</li><li>• State/describe/explain the factors which affect heat transfer</li><li>• Recall/recognise methods of home insulation</li><li>• Describe/explain method of insulation relative to particle arrangement of material and heat transfer</li><li>• Compare methods of home insulation</li><li>• Evaluate methods of home insulation</li><li>• Complete tables, pie charts, bar charts or line graphs</li><li>• Describe/explain patterns and trend in data.</li></ul>



## Year 9 Science: Rates of reaction

Core Knowledge And Cultural Knowledge (KNOW)		SHOW
<p><b><u>Rates of reaction</u></b></p> <ul style="list-style-type: none"><li>• Know the 4 factors which affect the rate of reaction</li><li>• Know how to write word and balanced symbol equations</li><li>• Know a reaction is dependent on particles colliding and the activation energy</li><li>• Know the definition of activation energy and catalyst</li><li>• Know how to describe/explain rate of reaction in terms of collision theory relative to each factor.</li><li>• Calculate rate of reaction</li><li>• Know how to determine units for rate of reaction</li><li>• Interpret data</li></ul>	<ul style="list-style-type: none"><li>• Link to maths with graph plotting and determining trends and patterns</li><li>• Calculate rate from graph data linked to tangent drawing and gradients from maths</li></ul>	<ul style="list-style-type: none"><li>• Recall 4 factors which affect the rate of reaction</li><li>• Recall/recognise definition of activation energy</li><li>• Recognise practical scenarios</li><li>• Complete/write word and symbol equations</li><li>• Describe/explain rate of reaction linked to all factors and collision theory.</li><li>• Complete tables, bar charts and line graphs</li><li>• Draw lines of best fit</li><li>• Calculate/determine rate of reaction</li><li>• Recognise/determine units for rate of reaction</li></ul>

## Year 9 Science: Health and disease

Core Knowledge And Cultural Knowledge (KNOW)		SHOW
<p><b><u>Disease</u></b></p> <ul style="list-style-type: none"> <li>• know what a microbe/pathogen is</li> <li>• Know pathogens can be bacteria, virus, fungi, protists.</li> <li>• Know the differences between types of pathogens</li> <li>• Know that pathogens can cause infectious diseases.</li> <li>• Know what a communicable disease is and how they are spread</li> <li>• Know examples of diseases caused by types of pathogens and symptoms</li> </ul>	<ul style="list-style-type: none"> <li>• Relate to common diseases and global issues such as epidemic and pandemic</li> </ul>	<ul style="list-style-type: none"> <li>• Recall/recognise the definition for microbe/pathogen/communicable disease is</li> <li>• Recall/recognise types of pathogen and diseases they can cause.</li> <li>• Describe/explain the differences between they types of pathogen</li> <li>• Describe the symptoms of diseases</li> <li>• Describe/explain how each type of pathogen cause disease</li> <li>• Describe/explain how a communicable disease is spread</li> </ul>
<p><b><u>Health</u></b></p> <ul style="list-style-type: none"> <li>• Know terms toxin, antibody, antitoxins</li> <li>• Know how to prevent disease</li> <li>• Know the contribution of scientists to prevent disease</li> <li>• Know the role of the human body and the role of the immune system</li> <li>• Know the role of the white blood cells in the defence against disease</li> </ul>	<ul style="list-style-type: none"> <li>• Relate to everyday methods to prevent the spread of disease.</li> </ul>	<ul style="list-style-type: none"> <li>• Recall/recognise methods to prevent spread of disease.</li> <li>• Describe/explain impact of scientists discoveries impact on reducing the spread of disease.</li> <li>• Describe/explain the role of the human body and the immune system</li> <li>• Describe/explain the role of the white blood cells in the defence against disease</li> </ul>
<ul style="list-style-type: none"> <li>• Know how to interpret data</li> </ul>	<ul style="list-style-type: none"> <li>• Link to maths in completing charts or graphs/finding patterns/treads in data.</li> </ul>	<ul style="list-style-type: none"> <li>• Complete charts or graphs</li> <li>• Describe trends/patterns in data provided</li> <li>• Explain trends /patterns linked to pathogens or prevention of disease.</li> </ul>

# Year 9 Science: Transverse and longitudinal waves

Core Knowledge And Cultural Knowledge (KNOW)		SHOW
<p><b>Types of wave</b></p> <ul style="list-style-type: none"> <li>• Know the definition of wave</li> <li>• Know the type of wave-longitudinal and transverse</li> <li>• Know the features of each type of wave</li> <li>• Know definitions of wavelength, amplitude, frequency, time period</li> <li>• Know how to calculate frequency <math>frequency = \frac{1}{T}</math></li> <li>• Know how to calculate wave speed</li> </ul> <p><math>wave\ speed = \frac{distance}{time}</math>    <math>v=f \times \lambda</math>    <math>\lambda = \text{wavelength}</math>    <math>v = \text{velocity}</math></p>	<p>Link to maths using data in correct position of formula and rearrange to calculate other components of each formula.</p>	<ul style="list-style-type: none"> <li>• Recall/recognise definitions of wave, wavelength, amplitude, frequency and time period</li> <li>• Describe or explain feature of each wave type</li> <li>• Calculate frequency or rearrange formula to calculate time.</li> <li>• Calculate wave speed/velocity or rearrange formula to calculate frequency or wavelength</li> </ul>
<p><b>Reflection and refraction</b></p> <ul style="list-style-type: none"> <li>• Know how to describe reflection and refraction of a wave</li> <li>• Know the rule of reflection at a plane surface</li> <li>• Know the rule of refraction between air and glass</li> <li>• Know wave speed practical</li> <li>• Interpret data</li> </ul>	<ul style="list-style-type: none"> <li>• Link to maths using a protractor required linked to maths unit on measuring angles</li> </ul>	<ul style="list-style-type: none"> <li>• Recall/recognise definitions of reflection or refraction</li> <li>• Recall rules for refraction and reflection</li> <li>• Measure angles</li> <li>• Complete diagrams for reflection or refraction</li> <li>• Complete tables, bar charts and line graphs</li> <li>• Determine trends and patterns in data</li> <li>• Compare reflection and /or refraction in a range of scenarios.</li> </ul>
<p><b>Sound</b></p> <ul style="list-style-type: none"> <li>• Know sound is example of longitudinal wave</li> <li>• Know definition of Ultrasound and its uses.</li> <li>• Know how to echo locate using <math>speed = \frac{distance}{time}</math></li> </ul>	<ul style="list-style-type: none"> <li>• Link to maths using data in correct position of formula and rearrange to calculate distance or time.</li> </ul>	<ul style="list-style-type: none"> <li>• Recall definition of sound/echo</li> <li>• Recall/recognise definition of Ultra sound</li> <li>• Recall/recognise uses of Ultrasound</li> <li>• Calculate position of object using echo location calculations</li> <li>• Rearrange and use formula for speed</li> <li>• Complete tables, bar charts and line graphs</li> <li>• Determine trends and patterns in data</li> </ul>
<p><b>Seismic Waves</b></p> <ul style="list-style-type: none"> <li>• Know the structure of the Earth</li> <li>• Know the composition of the Earths layers</li> <li>• Know seismic waves are s,p and l</li> <li>• Know features of s,p and l waves</li> <li>• Know how to link seismic waves to layers of the Earth</li> </ul>		<ul style="list-style-type: none"> <li>• Recall/recognise structures of the Earth</li> <li>• Describe the composition of the Earth layers</li> <li>• Recall/recognise seismic waves as s,p and l</li> <li>• Recognise or recall features of s,p,l waves</li> <li>• Identify seismic waves from position detected in the Earth</li> <li>• Describe/explain seismic wave positions detected on the Earth</li> </ul>

## Year 9 Science: Crude oils

Core Knowledge And Cultural Knowledge (KNOW)		SHOW
<p><b><u>Crude oil and fuels</u></b></p> <ul style="list-style-type: none"><li>• Know that crude oil is a mixture of hydrocarbons</li><li>• Know definition of hydrocarbon</li><li>• Know definition of fractional distillation, condensation and evaporation</li><li>• Know crude oil is separated into fractions using fractional distillation</li><li>• Know the names and uses of crude oil fractions</li><li>• Know how to describe/explain the method of separating crude oil into its fractions</li><li>• Interpret data</li></ul>	<ul style="list-style-type: none"><li>• Link to maths for completing tables based on trends and graph drawing.</li></ul>	<ul style="list-style-type: none"><li>• Recall/recognise definition of hydrocarbons, fractional distillation, evaporation and condensation</li><li>• Recall or recognise apparatus for distillation</li><li>• Describe/explain the process of separating crude oil into its fraction</li><li>• Recognise fractions of crude oil and their uses</li><li>• Complete pie charts, tables, bar charts and line graphs</li><li>• Determine trends and patterns in data in a range of scenarios</li></ul>
<p><b><u>Burning hydrocarbons fuels</u></b></p> <ul style="list-style-type: none"><li>• Know definition of complete and incomplete combustion</li><li>• Know how to write word and balanced symbol equations for complete and incomplete combustion</li><li>• Know how to compare fuels used for burning.</li><li>• Interpret data</li></ul>	<ul style="list-style-type: none"><li>• Link to maths for completing tables based on trends and graph drawing.</li></ul>	<ul style="list-style-type: none"><li>• Recall/recognise definitions for types of combustion</li><li>• Complete or write word and balanced symbol equations for complete and incomplete combustion</li><li>• Determine trends and patterns from data provided</li><li>• Compare advantages and disadvantages of burning different fuels</li><li>• Evaluate fuels used for burning</li><li>• Complete pie charts, tables, bar charts and line graphs</li></ul>

## Year 9 Science: Chemical reactions and extracting metals

Core Knowledge And Cultural Knowledge (KNOW)		SHOW
<p><b><u>Reactivity, displacement and extraction of metals.</u></b></p> <ul style="list-style-type: none"> <li>• Know what the reactivity series is</li> <li>• Know the definition of displacement</li> <li>• Know why a displacement reaction takes place</li> <li>• Write word and balanced symbol equations for displacement/extraction of metals.</li> <li>• State method of extracting a metal</li> <li>• Use knowledge of displacement to describe/explain method of extracting a metal</li> <li>• Know the alternative methods for extracting copper</li> <li>• Compare methods for extracting copper</li> <li>• Evaluate methods of extracting copper</li> </ul>	<ul style="list-style-type: none"> <li>• Relate to environmental, economic and social issues.</li> </ul>	<ul style="list-style-type: none"> <li>• Recall/recognise reactivity series</li> <li>• Recall/recognise displacement reactions</li> <li>• Describe/explain why a displacement reaction takes place</li> <li>• Complete or write word and balanced symbol equations</li> <li>• Use reactivity list and knowledge of displacement to describe/explain method of extracting metals</li> <li>• Recall/recognise alternative methods of extracting copper</li> <li>• Compare methods of extracting copper</li> <li>• Evaluate methods of extracting copper</li> </ul>
<p><b><u>Chemical reactions</u></b></p> <ul style="list-style-type: none"> <li>• Know definition of neutralisation</li> <li>• Know the difference between a strong and weak acid</li> <li>• Know the pH scale</li> <li>• Describe how to test the pH of any substance.</li> <li>• Describe method to make a salt</li> <li>• Evaluate methods of making a salt.</li> <li>• Describe how to monitor a reaction using an indicator</li> <li>• Write word and balanced symbol equations for neutralisation reactions</li> </ul>	<ul style="list-style-type: none"> <li>• Relate to everyday examples of neutralisation</li> <li>• Use of numbers in pH scale linked to acid, alkali or neutral</li> </ul>	<ul style="list-style-type: none"> <li>• Recall/recognise neutralisation reaction from a range of scenarios</li> <li>• Recall the pH scale</li> <li>• Identify acid, alkali and neutral on the pH scale</li> <li>• Recall definition of strong or weak acid</li> <li>• Describe method of how to identify between a strong or weak acid</li> <li>• Describe how to make a salt using soluble and insoluble bases</li> <li>• Evaluate methods of making salts</li> <li>• Describe how to monitor a reaction using an indicator and the pH scale</li> <li>• Complete and write word and balanced symbol equations.</li> </ul>

## Year 9 Science: Electromagnetic Waves

Core Knowledge And Cultural Knowledge (KNOW)		SHOW
<p><b><u>Electromagnetic waves</u></b></p> <ul style="list-style-type: none"> <li>• Know the parts of electromagnetic spectrum(EMS)</li> <li>• Know the differences in wavelength and frequency of each part of the EMS</li> <li>• Know the electromagnetic waves that cause ionising radiation</li> <li>• Know the consequences of ionising radiation</li> <li>• Know the source, dangers and application of each electromagnetic wave</li> </ul>	<ul style="list-style-type: none"> <li>• Relate to everyday uses of radio waves, medical uses and dangers of x-rays and gamma radiation</li> </ul>	<ul style="list-style-type: none"> <li>• Recall/recognise parts of the EMS</li> <li>• Complete EMS diagrams</li> <li>• Describe differences in wavelength or frequency of each part of the EMS</li> <li>• Recall parts of the EMS that cause ionising effects</li> <li>• Describe the consequences of ionising radiation</li> <li>• Recall sources,dangers and uses of EMS</li> </ul>
<p><b><u>Infrared</u></b></p> <ul style="list-style-type: none"> <li>• Know definition of emission, absorption and radiation</li> <li>• Know method and outcome of Leslie’s cube practical</li> <li>• Know method and outcome of IR absorption practical</li> <li>• Know surfaces which are best emitters and absorbers of radiation</li> <li>• know how to interpret data</li> </ul>	<p>Link to maths with graph plotting and determining trends and patterns</p>	<ul style="list-style-type: none"> <li>• Recall/recognise examples of emission, absorption and radiation</li> <li>• Recall definition of emit and absorb</li> <li>• Recall best/worst emitters/absorbers</li> <li>• Recognise Leslie’s cube or applications of this practical</li> <li>• Predict outcomes of IR emission/absorption practicals</li> <li>• Describe trends in data linked to Leslie’s cube/absorption practical</li> <li>• Complete or draw graphs of emission/absorption practicals</li> <li>• Describe/explain outcomes of emission/absorption practicals</li> </ul>

## Year 9 Science: Atomic structure and Periodic table

Core Knowledge And Cultural Knowledge (KNOW)		SHOW
<p><b><u>The Atom</u></b></p> <ul style="list-style-type: none"><li>• Know the history of the atom</li><li>• Know the structure of the modern atom</li><li>• Know definition of atomic mass and number</li><li>• Know how to interpret the Periodic table</li><li>• Know how to draw and write the electronic structure or arrangement of an atom and ion.</li><li>• Know definition of an ion</li><li>• Know how ions are formed</li></ul>	<p><b>Link to maths-Use of simple addition and subtraction to calculate numbers of neutrons</b></p>	<ul style="list-style-type: none"><li>• Recall/recognise the models of the atom-Plum pudding model and nuclear model</li><li>• Recall experiments which led to development of the modern tom</li><li>• Describe outcomes of the experiments in development of the modern atom</li><li>• Describe differences and similarities with atomic models</li><li>• Compare models of the atom</li><li>• Explain outcomes of the experiments leading to structure of modern atom</li><li>• Identify numbers of protons and electrons of each atom in Periodic Table</li><li>• Calculate number of neutrons in each atom listed in Periodic Table</li><li>• Complete or draw electron arrangement for 1<sup>st</sup> 20 elements in periodic table</li><li>• Write the electron configuration of the 1<sup>st</sup> 20 elements in the Periodic Table</li><li>• Recall definition of an ion</li><li>• Show how ions are formed from metals and non-metals</li><li>• Recognise/complete or draw electron arrangement for ions</li></ul>
<p><b><u>Periodic Table</u></b></p> <ul style="list-style-type: none"><li>• Know the history and development of the Periodic table</li><li>• Know what a Group and Period are</li><li>• Know the patterns in reactivity, physical and chemical properties and electron arrangements of Group 0,1 and 7</li><li>• Know why the patterns in Group 0, 1 and 7 exist</li></ul>		<ul style="list-style-type: none"><li>• Recall/recognise the theories leading to the development of the Periodic Table</li><li>• Describe/explain reasons for theories being accepted or rejected</li><li>• Recall/recognise elements from the Periodic Table</li><li>• Recall Group/Period an element belongs to</li><li>• Describe/explain patterns in reactivity, physical and chemical properties of Group 0,1 and 7</li></ul>

## Year 9 Science: Genetics and evolution

Core Knowledge And Cultural Knowledge (KNOW)		SHOW
<ul style="list-style-type: none"> <li>• know what the structure of DNA is and where it is found.</li> <li>• know the terms gene and genome.</li> <li>• Know term variation</li> <li>• Know what causes variation and give examples in animals and plants</li> <li>• know the terms allele, homozygous, heterozygous, phenotype, genotype, dominant and recessive</li> <li>• Know how to use the terms allele, homozygous, heterozygous, phenotype, genotype, dominant and recessive in genetic crosses</li> <li>• know how some disorders are caused by the inheritance of certain alleles.</li> <li>• Know how to draw punnet squares to predict the probability of offspring inheriting a disorder</li> <li>• know what screening is used for and how it is carried out.</li> <li>• know the advantages and disadvantages of embryo screening.</li> </ul>	<ul style="list-style-type: none"> <li>• Link to maths in use of fractions, % and ratios.</li> <li>• know the social, ethical and economical issues concerning embryo screening.</li> </ul>	<ul style="list-style-type: none"> <li>• Recall/recognise structure of DNA, definition of gene, genome, variation, allele, homozygous, heterozygous, phenotype, genotype, dominant and recessive</li> <li>• Identify types of variation as inherited/environmental or both</li> <li>• Describe/explain products of genetic crosses using key terms</li> <li>• Recognise/identify inherited disorders</li> <li>• Describe/explain how some disorders are inherited</li> <li>• Complete/draw punnet squares to show probability of offspring inheriting a disorder</li> <li>• Recall/recognise term embryo screening</li> <li>• Describe how embryo screening is carried out</li> <li>• Give advantages/disadvantages of embryo screening</li> </ul>
<p><b><u>Adaptations of plants and animals</u></b></p> <ul style="list-style-type: none"> <li>• know why and what animals and plants compete for.</li> <li>• know what makes an animal a successful competitor.</li> <li>• Know what an extremophile is</li> <li>• know the conditions extremophiles live in.</li> <li>• Know examples of adaptations extremophiles have to survive.</li> </ul>		<ul style="list-style-type: none"> <li>• Recall/recognise what plants and animals compete for</li> <li>• Recall/recognise definition of an extremophile</li> <li>• Recognise/identify an extremophile</li> <li>• Identify/describe/explain adaptations of plants/animals and extremophiles</li> </ul>



## Year 9 Science: Genetics and evolution

Core Knowledge And Cultural Knowledge (KNOW)		SHOW
<p><b>Evolution</b></p> <ul style="list-style-type: none"><li>• Know term natural selection and evolution</li><li>• know who Darwin was and why his theory of evolution was not accepted at first</li><li>• Know what a fossil is</li><li>• Know how fossils provide evidence to theories of evolution</li><li>• Know term extinction</li><li>• Know what causes extinction.</li><li>• Know what cloning means</li><li>• Know how to clone plants and animals</li><li>• Know terms selective breeding, genetic engineering, genetically modified</li><li>• know the history of biotechnology and the range of techniques used today including genetic engineering.</li><li>• know how genetic engineering is used amongst organisms.</li></ul>	<ul style="list-style-type: none"><li>• Know benefits and concerns linked to adult cell cloning</li><li>• know the advantages and disadvantages of genetic engineering.</li></ul>	<ul style="list-style-type: none"><li>• Recall/recognise terms/examples of natural selection, selective breeding, fossil, evolution, extinction, cloning, genetically modified, genetic engineering</li><li>• Recall/recognise Darwin and his theory</li><li>• Describe theory of evolution</li><li>• Describe/explain why Darwin's theory was not accepted at first.</li><li>• Recognise/identify fossil examples or records</li><li>• Describe/explain what causes extinction in a range of examples</li><li>• Describe or explain how to clone animals or plants</li><li>• Give/compare/evaluate benefits and concerns of adult cell cloning</li><li>• Recognise/identify genetic engineering terms</li><li>• Describe/explain how genetic engineering is used in animals and plants</li><li>• Give/compare/evaluate the advantages and disadvantages of genetic engineering</li></ul>