Year 3

Working scientifically

During years 3 and 4, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- asking relevant questions and using different types of scientific enquiries to answer them
- setting up simple practical enquiries, **comparative** and **fair** tests
- making systematic and careful observations and, where appropriate, taking accurate measurements using standard units, using a range of equipment, including thermometers and data loggers
- gathering, recording, classifying and presenting data in a variety of ways to help in answering questions
- recording findings using simple scientific language, drawings, labelled diagrams, keys, bar charts, and tables
- reporting on findings from enquiries, including oral and written explanations, displays or presentations of results and conclusions
- using results to **draw simple conclusions**, **make predictions** for new values, **suggest improvements** and **raise further questions**
- identifying differences, similarities or changes related to simple scientific ideas and processes
- using straightforward scientific evidence to answer questions or to support their findings.

Topic and objectives	Lesson ideas	Key Words	Misconceptions
Plants Pupils should be taught to: • identify and describe the functions of different parts of flowering plants: roots, stem/trunk, leaves and flowers • explore the requirements of plants for life and growth (air, light, water, nutrients from soil, and room to grow) and how they vary from plant to plant • investigate the way in which water is transported within plants • explore the part that flowers play in the life cycle of flowering plants, including pollination, seed formation and seed dispersal	Introduce the relationship between structure and function: the idea that every part has a job to do. They should explore questions that focus on the role of the roots and stem in nutrition and support, leaves for nutrition and flowers for reproduction. Note: pupils can be introduced to the idea that plants can make their own food, but at this stage they do not need to understand how this happens. Work scientifically by: comparing the effect of different factors on plant growth, for example, the amount of light, the amount of fertiliser; discovering how seeds are formed by observing the different stages of plant life cycles over a period of time; looking for patterns in the structure of fruits that relate to how the seeds are dispersed. Observe how water is transported in plants, for example, by putting cut, white carnations into coloured water and observing how water travels up the stem to the flowers. **Scientist – Joseph Banks – Botanist**	***Following on from Year 1 & 2 Key words*** **Structure** Flowering plants, roots, stem/trunk, leaves, flowers **Function** nutrition, support, reproduction **requirements for life and growth** air, light, water, nutrients from soil, room to grow needs, vary, fertiliser **life cycle** flowers, pollination, seed formation, seed dispersal	Misconception: All plants reproduce from seeds. Fact: Many plants reproduce by vegetative propagation – from leaves, stems etc. Misconception: Propagating of fruit trees – as the tree can be propagated by plant parts, e.g. stem cutting, therefore the fruit has no seed. Fact: Fruits produced by vegetative propagation do have seeds. Examples of fruits produced by vegetative propagation may be shown to pupils to show them that they produce seeds.
Animals, including humans Pupils should be taught to: • identify that animals, including humans, need the right types and amount of nutrition, and that they cannot make their own food; they get nutrition from what they eat	Continue to learn about the importance of nutrition and introduce the main body parts associated with the skeleton and muscles, finding out how different parts of the body have special functions. Work scientifically by: identifying and grouping animals with and without skeletons and observing and comparing their movement; exploring ideas about what would happen if humans did not have skeletons. Look at the different types of skeletons and classify animals according to their skeletons. Compare and contrast the diets of different animals (including their pets) and decide ways of grouping them according to what they eat. They might	Nutrition, vitamins, minerals, fat, protein, carbohydrates, fibre, water, diet **Skeletons** Support, protection, Skull-brain Ribs – heart, lungs	Misconception: Muscles push and pull our limbs for movement. Fact: muscles can only pull, they work in antagonistic pairs to move limbs. The tongue is the only muscle that can both push and pull.

• identify that humans and some other animals have skeletons and muscles for support, protection and movement	research different food groups and how they keep us healthy, and design meals based on what they find out. Ideas – What would happen if we didn't have a skeleton? How are our bodies affected by exercise? Make a model to show how muscles work. **Scientist – Marie Curie – Radiation/X-Rays**	Movement, joint Muscles – pull, contract, relax	
Rocks Pupils should be taught to: • compare and group together different kinds of rocks on the basis of their appearance and simple physical properties • describe in simple terms how fossils are formed when things that have lived are trapped within rock • recognise that soils are made from rocks and organic matter	Linked with work in geography, pupils should explore different kinds of rocks and soils, including those in the local environment. Look at coastal erosions. Work scientifically by: observing rocks, including those used in buildings and gravestones, and exploring how and why they might have changed over time. Use a hand lens or microscope to help them to identify and classify rocks according to whether they have grains or crystals, and whether they have fossils in them. Research and discuss the different kinds of living things whose fossils are found in sedimentary rock and explore how fossils are formed. Explore different soils and identify similarities and differences between them and investigate what happens when rocks are rubbed together or what changes occur when they are in water. They can raise and answer questions about the way soils are formed. **Famous Scientist – William Smith – Fossils Strata**	Appearance Physical properties **Properties** Hard/soft Shiny/dull Rough/smooth Absorbent/ Not absorbent Fossils Sedimentary rock organic matter buildings grave stones grains crystals	Misconception: all rocks are hard. Fact: rocks have variable hardness with some being more hard (granite) or less hard (chalk). Misconception: Fossils are the bones of dead animals and plants. Fact: The bones of deceased animals lithify and become rocks when minerals are compressed and swapped.
Light Pupils should be taught to:	Explore what happens when light reflects off a mirror or other reflective surfaces, including playing mirror games to help them to answer questions about how light behaves. Children could test a range of materials to find out which reflects light the best.	light see dark reflect	Misconception: Light is not necessary for vision; it is possible to see in the dark. Fact: Light is necessary for vision. It is impossible to see in total darkness.

• recognise that they need light in order to see things and that dark is the absence of light • notice that light is reflected from surfaces • recognise that light from the sun can be dangerous and that there are ways to protect their eyes • recognise that shadows are formed when the light from a light source is blocked by an opaque object • find patterns in the way that the size of shadows change	Think about why it is important to protect their eyes from bright lights. They should look for, and measure, shadows, and find out how they are formed and what might cause the shadows to change. *Note: pupils should be warned that it is not safe to look directly at the sun, even when wearing dark glasses.* Work scientifically by: looking for patterns in what happens to shadows when the light source moves or the distance between the light source and the object changes. Ideas - Create a shadow puppet show to perform in class. How does the size of a shadow change throughout the day? **Famous scientists – Justin Von Liebig - mirrors**	surface natural star sun moon artificial torch candle lamp	Misconception: Only smooth, shiny objects like mirrors reflect light; dull and rough objects do not reflect light. Fact: Dull objects do reflect light, otherwise we would not be able to see them. Smooth surfaces produce regular reflection while rough surfaces produce scattered, diffused or irregular reflection. Misconception: Light travels from the source to both the observer and the object, but there is no link between the two. Fact: Light travels from the source to the object; the object reflects the light from the source into the eyes of the observer; the receptor cells in the observer's retinas detect the light and send the signals to the brain. Misconception: Shadow is the presence of something that light allows us to see. Fact: Shadow is the absence of light.
Forces and magnets Pupils should be taught to: • compare how things move on different surfaces • notice that some forces need contact between 2 objects, but magnetic forces can act at a distance • observe how magnets attract or repel each other and attract some materials and not others • compare and group together a variety of everyday materials on the basis of whether they are attracted to a magnet, and identify some magnetic materials • describe magnets as having 2 poles • predict whether 2 magnets will attract or repel each other, depending on which poles are facing	Observe that magnetic forces can act without direct contact, unlike most forces, where direct contact is necessary (for example, opening a door, pushing a swing). Explore the behaviour and everyday uses of different magnets (for example, bar, ring, button and horseshoe). Work scientifically by: comparing how different things move and grouping them; raising questions and carrying out tests to find out how far things move on different surfaces, and gathering and recording data to find answers to their questions; exploring the strengths of different magnets and finding a fair way to compare them; sorting materials into those that are magnetic and those that are not; looking for patterns in the way that magnets behave in relation to each other and what might affect this, for example, the strength of the magnet or which pole faces another; identifying how these properties make magnets useful in everyday items and suggesting creative uses for different magnets. Ideas - Does the stretch of a balloon affect the distance a marshmallow can be fired? Look at levitation – demonstrate using hairdryers and plastic balls link to superhero! Investigate which design of aeroplane will travel the furthest.	force push pull open surface magnet magnetic attract repel magnetic poles north south	Misconception: Force and energy are synonymous. Fact: Force and energy are different concepts. Force is a push or a pull while energy is the ability to do work. Misconception: If there is motion, there is a force acting; when an object is moving, there is a force in the direction of its motion. Fact: No force is acting on the object if the object is in uniform motion (constant speed in a straight line). Misconception: If there is no motion, then there is no force acting. Fact: There are forces acting on a stationary object in equilibrium. Misconception: Moving objects come to a stop even when there is no friction. Fact: Moving objects continue to move when there is no friction.

	Famous scientist – Andre Marie Ampere – Founder of electro-magnetism		Misconception: All metallic-looking objects are magnetic. Fact: Not all metals are magnetic. Iron, steel, nickel and cobalt are metals which are magnetic. Misconception: All objects made of iron and steel are magnets. Fact: Iron and steel are magnetic and can be made into magnets. Misconception: Magnetism is a kind of gravity. Fact: Magnetic force and gravity are two different types of forces. Magnetic force is the force of attraction between magnets and magnetic materials or the unlike poles of two magnets, or the force of repulsion between two like poles of magnets. Gravity is the force of attraction between two masses. Misconception: Magnetic force is called 'magnetic energy'. Fact: Force is a pull or a push; energy is the ability to do work. Misconception: Poles of magnets are defined as the ends of magnets. Fact: Poles of magnets are the parts of the magnets where the attraction or repulsion is the strongest. Misconception: Big magnets are stronger than small ones. Fact: Big magnets are not necessarily stronger than small magnets. Misconception: A coil of wire had to be uninsulated in order to create an electromagnet. Fact: A coil of wire can be insulated to create an electromagnet.