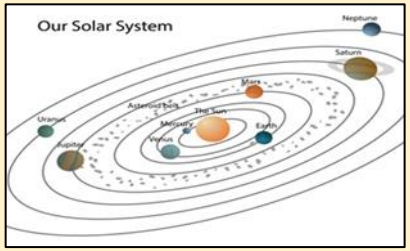
St John's C of E (Aided) Primary School

Year 5 Science Long Term Overview

Biology	Chemistry	Physics

Term	Knowledge (Objectives)
Autumn 1/2	**Space and gravity - 8 sessions** **Knowledge Block 1: Our solar system** <u>Substantive Knowledge:</u> - A **Solar system** is a collection of **planets**, which **orbit** (a curved path) a **star**. - There are huge number of stars in space and therefore a huge number of solar systems. - Our solar system consists of 8 planets, many of those planets have **moons** which orbit around them. - Earth's moon is not a planet but is a satellite which orbits Earth. It is around a quarter of the size of Earth. - As the Moon orbits the Earth, the Sun lights up different parts of it, making it seem as if the Moon is changing shape. We call these the phases of the moon. - The Moon doesn't emit (give off) light itself, the 'moonlight' we see is actually the Sun's light reflected off the lunar surface. - Our solar system can be represented with a model (see diagram), but it isn't possible to draw it to scale. - The planets and moons are **rotating** (spinning). - The time it takes one planet to rotate is called a **day**. On Earth this is 24 hours. - The time it takes a planet to complete one orbit around its star is called a **year**. On Earth this is 356.25 days. - The solar system is with a massive collection of stars called the **galaxy** (called the Milky way). - The Milky way is one of billions of galaxies in the **Universe**.  **Knowledge Block 2: What else is in the solar system** <u>Substantive Knowledge:</u> - Stars are huge balls of gas that produce vast amounts of light and heat. - **Asteroids** are lumps of rock that orbit a star (there are millions in between Mars and Jupiter). - **Comets** are objects that are made of Ice, which melts when they get closer to the sun leaving a tail. **Knowledge Block 3: Gravity and its effects** <u>Substantive Knowledge:</u> - **Gravity** is force of attraction between two objects with **mass** (a quantity of matter). - The bigger the mass the bigger force it exerts - Gravity works over distance but gets weaker as distance increases. - Stars, planets, moons have a very large amount of mass. They exert a gravitational attraction on each other. - Differences in gravity result in smaller mass objects orbiting around lager mass objects, e.g., planets around stars and moons around planets.

	Disciplinary Knowledge (Working Scientifically): - Identifying scientific evidence that has been used to support or refute ideas or arguments. - Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate. - Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs.
Autumn 2/ Spring 1	**Circulation – 7 sessions** **Knowledge Block 1: Getting oxygen into the blood** Substantive Knowledge: - All animals need **oxygen** to survive. - Air is breathed into the **lungs** where the oxygen in the air is passed into the blood. - Every part of animals' bodies need oxygen, especially **muscles**. - Muscles need a supply of oxygen and **sugar (glucose)** to make them work, they are supplied by the blood. **Knowledge Block 2: The blood circulation model** Substantive Knowledge: - The heart is a vital organ pumps blood through the blood vessels. - Blood Vessels are the tubes that blood flows through. - The blood **circulates** around the body in a way that ensures all muscles in the body get a supply of oxygen and sugar. - The **heart** pumps blood to every muscle in the body. The circulatory route must allow the blood to collect oxygen from the lungs, sugar from the intestines and visit muscles. - The blood then returns to the heart where it is pumped again. - Exercise helps the heart to work more efficiently. - Eating a healthy diet helps to keep the blood vessels from getting blocked. - Avoiding smoking and alcohol puts less stress on the whole system and keeps it healthier. Disciplinary Knowledge (Working Scientifically): - Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs. - Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate. - Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations. - Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. - Recording data and results using scatter graphs, line graphs. - Identifying scientific evidence that has been used to support or refute ideas or arguments. - Using test results to make predictions to set up further comparative and fair tests.
Spring 1/2	**Forces that Oppose Motion – 8 sessions** **Knowledge Block 1 – Water and air resistance** Substantive Knowledge: - When objects move through air and water, they have to push it out of the way. The water and air push back with forces called **water resistanc**e and **air resistance**. The harder it is to push the material out of the way the greater the resistance. - Gases weigh less than liquids and so water resistance is greater than air resistance. **Knowledge Block 2 – Friction** Substantive Knowledge: - Friction is a **force against motion** caused by two surfaces **rubbing** against each other. It occurs because no surfaces are perfectly smooth; they have bumps **and undulations** that can **interlock** when placed on top of each other.

	- To move one **interlocking** surface over another, one of three things must happen: 1. The surfaces must rise slightly 2. The bumps on the surface must bend 3. The bumps on the surface must break All of these actions require a force, this is what causes friction **Knowledge Block 3 – Managing forces** <u>Substantive Knowledge:</u> - Some objects require large forces to make them move; **gears**, **pulley** and **levers** can reduce the force needed to make things move. - The use of levers can reduce the force needed to move things. The object you are lifting is called the **load**, and the force you apply to the arm to make the object move is called the **effort**. - The use of pulleys can reduce the force needed to move things. <u>Disciplinary Knowledge (Working Scientifically):</u> - Using test results to make predictions to set up further comparative and fair tests. - Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. - Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations. - Recording data and results of increasing complexity using scientific diagrams. - Identifying scientific evidence that has been used to support or refute ideas or arguments. - Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate.
Spring 2/ Summer 1	**Making New Substances – 8 sessions** **Knowledge Block 1 – Reversible and irreversible changes** <u>Substantive Knowledge:</u> - All matter, including gas, has **mass**. - Sometimes, mixed substances **react** to make a new substance. These changes are usually **irreversible**. - Heating can sometimes cause materials to change permanently. When this happens, a new substance is made. These changes are not reversible. - Indicators that something new has been made are the properties of the material are different (colour, state, texture, hardness, smell, temperature). - If it is not possible to get the material back easily it is likely that it is not there anymore and something new has been made (irreversible change). <u>Disciplinary Knowledge (Working Scientifically):</u> - Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate. - Reporting and presenting findings from enquiries.
Summer 2	**Fossils, geological time and classification – 5 sessions** **Knowledge Block 1 – Geological time** <u>Substantive Knowledge:</u> - The Earth is very old. Around 4.2 **billion** years. We know this from dating rocks. - Life first appeared on Earth around 3.8 billion years ago. - Life was, at first, very simple but over **millions** and millions of years life became more complex through the process of **evolution**.

	Knowledge Block 2 – Evidence for evolution Substantive Knowledge: - There are many sources of evidence for evolution. - **Fossils** are one of the main sources of evidence for evolution. They show when new organisms appear and when they go **extinct**. - Due to the nature of fossil formation and discovery, fossils only provide an incomplete record of evolution. - Scientists use fossils along with other pieces of evidence (DNA, Embryology, comparative anatomy, artificial selection) to work out how organisms have evolved. - Fossils form when dead organisms are rapidly buried or leave an imprint and are turned to stone over a long period of time. If they survive in the Earth, they then have to be found by a **palaeontologist** who will study them. **Knowledge Block 3 – Classification of life** Substantive Knowledge: - All living (and **extinct**) **organisms** are classified into groups based upon their physical features. - This includes animals, plants, fungi, and **microorganisms** like **bacteria**. - Within each of these broad groups, organisms are classified into small subgroups. Animals- invertebrates, mammals, birds, amphibians, reptiles and fish. Plants- flowering plants, ferns, conifers, moss. - Bacteria are a group of organisms that are not visible to the naked eye but are very abundant and have distinct physical features we can only see under powerful **microscopes**. Disciplinary Knowledge (Working Scientifically): - Reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations. - Identifying scientific evidence that has been used to support or refute ideas or arguments. - The method of scientific classification.

Disciplinary Knowledge (Working Scientifically)				
Years	Types of enquiry that must be introduced in phase	All children should learn to	Recording and teaching that supports key learning	Statutory requirements NC
1 and 2	• Comparing differences and changes. • Describing in order to classify. • Surveys to identify patterns and support classification. • Describing the effect of changing things. • Using secondary sources, including the internet and *experts.*	• Gather evidence to describe the differences and similarities between different organisms, habitats and objects. • Gather evidence to describe how things change over time or as a result of something happening (e.g. how some things spring back when bent and others do not, or plants will wilt when they are not watered). • Begin to gather evidence to describe the relationship between variables and patterns (cause and effect) by identifying	Venn diagrams, bar charts. Timelines and tables showing how one and more than one thing changes over time, bar charts, tally charts. Results tables with the independent variable increasing in one column and the dependent variable in the other.	• Asking simple questions and recognising that they can be answered in different ways. • Observing closely, using simple equipment. • Performing simple tests. • Identifying and classifying. • Using their observations and ideas to suggest answers to questions. • Gathering and recording data to help in answering questions.

	• Pupils begin to look for relationships between variables (patterns)	and seeking to quantify what must be changed and what measured (*what change and what measure).*		
3 and 4	• Pupils become confident in identifying relationships between variables (patterns).	• Recognise that factors other than that we are changing may have an effect and seek to control these factors (what change and what measure *and what keep same*). • Gather evidence to describe and classify patterns of behaviour, characteristics and properties of materials and make generalisations from data samples.	Results tables with independent variable increasing in one column and dependent variable in the other. Increasing use of equipment that allows for standard measure (thermometers, data loggers, measuring cylinders, force meters, digital balances).	• 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.
5 and 6	• Pupils explore more complex relationships or questions requiring greater precision; this will often require the identification of important values (e.g. biggest, smallest, optimum).	• Recognise that conclusions may be uncertain due to difficulties controlling and measuring variables accurately and that measurement always introduces some error. Understand that repeating experiments helps to identify what the true value is and that data points far from the mean are likely to be inaccurate and should be discounted when averaging. • Adapting experiments to produce more precise conclusions when the questions requires it, especially when seeking to find maximum, minimum or specific values.	Results tables with the independent variable increasing in one column and the dependent variable in the other, results tables that show pupils *choosing* to repeat experiments as appropriately and the averaging of repeated measurements, scatter graphs to identify precise relationships and important values.	• Planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary. • Taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate. • Recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs. • Using test results to make predictions to set up further comparative and fair tests. • Reporting and presenting findings from enquiries, including conclusions, casual relationships and explanations of and degree if trust in results, in oral and written forms such as displays and other presentations. • Identifying scientific evidence that has been used to support or refute ideas or arguments.