Science Curriculum St Marys Junior School

Intent Statement

The curriculum aims for pupils to develop a complex knowledge of biology, chemistry and physics but also adopt a broad range of skills in working scientifically and beyond. The lessons are inclusive and meaningful so all pupils may experience the joy of science and make associations between their science learning and their lives outside the classroom. Studying science allows pupils to appreciate how new knowledge and skills can be fundamental to solving arising global challenges. The curriculum aims to encourage critical thinking and empower pupils to question the hows and whys of the world around them.

The curriculum encourages:

- A strong focus on developing knowledge *alongside* scientific skills across biology, chemistry and physics.
- Curiosity and excitement about familiar and unknown observations.
- Challenging misconceptions and demystifying truths.
- Continuous progression by building on practical and investigative skills across all units.
- Critical thinking, with the ability to ask perceptive questions and explain and analyse evidence.
- Development of scientific literacy using wide-ranging, specialist vocabulary.

<u>Subject Concepts</u>

Pupils will build their substantive knowledge base by:

- Knowing more facts.
- Giving further examples of the same concept.
- Understanding and using a wider range of vocabulary.
- Using models or concepts that cannot be seen to explain ideas.
- Making and explaining links across areas of science.

Science curriculum is broken down into 7 key areas:

- Plants
- Animals including humans
- Living things and their habitats
- Materials
- Energy
- Forces, Earth and Space
- Making connections

<u>Disciplinary Learning</u>

Working scientifically:

- Posing questions
- Planning
- Predicting
- Observing
- Measuring
- Researching
- Recording (including diagrams)
- Recording (tables)
- Grouping and classifying
- Graphing
- Analysing and drawing conclusions
- Evaluating

<u>Curriculum Enrichment</u>

Year 6 – Johnson Matthey – investigations and site visit

Participate in science week every other year.

Participate in Protect Our Planet Day

Topic	Key Learning Goals	Prior Knowledge	Vocabulary	Subject Concepts
Year 3 Autumn 1	• Explain the role of the skeleton • Know the bones in the body • Muscles and movement • Eating for survival • Nutrient groups • Healthy diet • Balanced diet When working scientifically, pupils who are **secure** will be able to: • Use information about skeletons to group animals. • Record measurements of different bones and use the data to sort them into size order. • Describe some ways scientific research has improved the field of bionics/prosthetics, such as the choice of materials or linking their movement to muscles in the arm. • Find relevant data on food packaging and make numerical comparisons. • Summarise key information using secondary sources. • Describe some changes to scientific knowledge and jobs that require this information.	Year 2 – animals, including humans: Life cycles and health	balanced diet bone carbohydrate conclusion fat fibre invertebrate joint measure (KS1) mineral movement muscle nutrient protection protein record research (KS1) skeleton support vertebrate vitamin	Animals – movement and nutrition
Year 3 Autumn 2	• Sources of light • Reflection • Where shadows come form • Shadows throughout the day • Investigating shadows • Using light and shadows When working scientifically, pupils who are **secure** will be able to: • Recall what information needs recording to decide the number of columns in a results table and suggest suitable headings for the results table. • Record information in the correct columns. • Identify if a question is testable, explain why and plan ways to answer a testable question.	Year 2 – materials: use of everyday materials	bar chart cast (a shadow) conclusion group (KS1) investigation light source luminous measure (KS1) mirror non-luminous observe (KS1) opaque mirror pattern (KS1)	Energy – light and shadows

	• Identify and explain why something is an advantage or disadvantage of a method and suggest an improvement to the experiment. • I can describe patterns in data and quote values as evidence of patterns in data. • I can identify odd results that do not fit the pattern. • I can use patterns to make predictions for missing data.		predict (KS1) prove record reflect reflection reflective (shiny) results table shadow the Sun translucent transparent trustworthy variable	
Year 3 Spring 1	• Rocks: appearance • Rocks: physical properties • Fossil formation • Fossils and palaeontology • Soil formations • Soil layers and earthworms When working scientifically, pupils who are **secure** will be able to: • Use a magnifying glass correctly to observe the appearance of a rock in detail. • Use results to choose the appropriate rock type for a specific use, suggest a better choice of rock for a specific use and predict how a rock will be affected by the weather. • Research and present information on fossil formation using a single source. • Use a model of the fossil record to determine the relative age of a fossil, to suggest how a living thing has changed over time and to suggest what living things were around in a certain era. • Draw and label the bars on a bar chart. • Accurately draw and label the layers of sediment in a sedimentation jar.	Year 2 – materials: use of everyday materials	bar chart conclusion crystal diagram (KS1) fossil grain group (KS1) hard hardness observe (KS1) predict (KS1) record research (KS1) rock sediment sedimentary rock sedimentation soft soil	Materials – rocks and soil

Year 3 Spring 2	• Plant growth • Structure and function • Transporting water • Flowers • Evaluating an enquiry • Seed dispersal When working scientifically, pupils who are **secure** will be able to: • Pose relevant questions. • Design and record in results tables. • Plan a simple enquiry. • Complete, read and interpret data in a bar chart. • Identify and suggest changes to an enquiry. • Use results to draw conclusions.	Year 2 – Plants: plant growth	bar chart conclusion female flowering plant male pattern (KS1) pollen pollination predict (KS1) record reproduction results table seed dispersal transport variable	Plants – plant reproduction
Year 3 Summer 1	• Pushes, pulls and twists • Friction • Investigating friction • Magnets • Investigating magnet strength • Uses of magnets When working scientifically, pupils who are **secure** will be able to: • Use arrows and scientific vocabulary to show the direction of a contact force. • Use evidence to support conclusions. • Identify the variables to change, measure and control. • Write a method to explain how to use a magnet to sort and classify materials as magnetic or non-magnetic. • Label the axes of a bar chart. • Draw bars on a chart accurately. • Identify key information from a source. • Use more than one source to research a question.	No previous units on forces – but does build on year 2 unit – uses of everyday materials	attract bar chart conclusion contact force diagram (KS1) force friction investigation magnet magnetic material magnetism method non-contact force north pole plan (KS1) results (KS1) record repel south pole variable	Forces and space – forces and magnets

Year 3 Summer 1	Key question – Does hand span affect grip strength? Pupils who are **secure** will be able to: • Recall key knowledge from previous units. • Apply knowledge in new contexts. When working scientifically, pupils who are **secure** will be able to: • Carry out a full scientific enquiry.	This unit revises and builds on learning from year 3 science units.	bar chart bone carbohydrate conclusion fat friction joint light source muscle opaque predict (KS1) protein shadow trustworthy variable	Making connections unit
Topic	**Key Learning Goals**	**Prior Knowledge**	**Vocabulary**	**Subject Concepts**
Year 4 Autumn 1	• Grouping living things – vertebrates and invertebrates • Grouping living things – plants • Classification keys • Habitats and seasonal change • Human impact on habitats • Natural changes to habitats When working scientifically, pupils who are secure will be able to: • Record data in different ways. • Apply and create classification keys. • Make careful observations. • Make and use classification keys. • Present information in different ways. • Research using an information sheet.	Year 2 – living things – Habitats	classification key classify conservation deforestation endangered flowering plants group (KS1) insect nature reserve non-flowering plants observe (KS1) pollution research (KS1) slug snail spider worm	Living things – classification and changing habitats
Year 4 Autumn 2	• Human digestive system • Teeth • Dental hygiene	Year 3 – animals: movement and nutrition	canine conclusion control variable	Animals including humans – digestion and food

	• Carnivores, herbivores and omnivores • Predators, prey and food chains • Animal poo When working scientifically, pupils who are **secure** will be able to: • Evaluate a strength or weakness of the digestive system model. • Describe an example of evidence that can be used to study teeth. • Evaluate a method by considering its limitations. • Recall that scientific research needs repeated results before being used in society. • Identify trends in predators and prey. • Draw a results table that has space for observations about different poo samples.		diagram (KS1) digest digestive system ethics faeces fair test group (KS1) incisor large intestine molar mouth oesophagus pattern (KS1) plan (KS1) premolar producer proof record results table saliva small intestine stomach trustworthy variable	
Year 4 Spring 1	• Solids • Liquids and gases • Melting and freezing • Condensing and evaporating • The water cycle • Climate change When working scientifically, pupils who are **secure** will be able to: • Ask relevant questions. • Use results to draw simple conclusions. • Use thermometers to take accurate measurements.	Year 1 – materials: everyday materials	boiling conclusion condensing degrees Celsius diagram (KS1) evaporating evaporation rate freezing gas liquid measure (KS1) melting	Materials – states of matter

	• Make predictions for new values. • Record findings using labelled diagrams. • Research using more than one source.		precipitation predict (KS1) rate research (KS1) solid steam stopwatch temperature thermometer the water cycle	
Year 4 Spring 2	• Vibrations • Sound waves • Volume and distance • Pitch • Sound insulation When working scientifically, pupils who are **secure** will be able to: • To observe closely how different instruments create a sound. • Research how whales and dolphins communicate underwater. • Present results using a bar chart. • Suggest which variables to measure and for how long. • Design simple results tables. • Identify when results or observations do not match predictions.	Year 4- Materials: states of matter	air bar chart eardrum insulator observe (KS1) pitch plan (KS1) predict (KS1) proof record research (KS1) results table sound trustworthy vibrations volume	Energy – sound and vibrations
Year 4 Summer 1	• Using electricity • Building circuits • Switching on and off • Conductors and insulators • Investigating bulb brightness • Electrical safety	Year 3 – Energy: Light and shadows	appliance battery/cell bulb buzzer circuit conclusion electrical conductor electrical insulator	Energy – electricity and circuits

	When working scientifically, pupils who are **secure** will be able to: • Draw a results table and record a range of appliances under the correct headings 'Mains' or 'Batteries'. • Identify and draw simplified electric circuit symbols and use these to draw a simplified circuit diagram. • Write a method for the investigation that considers appropriate equipment, orders clearly written steps and considers safety. • Pose questions relating to bulbs in an electrical circuit. • Explain why a selected question is testable. • Suggest that new inventions will change safety advice.		electricity mains method motor pattern (KS1) power source predict (KS1) property results table switch wire variable	
Year 4 Summer 2	Key question: **How does the flow of liquids compare?** Pupils who are **secure** will be able to: • Recall key knowledge from previous units. • Apply knowledge in new contexts. When working scientifically, pupils who are **secure** will be able to: • Carry out a full scientific enquiry.	This unit revises and builds on learning from year 4 science units.	bar chart battery/cell condensing conclusion evaporating gas insect liquid motor precipitation predict (KS1) solid switch temperature the water cycle trustworthy variable	Making connections unit

Topic	**Key Learning Goals**	**Prior Knowledge**	**Vocabulary**	**Subject Concepts**
Year 5 Autumn 1	• Life cycles and reproduction in plants • Life cycle of a mammal • Life cycle of a bird • Life cycle of an amphibian • Life cycle of an insect • Asexual reproduction in plants • When working scientifically, pupils who are **secure** will be able to: • Observe and compare equivalent parts in different flowers. • Research the life cycles of different mammals. • Pose questions to compare the life cycles of different birds. • Suggest how one temperature may affect egg hatching. • Use data to describe a relationship and make predictions. • Represent root growth over time on a line graph.	Year 4 – Living things: classification and changing habitats	adolescence asexual reproduction characteristic data estimate fertilisation germination gestation gills incubation line graph line of best fit lungs mating metamorphosis offspring ovule pollen pollination reproduction sexual reproduction testable	Living things – life cycles and reproduction
Year 5 Autumn 2	• Solar system – models of and the movement and shapes • The Moon • Day and night • Time • Satellites and space When working scientifically, pupils who are **secure** will be able to: • Pose and identify testable questions about the movement of the celestial bodies in our Solar System. • Use a model to represent the Solar System.	Year 3 – Forces and space: forces and magnets	celestial bodies data day/daytime degrees Celsius (LKS2) discovery Earth evidence gravity Jupiter line graph line of best fit Mars Mercury	Forces and space – Earth and space

	• Design and draw a table to record data on moons. • Accurately draw day and night and seasons diagrams. • Calibrate a sundial using a compass and torch and use it to measure time. • Analyse patterns in temperature data for the Earth and use them to predict temperature values for the Earth in the future.		model Moon Neptune night/nighttime orbit phase planet Pluto Saturn Solar System spherical star temperature (LKS2) testable Uranus Venus year	
Year 5 Spring 1	• Gravity • Air resistance • Water resistance • Friction • Levers, pulleys and gears When working scientifically, pupils who are **secure** will be able to: • Analyse predictions, data and anomalies to write a conclusion. • Plan a fair test to investigate air resistance. • Write a method. • Evaluate a method and judge the degree of trust. • Design a results table. • Calculate the mean average from repeat data. • Draw and annotate a diagram. • To draw an accurate line graph.	Year 3 – Forces and space: forces and magnets	air resistance anomaly balanced control variable (LKS2) data force (LKS2) gear gravity lever line graph line of best fit mean average pivot pulley relationship reliable surface area trustworthy (LKS2) unbalanced variable (LKS2)	Forces and space – unbalanced forces

			water resistance	
Year 5 Spring 2	• Describing mixtures • Sieving • Filtering • Solutions • Dissolving • Evaporating When working scientifically pupils who are **secure** will be able to: • Research a mixture to find out what substances it is made from. • Draw and annotate a diagram to explain how sieving separates a solid-solid mixture. • Identify and justify which type of enquiry to use to answer my testable question. • Identify solutions by observing and describing their appearance. • Suggest which variables to change, measure and control when investigating how temperature affects the time taken to dissolve. • Choose which measurements to take and how long to take them for.	Year 4 – Materials: states of matter	control variable (LKS2) dissolve filtering insoluble mixture sieving soluble solution stopwatch (LKS2) variable (LKS2)	Materials – mixtures and separation
Year 5 Summer 1	• Hardness of materials • Transparency • Conductivity • Reversible changes • Irreversible changes – burning and rusting • Irreversible changes – mixing When working scientifically pupils who are **secure** will be able to: • Evaluate the hardness test to determine the degree of trust in the results. • Plan and draw a table of results.	Year 5 – Materials: mixtures and separation	burning control variable (LKS2) conductor electrical conductivity hazard insulator irreversible change method (LKS2) reversible change rust rusting safety thermal conductivity	Materials – properties and change

	• Write a detailed, organised and easy to follow method. • Write a prediction using prior knowledge of the states of matter. • Analyse observations about rusting and use them to support a conclusion. • Measure accurately in centimetres.		transparency trustworthy (LKS2) variable (LKS2)	
Year 5 Summer 2	• Growing old • Puberty • Comparing human gestation When working scientifically, pupils who are **secure** will be able to: • Use data to describe growth from baby to adult. • Identify where on the graph the rate of growth changes. • Use a line graph to make predictions about height. • Choose a suitable title and axes labels for the scatter graph and plot data on the scatter graph.	Year 5: Living things: life cycles and reproduction	anomaly evidence foetus gestation period hormones life cycle line graph period (menstruation) puberty rate (LKS2) relationship	Animals – human timeline
	Key question: Does the size of an asteroid affect the diameter of its impact crater? Pupils who are **secure** will be able to: • Recall key knowledge from previous units. • Apply knowledge in new contexts. When working scientifically, pupils who are **secure** will be able to: • Carry out a full scientific enquiry.	This unit revises and builds on learning from year 5 science units.	air resistance celestial bodies conclusion (LKS2) evaluate fair test gravity predict (KS1) spherical reliable trustworthy (LKS2) variable (LKS2)	Making connections unit

Topic	**Key Learning Goals**	**Prior Knowledge**	**Vocabulary**	**Subject Concepts**
Year 6 Autumn 1	• Factors affecting health • The heart and circulatory system • Blood • Heart rate • Investigating exercise and heart rate • Heart rate and fitness When working scientifically, pupils who are secure will be able to: • Evaluate the trustworthiness of secondary sources that provide health advice. • Evaluate the model blood by considering a strength and a weakness when representing blood and suggesting improvements. • Compare class values and recognise when they do not match. • Use identified patterns to predict new values. • Write a method for an enquiry with consideration of equipment, the different versions of the changed variable and how to complete the measured variable. • Choose a suitable title and axis labels with units for the line graph and plot points on the line graph.	Year 4 – Animals including humans: Digestion and food	anomaly blood bloodstream blood vessels carbon dioxide circulatory system control variable (LKS2) data drug evaluate evidence fair test heart heart rate line graph mean average model oxygen pulse rate (LKS2) relationship reliable secondary source trustworthy (LKS2) variable (LKS2)	Animals including humans – circulation and health
Year 6 Autumn 2	• Pathway of light • How we see • Measuring shadows • Reflecting light • Making a periscope • Using mirrors When working scientifically, pupils who are **secure** will be able to:	Year 3 – Energy: Light and shadows	anomaly conclusion (LKS2) control variable (LKS2) evaluate evidence fair test light ray line graph line of best fit	Energy – light and reflection

	• Make observations about the properties of light. • Use my observations as evidence to support conclusions about light. • Draw ray diagrams. • Pose testable questions in response to observations. • Record my measurements as a line graph. • Use my line graph to extrapolate data and make predictions about missing values. • Recall various jobs or inventions that use mirrors and reflection.		mean average pupil ray diagram reflective relationship reliable scale testable units variable (LKS2)	
Year 6 Spring 1	• Carl Linnaeus and classification • Cold-blooded vertebrates • Warm-blooded vertebrates • Invertebrates • Plants • Micro-organisms When working scientifically pupils who are **secure** will be able to: • Use a classification key to group and identify organisms. • Make a simple classification key.	Year 4 – Living things: Classification and changing habitats	classification key (LKS2) classify (LKS2) cold-blooded conifer exoskeleton fern life processes micro-organism moss organism warm-blooded	Living things – classifying big and small
Year 6 Spring 2	• Components and circuits • Circuit diagrams • Current and resistance • Batteries and voltage • Voltage and bulb brightness • Practical circuits When working scientifically, pupils who are **secure** will be able to: • Draw circuit diagrams with straight lines and using standard circuit symbols.	Year 4 – Energy: Electricity and circuits	anomaly cell circuit diagram control variable (LKS2) current data evaluate evidence fair test hazard mean average model	Energy – circuits, batteries and switches

	• Design a results table with an appropriate number of columns and headings with units. • Identify the changed, measured and control variables in an enquiry to plan a method.		relationship resistance safety units variable (LKS2) voltage	
Year 6 Summer 1	• Variation • Inheritance • Adaptations • Natural selection • Evolution When working scientifically, pupils who are **secure** will be able to: • Sort variation as environmental, inherited or a mixture of both. • Evaluate a method by recalling variables that were effectively kept the same and those that were harder to control. • Comment on the reliability of the results and the degree of trust. • Consider how evidence is used to form theories and the degree of trust the evidence offers.	Year 6: Living things: Classifying big and small	adaptation anomaly competition control variable (LKS2) environment environmental evaluate evidence evolution extinct fossil gene inherit inheritance mean average model natural selection parent population reliable selective breeding survival of the fittest theory variable (LKS2) variation	Living things – evolution and inheritance
Year 6 Summer 2	Key question: Are some sunglasses safer than others? Pupils who are **secure** will be able to:	This unit revises and builds on learning from year 6 science units.	adaptation bar chart (LKS2) circuit diagram classify (LKS2)	Making connections unit

	• Recall key knowledge from previous units. • Apply knowledge in new contexts. When working scientifically, pupils who are **secure** will be able to: • Carry out a full scientific enquiry.		conclusion (LKS2) evaluate inherit predict (KS1) trustworthy (LKS2) variable (LKS2)	

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