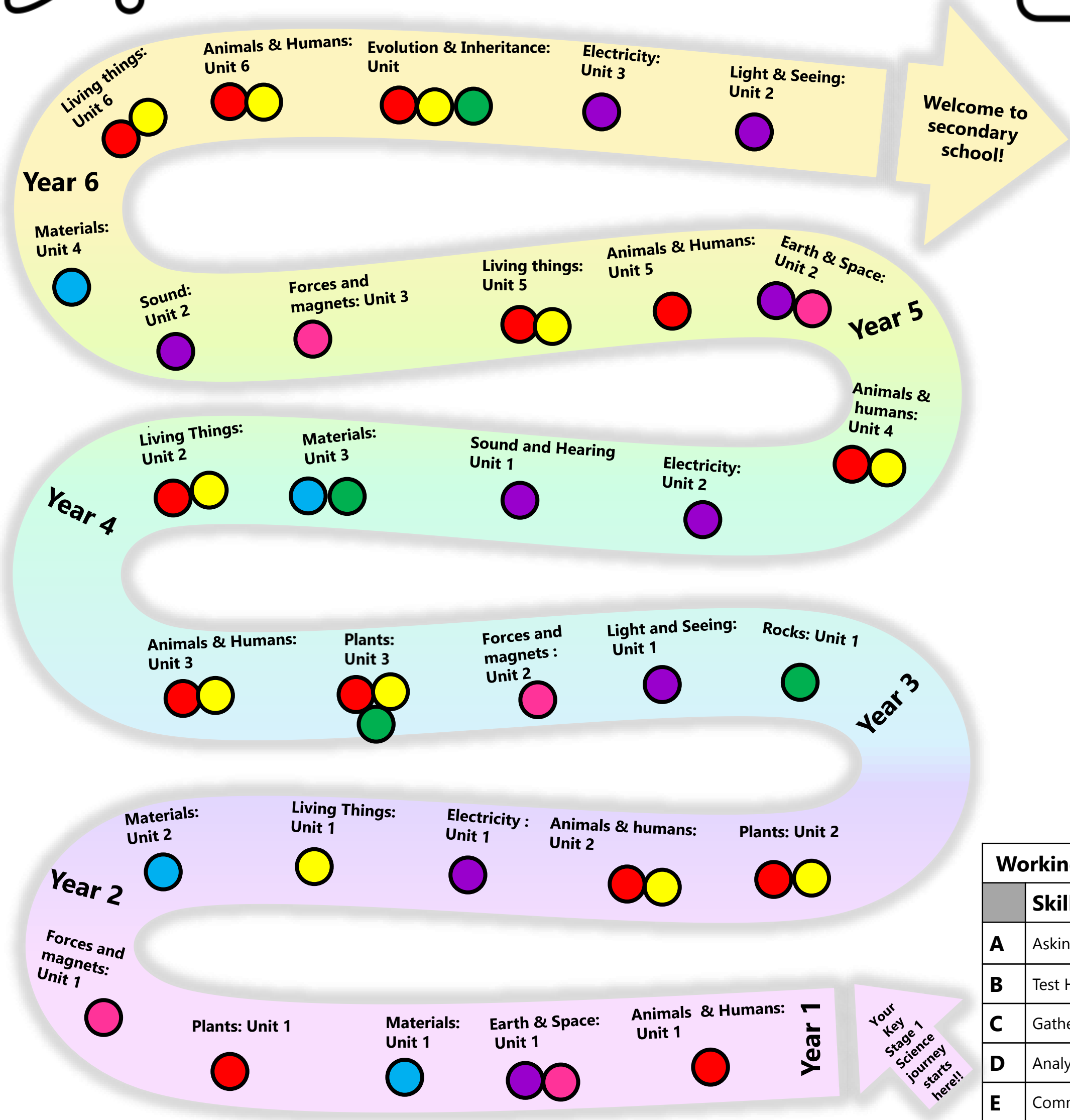




Science Learning Journey

“Remember to look up at the stars, not down at our feet. Try to make sense of what you see and wonder about what makes the universe exist. Be curious.” – Stephen Hawking



Working Scientifically	
	Skill
A	Asking Questions
B	Test Hypotheses
C	Gathering & Recording
D	Analysis
E	Communication

Why do Scientists read?

- To situate their research
- To interpret others data and critique their findings
- To find specific information to support their own investigations
- To learn about others' procedures and experiments
- To learn what other scientists are learning
- Helps to understand what's already been discovered
- Helps to see the bigger picture

Write like a scientist

- Avoid using the first person in your writing (third person is usually used)
- Be clear when stating scientific observations
- Be succinct, precise and logical in your writing
- Use labelled diagrams to help explain your points
- Correctly use the required scientific key words in your writing
- Use referencing to back up your arguments/ scientific points

Threshold Concepts in Science

B	Animals, humans and plants are made up of complex interacting systems in order to function.
B	Organisms require a supply of energy for organisms to carry out the basic functions of life and to grow.
C	The Earth is a complex of interacting rock, water, air and life.
C	The particle theory of matter is the abstract idea that helps us develop an understanding of why materials behave as they do
P	Energy is a powerful and unifying abstract idea which is difficult to define
P	Forces change the state of rest or motion of a body. They hold matter together and interplay between all objects



Science Learning Journey

“Nothing in life is to be feared, it is only to be understood. Now is the time to understand more, so that we may fear less.”

– Marie Curie



Science is key to providing the foundation for understanding the world. Science has changed and continues to change our lives and it vital to the world's future prosperity. Pupils can develop a sense of excitement and curiosity about natural phenomena and are encouraged to understand how science can be used to explain difference concepts, as well as allow us to make predictions and analyse causes; aiming to develop scientific knowledge, conceptual understanding, working scientifically skills, and the uses & implications of science. In the EYFS, science is included within “Understanding of the World”, where pupils learn about science by undertaking activities that help children to develop working scientifically skills and critical thinking. At KS1 and KS2 the curriculum is underpinned by 6 threshold concepts which are regularly revisited and developed over time. The units are taught in a carefully sequenced manner; ensuring that pupils build knowledge, understanding and enquiry skills, which offer them the firm foundation as they make the transition to secondary school to continue their studies further. The topics studied are hierarchical; increasing in difficulty and demand as pupils progress from Y1-6.

The journey begins

In every topic studied throughout a pupil's time in Primary school, there are aspects of Mathematics and English that underpin the science curriculum; we believe this is key to pupils' success in science. Language skills are essential to participating fully as a member of society; pupils', therefore, who do not learn to speak, read and write fluently & confidently are effectively disadvantaged. English reflects the importance of spoken language in pupils' development across the whole curriculum- cognitively, socially and linguistically. The quality and variety of language pupils hear and speak are key factors in developing their scientific vocabulary and presenting scientific justifications, evaluations, conclusions or arguments. Pupils are assisted in making their thinking clear, both to themselves and others, ensuring secure foundations are built by using discussion to probe and remedy misconceptions.

During the curriculum in science the following essential English skills are developed over time:

- 1) developing scholarly reading for information, reading increasingly challenging material independently; through learning new vocabulary, relating it to known vocabulary and understanding it with the help of context
- 2) choosing and reading books for challenge, interest and enjoyment
- 3) applying their growing knowledge of vocabulary to their writing and selecting the appropriate form
- 4) paying attention to accurate grammar, punctuation and spelling
- 5) understanding the difference between every day and scientific language
- 6) participating in debates, structured discussions and expressing pupils' own ideas.

Mathematics is essential to everyday life, critical to science, technology and engineering and necessary for financial literacy and most forms of employment. It develops an understanding of the world, the ability to reason and brings about a sense of power and curiosity about the subject. During their time at St Aloysius, in science, we re-enforce some of those essential skills by:

- 1) developing fluency in the fundamentals of mathematics so pupils develop conceptual understanding and the ability to recall and apply knowledge
- 2) practice and re-enforce mathematical reasoning and justification using mathematical language
- 3) use problem solving to routine and non-routine problems; including breaking down problems into simpler step,
- 4) help to develop pupils to think for themselves.

We also like to highlight the importance of STEM, discuss the varied nature of scientific careers and embed working scientifically skills into our subject curriculum, emphasizing how science can be put into context within the wider world; we believe this is an important aspect of providing a broad and balanced curriculum.

Biology threshold concepts

- Animals, humans and plants are made up of complex interacting systems in order to function.
- Organisms require a supply of energy for organisms to carry out the basic functions of life and to grow.

The two threshold concepts in Biology are taught across the following 3 topics: Plants, Animals & Humans and Living things & their habitats.

The concepts stem from the idea that all living organisms are made from cells. Most organisms are multicellular which means that the organism needs to contain sophisticated systems in order to carry out the various life processes, which require energy. It is important to develop an idea of how plants and animals can be grouped and categorised before exploring various parts and systems in plants and humans. Pupils start by identifying a variety of common animals, describing and comparing their structure. This then leads to pupils grouping common animals into carnivores, herbivores and omnivores as well as identifying the major parts of the human body. Over time, pupils will explore in more depth the major body systems in humans, this also is linked to the the concept of organism requiring energy, we take the opportunity to study the human digestive, circulatory, respiratory and skeletal systems as well as the importance of nutrition, a balanced diet and the impact of lifestyle choices in order to build on this concept in humans. It is also explored using food chains, habitats, competition as well as in plants, whereby plant structure, transport of materials, substances required for growth and the life cycle of a flowering plant are studied. We take the opportunity to study flowers, trees and plant growth in the spring and summer months, when use of the outdoor area in school can be maximised to support learning. Organisms also require energy to reproduce; this is explored in plants and animals whereby lifecycles, sexual and asexual reproduction are studied. We teach evolution and inheritance towards the end of Year 6. This is due to the topic being more conceptually difficult and students can use the knowledge they have gained in the other aspects of Biology to help build on the idea that plants and animals are classified which links to evolution. A good grounding in reproduction also aids pupil understanding of inheritance.

Chemistry threshold concepts

- The Earth is a complex of interacting rock, water, air and life.
- The particle theory of matter is the abstract idea that helps us develop an understanding of why materials behave as they do

The two threshold concepts in Chemistry are taught across the Materials topic. The concepts stem from the idea that all materials are made from atoms/particles and everyday materials behave in different ways, which can relate to simple physical properties and the arrangement of particles. The concept is more complex and increasingly abstract over the course of the curriculum, which prepares students for Chemistry at secondary school. Other aspects of chemistry that are developed using the concept that earth's resources can occur as a result of natural phenomena. Pupils start by distinguishing between an object and the materials from which it is made, identifying everyday materials, describing their physical properties, being able to group materials based their properties and comparing the suitability of everyday materials for particular uses. The opportunity is then taken to look at the physical properties of rocks and rock, fossil and soil formation which links with the concept that earth is a complex of interacting rock water, air and life. As the topic progresses pupils look at the particle model of solids, liquids and gases and what happens to materials when heated or cooled and how evaporation and condensation are related to the water cycle. In Year 5 students begin to explore the nature of physical and chemical reactions as well as separating simple mixtures.

Physics

- Energy is a powerful and unifying abstract idea which is difficult to define
- Forces change the state of rest or motion of a body. They hold matter together and interplay between all objects

The two concepts in Physics are taught across a range of topics including light, sound, electricity, earth & space and forces & magnets. Energy is a fundamental concept of physics that enables the explanation and prediction of many phenomena and contributes to the unification of the various branches of physics. Energy is a difficult concept to understand and master, which is why physics is usually taught from Year 3 onwards. We provide pupils with foundation lessons in earth & space and electricity in Years 1 and 2 respectively will aid in the preparing pupils for this highly abstract concept. The curriculum explores different forms of energy stores including electricity, sound and hearing and light and seeing. Pupils explore light, reflections and shadows before then being able to explain how we see things using ideas about light and its properties. Pupils in Year 4 learn how sounds are made, features of sound waves including pitch, amplitude and dissipation. Electricity includes common electrical appliances, constructing simple series circuits, common conductors and insulators, recognising components from circuit diagrams and investigating components in series circuits.

Force is a useful idea because it is the key to explaining changes in the motion of an object or in its shape. The motion of an object can be explained or predicted if you know the sizes and directions of all the forces that act on it. Understanding forces help us to predict and control the physical world around us. The idea of forces stem from the idea that essentially a force is a push or pull acting upon an object as a result of its interaction with another object. Pupils study contact and non-contact forces including magnetism and magnetic materials. Contact forces are explored through air and water resistance. Levers, gears and pulleys also look how forces can be useful in everyday contexts.

Earth and Space adopts both concepts, since it involves the force of gravity, which influences many dynamic processes within the earth's interior, on and above its surface. Energy is transferred from the sun to Earth via electromagnetic waves, or radiation. Most of the energy that passes through the upper atmosphere and reaches Earth's surface. The topics studied include the movement of the earth and other planets relative to the sun and its solar system, movement of the moon and explaining day and night. We also take the opportunity to study earth and space in the winter months when nights are longer, and children can participate in observing the moon and stars at a reasonable time at home.

When pupils move onto KS3 they explore the link between forces and energy and learn when objects collide, contact forces transfer energy to change the objects' motions. When two objects interact, each one exerts a force on the other, and these forces can transfer energy between them.