

# All Saints RC Primary School



**All Saints CPS**

## STEM

## Yearly overview for whole school

We have decided that science in our school will follow five themes: **Diversity, Cycles, Systems, Energy and Interactions**. These themes encompass a core body of concepts in both the life and physical sciences. This body of concepts has been chosen because it provides a broad-based understanding of the environment, and it will help build a foundation upon which students can rely on for further study.

Autumn 1	Systems-Ourselfs
Autumn 2	Systems-Electricity
Spring 1	Diversity-Living and non-living things/materials
Spring 2	Energy-Forces and different types of power
Summer 1	Interactions-How people impact the world
Summer 2	Cycles-Life cycles/water cycles

## Descriptions of learning

### WM 1 - Being curious and searching for answers is essential to understanding and predicting phenomena.

Curiosity about science and technology leads us to ask questions about the world around us. By being encouraged to use logic, evidence and creativity, learners will be supported to enquire into and apply scientific knowledge to further understanding of how our world works. Developing and testing models will also help them make sense of its complexity. With evidence derived from observations, new theories can be developed, and existing ideas may be refined or challenged.

Learners need to be able to evaluate scientific claims to help make informed decisions that affect our environment and well-being. The choices we make depend on many factors, including moral viewpoints and personal beliefs. However, rigorous and robust evidence-based research provides a solid foundation on which to base decisions. As ethically informed citizens, learners will need to consider the impact of our actions and of scientific and technological developments, locally and elsewhere in Wales, as well as in the wider world, asking 'Just because we can, does that mean we should?'

PS1	PS2	PS3
<p>I can show curiosity and question how things work.</p> <p>I can explore the environment, make observations and communicate my ideas.</p>	<p>I can ask questions and use my experience to suggest simple methods of inquiry.</p> <p>I can recognise patterns from my observations and investigations and can communicate my findings.</p> <p>I can use my <i>knowledge</i> and understanding to predict effects as part of my scientific exploration.</p> <p>I can recognise that what I do, and the things I use, can have an impact on my environment and on living things.</p> <p>I can explore relationships between living things, their habitats and their <i>life cycles</i>.</p>	<p>I can identify questions that can be investigated scientifically and suggest suitable methods of inquiry.</p> <p>I can suggest conclusions as a result of carrying out my inquiries.</p> <p>I can evaluate methods to suggest improvements.</p> <p>I can engage with scientific and technological evidence to inform my own opinions</p> <p>I can understand how my actions and the actions of others impact on the environment and living things.</p>

	<p>I can observe and describe ways in which materials change when they are mixed together.</p> <p>I can investigate different forms of energy and how it can be transferred.</p> <p>I can explore and communicate the basic properties of light, sound, electricity and magnetism.</p> <p>I can identify things in the environment which may be harmful and can act to reduce the risks to myself and others.</p>	<p>I can describe the impacts of science and technology, past and present, in my everyday life</p>
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**WM2-Design thinking and engineering offer technical and creative ways to meet society's needs and wants.**

By applying their experiences, skills and knowledge, learners can design and shape innovative engineered solutions. Being part of a user-centred design process will encourage them to use creativity to develop ideas, manage and mitigate risks, and minimise complexities. When engineering products, services and systems, they will need to understand and control the interactions between materials, structures, components and users. The application of engineering processes allows learners to develop accuracy, precision, dexterity and craftsmanship. By designing and engineering outcomes in response to needs and wants, learners can become enterprising problem solvers

PS1	PS2	PS3
<p>I can design while I make and communicate about what I am making.</p> <p>I can safely use simple tools, materials and equipment to construct and deconstruct.</p> <p>I can explore the properties of materials and choose different materials for a particular use.</p> <p>I can identify, follow and begin to create sequences and patterns in everyday activities</p>	<p>I can produce designs to communicate my ideas in response to particular contexts.</p> <p>I can make design decisions, using my knowledge of materials and existing products, and suggest design improvements.</p> <p>I can explore how different component parts work together.</p> <p>I can safely use a range of tools, materials and equipment to construct for a variety of reasons.</p> <p>I have experienced using basic prototyping techniques to improve outcomes.</p> <p>I can identify things in the environment which may be harmful and can act to reduce the risks to myself and others.</p> <p>I can explore and describe the properties of materials and justify their uses.</p>	<p>I can draw inspiration to design from historical, cultural and other sources.</p> <p>I can creatively respond to the needs and wants of the user, based on the context and on the information collected.</p> <p>I can identify and consider factors when developing design proposals.</p> <p>I can use design thinking to test and refine my design decisions without fear of failure.</p> <p>I can apply my knowledge and skills when making design decisions in order to produce specific outcomes.</p> <p>I can consider how my design proposals will solve problems and how this may affect the environment.</p> <p>I can use design communication methods to develop and present ideas, and respond to feedback.</p> <p>I can combine component parts, materials and processes to achieve functionality and improve the effectiveness of my outcomes.</p>

		<p>I can select and safely use appropriate tools, materials and equipment to construct purposeful outcomes.</p> <p>I can use prototyping as a link between my designing and making.</p> <p>I can take into account the impact my making may have on the environment.</p>
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**WM 3 – The world around us is full of living things which depend on each other for survival (Biology).**

By recognising the diversity of living things and how they interact with their environment, learners can develop an understanding of how these have evolved over significant periods of time. All living things require specific conditions and resources to survive and they may have to compete with other organisms to do so. Humans form part of the living world and our decisions and actions, along with natural selection, can have a significant impact on the diversity of life. Knowing about the structures and functions of living things enables learners to understand how these things grow, develop and reproduce successfully. Developing an understanding of the factors which affect the health and success of organisms allows us to make informed decisions, including about the prevention and treatments of diseases.

PS1	PS2	PS3
<p>I can recognise that plants and animals are living things which grow.</p> <p>I can identify, follow and begin to create sequences and patterns in everyday activities.</p>	<p>I can recognise patterns from my observations and investigations and can communicate my findings.</p> <p>I can use my knowledge and understanding to predict effects as part of my scientific exploration.</p> <p>I can recognise that what I do, and the things I use, can have an impact on my environment and on living things.</p> <p>I can explore relationships between living things, their habitats and their life cycles.</p>	<p>I can describe how living things compete for specific resources and depend on each other for survival.</p> <p>I can describe the features of organisms and recognise how they allow them to live, grow and reproduce for survival in their environment.</p> <p>I can explain the role of different organs and systems that enable plants and animals to live and grow.</p> <p>I can describe some changes in growth and development caused by hormones.</p> <p>I can identify the threats to the development and health of organisms and recognise some natural defences, preventions and treatments.</p>

#### WM 4 - Matter and the way it behaves defines our universe and shapes our lives (Chemistry).

The universe and all living things are made up of matter. The behaviour of matter determines the properties of materials and allows us to use natural resources, as well as to create new substances. Understanding the nature of matter can help learners to appreciate the impact that chemistry has on the world around them, as well as how it contributes to advances in science and technology. Chemical reactions happen continuously in our environment as well as in living things. Learning how to control and apply these reactions has benefits to individuals and industry.

PS1	PS2	PS3
<p>I can explore the properties of materials and choose different materials for a particular use.</p> <p>I can identify, follow and begin to create sequences and patterns in everyday activities.</p>	<p>I can recognise patterns from my observations and investigations and can communicate my findings.</p> <p>I can use my knowledge and understanding to predict effects as part of my scientific exploration.</p> <p>I can make design decisions, using my knowledge of materials and existing products, and suggest design improvements.</p> <p>I can explore and describe the properties of materials and justify their uses.</p> <p>I can observe and describe ways in which materials change when they are mixed together.</p>	<p>I can recognise that changes in materials affect their properties and uses under different conditions.</p> <p>I can recognise that our planet provides natural materials and can explain why they may have been processed to make them useful.</p>



WM5= Computation is the foundation for our digital world.

Computation involves algorithms processing data to solve a wide range of real-world problems. Computational processes have changed the way we live, work, study and interact with each other and our environment. They provide the foundation for all software and hardware systems, but learners should also be aware of the limitations of what computers can achieve. To create and use digital technologies to their full potential, learners need to know how they work. They also need to understand that there are broad legal, social and ethical consequences to the use of technology. This can help learners to make informed decisions about the future development and application of technology.

PS1	PS2	PS3
<p>I can identify, follow and begin to create sequences and patterns in everyday activities.</p> <p>I am beginning to follow a sequence of instructions.</p> <p>I can experiment with and identify uses of a range of computing technology in the world around me.</p>	<p>I can safely use a range of tools, materials and equipment to construct for a variety of reasons.</p> <p>I can use computational thinking techniques, through unplugged or offline activities.</p> <p>I can create simple algorithms and am beginning to explain errors.</p> <p>I can follow algorithms to determine their purpose and predict outcomes.</p> <p>I am beginning to explain the importance of accurate and reliable data to ensure a desired outcome.</p> <p>I can follow instructions to build and control a physical device.</p>	<p>I can use conditional statements to add control and decision-making to algorithms.</p> <p>I can identify repeating patterns and use loops to make my algorithms more concise.</p> <p>I can explain and debug algorithms.</p> <p>I can use sensors and actuators in systems that gather and process data about the systems' environment.</p> <p>I can identify positive and negative design elements that affect user interactions.</p> <p>I can explain how digital devices can be interconnected locally and globally.</p> <p>I can explain the importance of securing the technology I use and protecting the integrity of my data.</p> <p>I can explain how my data is used by services, which can help me make more informed decisions when using technology.</p> <p>I can explain how data is stored and processed.</p> <p>I can effectively store and manipulate data to produce and give a visual form to useful information.</p>

## Autumn term 1

### Systems-Ourselfes

WM 3 - The world around us is full of living things which depend on each other for survival (Biology).

Domain	Concepts	PS1	PS2	PS3
Systems	Human	<p><b>Knowledge</b></p> <p>Identify the main human body parts that enable us to live.</p>	<p><b>Knowledge</b></p> <p>Identify the main human body parts that enable us to live and begin to understand their functions.</p> <p>Communicate the functions of the organs in the respiratory, circulatory and digestive systems.</p>	<p><b>Knowledge</b></p> <p>Identify the organ systems and state their functions in human (digestive, respiratory, circulatory, skeletal and muscular).</p> <p>-Identify the organs in the human digestive system (mouth, gullet, stomach, small intestine and large intestine) and describe their functions.</p>
	Plant	<p><b>Knowledge:</b></p> <p>Identify the different parts of plants and state their functions:</p> <p>Leaf/stem/root</p>	<p><b>Knowledge:</b></p> <p>Identify the different parts of plants and state their functions.</p>	<p><b>Knowledge:</b></p> <p>Identify the different parts of plants and state their functions.</p>

	Cell			<p><b>Knowledge:</b></p> <ul style="list-style-type: none"><li>-Show an understanding that a cell is a basic unit of life.</li><li>-Identify the different parts of a typical plant cell and animal cell and relate the parts to the functions. Parts of plant cell: cell wall, cell membrane, cytoplasm, nucleus and chloroplasts.</li><li>Parts of animal cell: cell membrane, cytoplasm, nucleus</li></ul>

Autumn term 2

Systems-Circuits/Power

WM 1 - Being curious and searching for answers is essential to understanding and predicting phenomena.

WM 5 - Forces and energy

Domain	Concepts	PS1	PS2	PS3
Systems	Electrical	<p>Knowledge</p> <p>Explore parts of a circuit and learn names e.g. wire, bulb ect.</p>	<p>Knowledge</p> <p>To explore building circuits and investigate conductors.</p>	<p>Knowledge</p> <ul style="list-style-type: none"> <li>-Recognise that an electric circuit consisting of an energy source (battery) and other circuit components (wire, bulb, switch) forms an electrical system.</li> <li>-Show an understanding that a current can only flow in a closed circuit.</li> <li>-Identify electrical conductors and insulators.</li> </ul> <p>Skills</p> <ul style="list-style-type: none"> <li>-Construct simple circuits from circuit diagrams.</li> <li>-Investigate the effect of some variables on the current in a circuit and communicate findings. - number of batteries (arranged in series) - number of bulbs (arranged in series and parallel)</li> </ul>
	Solar			<p>Knowledge</p>

				<p>-Recognise that there are 8 planets in our Solar System and order them from distance to the Sun.</p> <p>-Understand how the Solar System was formed in the beginning.</p> <p>-Show and understand of the Earth's orbit and how this impacts on days/years etc.</p> <p>-Show an understanding of the moon's orbit.</p> <p>-Recognise the effects that gravity/air resistance has on a falling object.</p> <p><b>Skills</b></p> <p>-<u>Construct</u> a comic strip to show how the creation of the universe came about.</p> <p>-<u>Draw</u> diagrams to show the order of the planets from the Sun.</p> <p>-<u>Investigate</u> how air resistance can impact upon a falling object.</p>
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## Spring term 1

### Diversity-Living and non-living things

WM 3 - The world around us is full of living things which depend on each other for survival (Biology).

WM 4 - Matter and the way it behaves defines our universe and shapes our lives (Chemistry).

Domain	Concepts	PS1	PS2	PS3
Diversity	Living/non-living things	<p><b>Knowledge</b> Identify plants and animals in my local area.</p>	<p><b>Knowledge</b> Describe the characteristics of living things: need water, food and air to survive; grow, respond and reproduce Recognise some broad groups of living things. - plants (flowering, non-flowering) - animals (amphibians, birds, fish, insects, mammals, reptiles)</p> <p>Observe a variety of living and non-living things and infer differences between them. Classify living things into broad groups (in plants and animals) based on similarities and differences of common observable characteristics</p>	<p><b>Knowledge</b> Describe the characteristics of living things and how they have adapted to survive in their natural habitats/environments</p> <p>Compare the features of different living things from different environments.</p> <p>Communicate how specific adaptations have allowed life to be successful in different environments.</p>
	Materials	<p><b>Knowledge</b> Comparing soft/hard materials</p> <p>-Know that there are different materials that can</p>	<p><b>Knowledge</b> -Relate the use of various types of materials (ceramic, fabric, glass, metal, plastics, rubber, wood) to their physical properties.</p> <p>-Compare physical properties of materials based on: - strength - flexibility - waterproof - transparency - ability to float/sink in water</p>	<p><b>Knowledge</b> -Relate the use of various types of materials (ceramic, fabric, glass, metal, plastics, rubber, wood) to their physical properties. Changing materials.</p>

		be used differently		-Compare physical properties of materials based on: - strength - flexibility - waterproof - transparency - ability to float/sink in water
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Spring term 2

Energy-Forces and different types of power

**WM 1 - Being curious and searching for answers is essential to understanding and predicting phenomena**

**WM 5 - Forces and energy provide a foundation for understanding our universe (Physics).**

Domain	Concepts	PS1	PS2	PS3
Interactions	Forces	<p><u>Knowledge</u></p> <p>Recognise that a magnet can exert a push or a pull. Recognise that a magnet can exert a push or a pull.</p>	<p><u>Knowledge</u></p> <p>Recognise that a magnet can exert a push or a pull. Identify the characteristics of magnets. - magnets can be made of iron or steel - magnets have two poles. A freely suspended bar magnet comes to rest pointing in a North-South direction - unlike poles attract and like poles repel - magnets attract magnetic materials List some uses of magnets in everyday objects.</p> <p>-<u>Compare</u> magnets, non-magnets and magnetic materials. -<u>Make</u> a magnet by the 'Stroke' method and the electrical method.</p>	<p><u>Knowledge</u></p> <p>-Identify a force as a push or a pull. -Show an understanding of the effects of a force. - A force can move a stationary object - A force can speed up, slow down or change the direction of motion - A force can stop a moving object - A force may change the shape of an object -Recognise and give examples of the different types of forces. - magnetic force - gravitational force - elastic spring force - frictional force -Recognise that objects have weight because of the gravitational force acting on the object.</p> <p>-<u>Investigate</u> the effect of friction on the motion of objects and <u>communicate</u> findings. -<u>Investigate</u> the effects of forces on springs and <u>communicate</u> findings.</p>



<p><b>Energy</b></p>	<p><b>Forms and uses</b></p>	<p><b>Knowledge</b></p> <p>Comparing and investigating night and day/light and dark.</p> <p>Comparing and investigating temperature (hot and cold)</p> <p>I can identify, follow and begin to create sequences and patterns in everyday activities.</p>	<p><b>Knowledge</b></p> <ul style="list-style-type: none"> <li>-Recognise that an object can be seen when it reflects light or when it is a source of light.</li> <li>-Recognise that a shadow is formed when light is completely or partially blocked by an object.</li> <li>-List some common sources of heat.</li> <li>-State that the temperature of an object is a measurement of its degree of hotness.</li> </ul> <p>Differentiate between heat and temperature. - heat is a form of energy - temperature is a measurement of the degree of hotness of an object</p> <ul style="list-style-type: none"> <li>-Show an understanding that heat flows from a hotter to a colder object/region/place until both reach the same temperature.</li> </ul> <p>Relate the change in temperature of an object to the gain or loss of heat by the object.</p> <p>List some effects of heat gain/loss in our everyday life. - contraction / expansion of objects (solid, liquid and gas) - change in state of matter</p> <ul style="list-style-type: none"> <li>-Identify good and poor conductors of heat. - good conductors: metals - poor conductors: wood, plastics, air</li> </ul> <p>-Investigate the variables that affect shadows formed and communicate findings. - shape, size and position of object(s) - distance between light source-object and object-screen</p> <ul style="list-style-type: none"> <li>-Measure temperature using a thermometer and a data logger with temperature/heat sensors</li> </ul>	<p><b>Knowledge</b></p> <ul style="list-style-type: none"> <li>-Recognise that energy from most of our energy resources is derived in some ways from the Sun.</li> <li>-Recognise and give examples of the various forms of energy. - kinetic energy - potential energy - light energy - electrical energy - sound energy - heat energy</li> </ul> <p>-Investigate energy conversion from one form to another and communicate findings.</p>
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## Summer I

### Interactions-Environment

WM 1 - Being curious and searching for answers is essential to understanding and predicting phenomena

WM 3 - The world around us is full of living things which depend on each other for survival (Biology).

Domain	Concepts	PS1	PS2	PS3
Interactions	Environment	<p><b>Knowledge</b></p> <p>Identify personal action that they themselves can take to help maintain a healthy environment for living things, including humans (e.g., walk to school instead of being driven in the car; be careful what they put</p>	<p><b>Knowledge</b></p> <p>Identify personal action that they themselves can take to help maintain a healthy environment for living things, including humans (e.g., walk to school instead of being driven in the car; be careful what they put down the drain at home; practise cleanliness to reduce the spread of germs when helping in the kitchen; show care and concern for all living things)</p>	<p><b>Knowledge:</b></p> <ul style="list-style-type: none"><li>-Identify the factors that affect the survival of an organism. - physical characteristics of the environment (temperature, light, water) - availability of food - types of other organisms present (producers, consumers, decomposers)</li><li>-Discuss the effect on organisms when the environment becomes unfavourable (organisms adapt and survive; move to other places or die).</li><li>-Trace the energy pathway from the Sun through living things and identify the roles of various organisms (producers, consumers, predators, prey) in a food chain and a food web.</li><li>-Differentiate among the terms organism, population and community. - An organism is a living thing. - A population is defined as a group of plants and animals of</li></ul>

		<p><i>down the drain at home; practise cleanliness to reduce the spread of germs when helping in the kitchen; show care and concern for all living things)</i></p>		<p>the same kind, living and reproducing at a given place and time. – A community consists of many populations living together in a particular place</p> <p>–Show an understanding that different habitats support different communities (garden, field, pond, seashore, tree, mangrove swamp).</p> <p>–Recognise that adaptations serve to enhance survival and can be structural or behavioural. – cope with physical factors – obtain food – escape predators – reproduce by finding and attracting mates or dispersing seeds/fruits</p> <p>–Give examples of man’s impact, (both positive and negative) on the environment.</p> <p><u>Observe</u>, <u>collect</u> and <u>record</u> information regarding the interacting factors within an environment.</p>
<b>Cycles</b>	<b>Plants and animals</b>	<p><b>Knowledge</b></p> <p>Recognising different plants.</p> <p>Recognising different animals.</p> <p>Understanding how living things learn and grow.</p>	<p><b>Knowledge</b></p> <p>Show an understanding that different living things have different life cycles: Plants and animals</p> <p>–<u>Observe</u> and <u>compare</u> the life cycles of plants grown from seeds over a period of time.</p> <p>–<u>Observe</u> and <u>compare</u> the life cycles of animals over a period of time (butterfly, beetle, mosquito, grasshopper, cockroach, chicken, frog).</p>	<p><b>Knowledge</b></p> <p>–Show an understanding that living things reproduce to ensure continuity of their kind and that many characteristics of an organism are passed on from parents to offspring.</p> <p>–Recognise processes in the sexual reproduction of flowering plants. Pollination/fertilisation (seed production)/seed dispersal/germination</p> <p>–Recognise the process of fertilisation in the sexual reproduction of humans.</p> <p>–Recognise the similarity in terms of fertilisation in the sexual reproduction of flowering plants and humans.</p> <p>–<u>Investigate</u> the various ways in which plants reproduce and <u>communicate</u> findings. – spores – seeds</p>

Cycles	Matter and water	<p>Exploring the properties of materials.</p> <p>Choosing different materials for a particular use.</p>	<p><b>Knowledge</b></p> <ul style="list-style-type: none"> <li>-State that matter is anything that has mass and occupies space.</li> <li>-Differentiate between the three states of matter (solid, liquid, gas) in terms of shape and volume.</li> <li>-<u>Measure</u> mass and volume using appropriate apparatus.</li> </ul>	<p><b>Knowledge</b></p> <ul style="list-style-type: none"> <li>-Recognise that water can exist in three interchangeable states of matter.</li> <li>-Show an understanding of how water changes from one state to another. - Melting (solid to liquid) - Evaporation/Boiling (liquid to gas) - Condensation (gas to liquid) - Freezing (liquid to solid)</li> <li>-Show an understanding of the terms melting point of ice (or freezing point of water) and boiling point of water.</li> <li>-Show an understanding of the roles of evaporation and condensation in the water cycle.</li> <li>-Recognise the importance of the water cycle.</li> <li>-Recognise the importance of water to life processes.</li> <li>-Describe the impact of water pollution on Earth's water resources.</li> <li>-<u>Compare</u> water in 3 states.</li> <li>-<u>Investigate</u> the effect of heat gain or loss on the temperature and state of water and <u>communicate</u> findings. - when ice is heated, it melts and changes to water at 0oC - when water is cooled, it freezes and changes to ice at 0oC - when water is heated, it boils and changes to steam at 100oC - when steam is cooled, it condenses to water.</li> <li>-<u>Investigate</u> the factors which affect the rate of evaporation and <u>communicate</u> findings. - wind - temperature - exposed surface area.</li> </ul>
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