

SUBJECT: Science

CURRICULUM INTENT: At St Mary Magdalene we have designed our science curriculum to equip and develop the knowledge and skills our students need to understand the natural world around them. Through the acquisition and exploration of key scientific principles, the curriculum promotes scientific enquiry and curiosity to further our pupils' passion for science and prepare them for society in an ever-expanding scientific and technological world.

Biology Chemistry Physics Theme / concept 4	Biology	Chemistry	Physics	Theme / concept 4
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	AUTUMN 1	AUTUMN 2	SPRING 1	SPRING 2	SUMMER 1	SUMMER 2
NURSERY	Understanding the World					
– KEY	Children know about simila	rities and differences in re	elation to places, objects,	materials and living things	. They talk about the featu	res of their own
THEMES /	immediate environment an	d how environments migh	nt vary from one another.	They make observations of	of animals and plants and e	xplain why some things
CONCEPTS	occur and talk about chang	es.				
NURSERY						
– KEY						
CONTENT /						
LEARNING						
RECEPTIO	Understanding the World					
N - KEY	Children know about simila	rities and differences in re	elation to places, objects,	materials and living things.	. They talk about the featu	res of their own
THEMES /	immediate environment an	d how environments might	nt vary from one another.	They make observations of	of animals and plants and e	xplain why some things
CONCEPTS	occur and talk about chang	es.				
RECEPTIO						
N - KEY						
CONTENT/						
LEARNING						
YEAR 1 -	Seasonal Changes	<u>Plants</u>	Animals inclu	uding Humans	<u>Everyday</u>	<u>materials</u>
KEY						
THEMES /						
CONCEPTS						
YEAR 1 -	 Observe and 	 Identify and 	 Identify and 	 Identify and 	 Distinguish 	 Distinguish
KEY	describe	name a	name a	name a	between an	between an
CONTENT/	weather	variety of	variety of	variety of	object and	object and
LEARNING	associated with	common wild	common	common	the material	the material
	the seasons and	and garden	animals	animals	from which it	from which it
	how day length	plants,	including	including fish,	is made.	is made.
	varies.	including	fish,	amphibians.	 Identify and 	 Identify and
	Observe	deciduous	amphibians	reptiles, birds	name a	name a
	changes across	and	rentiles hirds	and	variety of	variety of
	changes across	unu	reptiles, bilds	mammalc	overvdov	overvdov
				manniais.	everyuay	everyuay



the four	evergreen	and	 Identify and 	materials,
seasons.	trees.	mammals.	name a	including
	 Identify and 	 Identify and 	variety of	wood, plastic,
	describe the	name a	common	glass, metal,
	basic	variety of	animals that	water, and
	structure of a	common	are	rock.
	variety of	animals that	carnivores,	• • Describe the
	common	are	herbivores	simple
	flowering	carnivores,	and	physical
	plants,	herbivores	omnivores.	properties of
	including	and	 Describe and 	a variety of
	trees.	omnivores.	compare the	everyday
		 Describe and 	structure of a	materials.
		compare the	variety of	Compare and
		structure of a	common	group
		variety of	animals (fish,	together a
		common	amphibians,	variety of
		animals (fish,	reptiles, birds	everyday
		amphibians,	and	materials on
		reptiles, birds	mammals,	the basis of
		and	including	their simple
		mammals,	pets).	physical
		including	 Identify, 	properties.
		pets).	name, draw	
		 Identify, 	and label the	
		name, draw	basic parts of	
		and label the	the human	
		basic parts of	body and say	
		the human	which part of	

body and say

the body is

materials, including wood, plastic, glass, metal, water, and rock.

- Describe the simple physical properties of a variety of everyday materials.
- Compare and group together a variety of everyday materials on the basis of their simple physical properties.



			which part of the body is associated with each sense.	associated with each sense.		
YEAR 2 - KEY THEMES / CONCEPTS	<u>Everyday Materials</u>	<u>Plants</u>	<u>Animals inclu</u>	uding Humans	<u>Living Things a</u>	and Habitats.
YEAR 2 - KEY CONTENT/ LEARNING	 Identify and compare the suitability of a variety of everyday materials, including wood, metal, plastic, glass, brick, rock, paper and cardboard for particular uses. Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, 	 Observe and describe how seeds and bulbs grow into mature plants. Find out and describe how plants need water, light and a suitable temperature to grow and stay healthy. 	 Notice that animals, including humans, have offspring which grow into adults. Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). Describe the importance 	 Notice that animals, including humans, have offspring which grow into adults. Find out about and describe the basic needs of animals, including humans, for survival (water, food and air). Describe the importance for humans of 	 Explore and compare the differences between things that are living, dead, and things that have never been alive. Identify that most living things live in habitats to which they are suited and describe how different habitats provide for 	 Explore and compare the differences between things that are living, dead, and things that have never been alive. Identify that most living things live in habitats to which they are suited and describe how different habitats provide for



twisting and stretching.	for humans of exercise, eating the right amounts of different types of food, and hygiene.	exercise, eating the right amounts of different types of food, and hygiene.	 the basic needs of different kinds of animals and plants, and how they depend on each other. Identify and name a variety of plants and animals in their habitats, including microhabitats Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different 	the basic needs of different kinds of animals and plants, and how they depend on each other. Identify and name a variety of plants and animals in their habitats, including microhabitats Describe how animals obtain their food from plants and other animals, using the idea of a simple food chain, and identify and name different



					sources of food.	sources of food.
YEAR 3 - KEY THEMES / CONCEPTS	<u>Animals including</u> <u>Humans</u>	<u>Rocks</u>	<u>Plants</u>	<u>Light</u>	Forces and	<u>d Magnets</u>
YEAR 3 - KEY CONTENT/ LEARNING	 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. Identify that humans and some other animals have skeletons and muscles for support, protection and movement. 	 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 	 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 	 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 	 Compare how things move on different surfaces. Notice that some forces need contact between two 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 	 Compare how things move on different surfaces. Notice that some forces need contact between two 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



		rocks and organic matter.	 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. 	 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. 	 whether they are attracted to a magnet, and identify some magnetic materials. Describe magnets as having two poles. Predict whether two magnets will attract or repel each other, depending on which poles are facing. 	 whether they are attracted to a magnet, and identify some magnetic materials. Describe magnets as having two poles. Predict whether two magnets will attract or repel each other, depending on which poles are facing.
YEAR 4 - KEY THEMES / CONCEPTS	Animals including Humans	States of Matter	<u>Sound</u>	<u>Living Things</u>	Electricit	Y
YEAR 4 - KEY CONTENT/ LEARNING	 Describe the simple functions of the basic parts of the 	 Compare and group materials together, 	 Identify how sounds are made, associating 	 Recognise that living things can be grouped in a 	 Identify common appliances 	 Identify common appliances



digestive system in humans.

- Identify the different types of teeth in humans and their simple
- functions.
 Construct and interpret a variety of food chains, identifying producers, predators and prey.

according to whether they are solids, liquids or

- gases.
 Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens
- in degrees Celsius (°C).
 Identify the
- part played by evaporation and condensation in the water cycle and associate the rate of

evaporation

some of them with something vibrating.

- Recognise that vibrations from sounds travel through a medium to the ear.
- Find patterns between the pitch of a sound and features of the object that produced it.
- Find patterns between the volume of a sound and the strength of the vibrations that produced it.

variety of ways.

Explore and use classification keys to help group, identify and name a variety of living things in

- name a variety of living things in their local and wider environment.
- Recognise that environments can change and that this can sometimes pose dangers to living things.

that run on electricity.

 Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs,

switches and buzzers. Identify whether or

•

- not a lamp will light in a simple series circuit, based on whether or not the lamp is part of a complete loop with a battery.
- Recognise that a switch opens and closes a

that run on electricity.

- Construct a simple series electrical circuit, identifying and naming its basic parts, including cells, wires, bulbs, switches and buzzers.
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 - Recognise that a switch opens and closes a

•



	with temperature.	 Recognise that sounds get fainter as the distance from the sound source increases. 		circuit and associate this with whether or not a lamp lights in a simple series circuit. • Recognise some common conductors and insulators, and associate metals with being good conductors. • Circuit and associate th with whether or not a lam lights in a simple series circuit. • Recognise some common conductors and being good conductors.
YEAR 5 - KEY THEMES / CONCEPTS	All Living Things (Living Things and Habitats and Animals including Humans)	<u>Properties and their</u> <u>Materials</u>	<u>Forces</u>	Earth and Space
YEAR 5 - KEY CONTENT/ LEARNING	 Describe the life process of reproduction in some plants and animals. Describe the life process of reproduction in some plants and animals. Describe the life process of reproduction in life process of process of reproduction in life process of life process of reproduction in life process of lif	 Compare and group together everyday materials on the basis of their properties, 	• Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the	 Describe the movement of the Earth, and other planets, relative to the Sun in the solar system. Describe the movement of the Earth, and other planets, relative to the solar system.



some plants and animals.

Describe the changes as humans develop to old age. in some plants and animals.Describe the changes as

reproduction

humans develop to old age. including their hardness, solubility, transparency , conductivity (electrical and thermal), and response to magnets.

- Know that
 some
 materials will
 dissolve in
 liquid to
 form a
 solution, and
 describe how
 to recover a
 substance
 from a
 solution.
- Use knowledge of solids, liquids and gases to decide how mixtures might be separated,

Earth and the falling object.

- Identify the effects of air resistance, water resistance and friction, that act between moving surfaces.
- Recognise that some mechanisms , including levers, pulleys and gears, allow a smaller force to have a greater effect.

- Describe the movement of the Moon relative to the Earth.
- Describe the Sun, Earth and Moon as approximatel y spherical bodies.
- Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.

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•

•

- Describe the Sun, Earth and Moon as approximatel y spherical bodies.
- Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky.



including through filtering, sieving and evaporating. • Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. Demonstrate • that dissolving, mixing and changes of state are reversible changes. Explain that ٠ some changes



			result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.			
YEAR 6 - KEY THEMES / CONCEPTS	All Living Things	<u>Electricity</u>	<u>Animals includ</u>	ling Humans	<u>Ligh</u>	<u>it</u>
YEAR 6 - KEY CONTENT/ LEARNING	 Describe how living things are classified into broad groups according to common observable 	 Associate the brightness of a lamp or the volume of a buzzer with the number and voltage 	 Identify and name the main parts of the human circulatory system, and describe the 	 Identify and name the main parts of the human circulatory system, and describe the 	 Recognise that light appears to travel in straight lines. Use the idea that light 	 Recognise that light appears to travel in straight lines. Use the idea that light



- characteristics and based on similarities and differences, including microorganisms , plants and animals.
- Give reasons for classifying plants and animals based on specific characteristics.
- of cells used in the circuit.
 Compare and give reasons for variations in how components function, including the
- brightness of bulbs, the loudness of buzzers and the on/off
 - position of switches. Use recognised symbols

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when representing a simple circuit in a

diagram

- functions of the heart, blood vessels and blood.
- Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function.
- Describe the ways in which nutrients and water are transported within animals, including humans

functions of the heart, blood vessels and blood.

- Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function.
- Describe the ways in which nutrients and water are transported within animals, including humans
- travels in straight lines to explain that objects are seen because they give out or reflect light into the eye. Explain that we see things
- we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes.
- Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects

- travels in straight lines to explain that objects are seen because they give out or reflect light into the eye.
- Explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes.
- Use the idea that light travels in straight lines to explain why shadows have the same shape as the objects



			that cast them.	that cast them.
YEAR 7 - KEY THEMES / CONCEPTS	 Metals and non-metals react with oxygen to form oxides which are either bases or acids. 			
	 Metals can be arranged as a reactivity series in order of how readily they react with other substances. 			
	 Some metals react with acids to produce salts and hydrogen. 			
	 Describe an oxidation, displacement , or metal acid reaction 			



	with a word		
	equation. Use		
	particle		
	diagrams to		
	represent		
	oxidation.		
	displacement		
	and metal-		
	acid		
	reactions		
	Identify an		
	unknown		
	element from		
	its physical		
	and chemical		
	properties.		
	h. ch er erer		
	Place an		
	unfamiliar		
	metal into		
	the reactivity		
	series based		
	on		
	information		
	about its		
	reactions.		
YEAR 7 -			
KEY			
CONTENT/			
LEARNING			



YEAR 8 - KEY THEMES / CONCEPTS YEAR 8 - KEY CONTENT/ LEARNING						
YEAR 9 - KEY THEMES / CONCEPTS	 Describe how cells are the basic unit of all forms of life. Explain how structural differences between types of cells enables them to perform specific functions within the organism. State how differences in cells are controlled by genes in the nucleus. Describe how an organism to grow, the cells must divide by mitosis 	 The periodic table provides chemists with a structured organisation of the known chemical elements from which they can make sense of their physical and chemical properties. The historical development of the periodic table and models of atomic structure provide good examples of how scientific ideas and explanations develop over time as new evidence emerges. 	 The concept of energy emerged in the 19th century. The idea was used to explain the work output of steam engines and then generalised to understand other heat engines. It also became a key tool for understanding chemical reactions and biological systems. Limits to the use of fossil fuels and global warming are critical problems for this century. Physicists and engineers are 	 In this section we will learn about the human digestive system which provides the body with nutrients and the respiratory system that provides it with oxygen and removes carbon dioxide. In each case they provide dissolved materials that need to be moved quickly around the body in the blood by 	 Chemists use theories of structure and bonding to explain the physical and chemical properties of materials. Analysis of structures shows that atoms can be arranged in a variety of ways, some of which are molecular while others are giant structures. Theories of bonding explain how atoms are held together in these structures. 	 The particle model is widely used to predict the behaviour of solids, liquids and gases and this has many applications in everyday life. It helps us to explain a wide range of observations and engineers use these principles when designing vessels to withstand high pressures and temperatures, such as submarines and spacecraft. It also explains why it is difficult to make a good cup of



producing two new		working hard to	the circulatory		tea high up a
identical cells.	 The arrangement of elements in the 	reduce our energy	system.	 Scientists use this knowledge of 	mountain
• Explain how if cells are isolated at an early stage of growth before they have become too specialised, they can retain their ability to grow into a range of different types of cells	modern periodic table can be explained in terms of atomic structure which provides evidence for the model of a nuclear atom with electrons in energy levels.	usage.	 Damage to any of these systems can be debilitating if not fatal. Although there has been huge progress in surgical techniques, especially with regard to coronary beart disease 	structure and bonding to engineer new materials with desirable properties. The properties of these materials may offer new applications in a range of different technologies	
•	 (Physics) Ionising radiation is hazardous but can be very useful. Although radioactivity was discovered over a century ago, it took many nuclear physicists several decades to understand the structure of atoms, nuclear forces and stability. 		 many interventions would not be necessary if individuals reduced their risks through improved diet and lifestyle. We will also learn how the plant's transport system is dependent on environmental conditions to ensure that leaf cells are provided with the water and carbon dioxide that 		



	 Early researchers suffered from their exposure to ionising radiation. Rules for radiological protection were first introduced in the 1930s and subsequently 	they need for photosynthesis.	
YEAR 9 - KEY CONTENT/ LEARNING			



YEAR 10 -KEY THEMES / CONCEPTS

microorganisms such as viruses and bacteria that cause infectious diseases in animals and plants. They depend on their host to provide the conditions and nutrients that they need to grow and reproduce. They frequently produce toxins that damage tissues and make us feel ill. This section will explore how we can avoid diseases by reducing contact with them, as well as how the body uses barriers against pathogens. Once inside the body our immune system is triggered which is usually strong enough to destroy the pathogen and prevent disease. When at risk from unusual or dangerous diseases our body's natural system can be enhanced by the use of vaccination. Since the 1940s a range of antibiotics have been developed which have

Pathogens are

Understanding of chemical changes began when people began experimenting with chemical reactions in a systematic way and organizing their results logically. Knowing about these different chemical changes meant that scientists could begin to predict exactly what new substances would be formed and use this knowledge to develop a wide range of different materials and processes. It also helped biochemists to understand the complex reactions that take place in living organisms. The extraction of important resources from the earth makes use of the way that some elements and compounds react with each other and how

Electric charge is a fundamental property of matter everywhere. Understanding the difference in the microstructure of conductors. semiconductors and insulators makes it possible to design components and build electric circuits. Many circuits are powered with mains electricity, but portable electrical devices must use batteries of some kind. Electrical power fills the modern world with artificial light and sound, information and entertainment. remote sensing and control. The fundamentals of electromagnetism were worked out by scientists of the 19th century. However, power stations, like all machines, have a limited lifetime. If we all continue to

Cells in the body can only survive within narrow physical and chemical limits. They require a constant temperature and pH as well as a constant supply of dissolved food and water. In order to do this the body requires control systems that constantly monitor and adjust the composition of the blood and tissues. These control systems include receptors which sense changes and effectors that bring about changes. In this section we will explore the structure and function of the nervous system and how it can bring about fast responses. We will also explore the hormonal system which usually brings about much slower changes. Hormonal coordination is particularly important in

Electromagnetic effects are used in a wide variety of devices. Engineers make use of the fact that a magnet moving in a coil can produce electric current and also that when current flows around a magnet it can produce movement. It means that systems that involve control or communications can take full advantage of this. Wave behaviour is

common in both natural and man-made systems. Waves carry energy from one place to another and can also carry information. Designing comfortable and safe structures such as bridges, houses and music performance halls requires an understanding of mechanical waves. Modern technologies such as imaging and



KOINONIA FEDERATION – ALL THROUGH SUBJECT MAP

proved successful against a number of lethal diseases caused by bacteria. Unfortunately many groups of bacteria have now become resistant to these antibiotics. The race is now on to develop a new set of antibiotics.	easily they can be 'pulled apart'. Energy changes are an important part of chemical reactions. The interaction of particles often involves transfers of energy due to the breaking and formation of bonds. Reactions in which energy is released to the surroundings are exothermic reactions, while those that take in thermal energy are endothermic. These interactions between particles can produce heating or cooling effects that are used in a range of everyday	demand more electricity this means building new power stations in every generation – but what mix of power stations can promise a sustainable future?	reproduction since it controls the menstrual cycle. An understanding of the role of hormones in reproduction has allowed scientists to develop not only contraceptive drugs but also drugs which can increase fertility.
	applications. Some interactions between ions in an electrolyte result in the production of electricity. Cells and batteries use these chemical reactions to provide electricity.		Chemists use quantitative analysis to determine the formulae of compounds and the equations for reactions. Given this information, analysts

communication systems show how we can make the most of electromagnetic waves.



	Electricity can also be	can then use	
	used to decompose	quantitative methods	
	ionic substances and is	to determine the purity	
	a useful means of	of chemical samples	
	producing elements	and to monitor the	
	that are too expensive	yield from chemical	
	to extract any other	, reactions. Chemical	
	way.	reactions can be	
	,	classified in various	
		ways. Identifying	
		different types of	
		chemical reaction	
		allows chemists to	
		make sense of how	
		different chemicals	
		react together, to	
		establish patterns and	
		to make predictions	
		about the behaviour of	
		other chemicals.	
		Chemical equations	
		provide a means of	
		representing chemical	
		reactions and are a key	
		way for chemists to	
		communicate chemical	
		ideas.	
YEAR 10 -			
KEY			
CONTENT/			
LEARNING			



YEAR 11 -	In this section we will			
KEY	discover how the number			
THEMES /	of chromosomes are			
CONCEPTS	halved during meiosis			
	and then combined with			
	new genes from the			
	sexual partner to produce			
	unique offspring. Gene			
	mutations occur			
	continuously and on rare			
	occasions can affect the			
	functioning of the animal			
	or plant. These mutations			
	may be damaging and			
	lead to a number of			
	genetic disorders or			
	death. Very rarely a new			
	mutation can be			
	beneficial and			
	consequently, lead to			
	increased fitness in the			
	individual. Variation			
	generated by mutations			
	and sexual reproduction			
	is the basis for natural			
	selection; this is how			
	species evolve. An			
	understanding of these			
	processes has allowed			
	scientists to intervene			
	through selective			
	breeding to produce			
	livestock with favoured			



	characteristics. Once new			
	varieties of plants or			
	animals have been			
	produced it is possible to			
	clone individuals to			
	produce larger numbers			
	of identical individuals all			
	carrying the favourable			
	characteristic. Scientists			
	have now discovered how			
	to take genes from one			
	species and introduce			
	them in to the genome of			
	another by a process			
	called genetic			
	engineering. In spite of			
	the huge potential			
	benefits that this			
	technology can offer,			
	genetic modification still			
	remains highly			
	controversial.			
YEAR 11 -				
KEY				
CONTENT/				
LEARNING				
YEAR 12 -				
KEY				
THEMES /				
CONCEPTS				
YEAR 12 -				
KEY				



CONTENT/			
LEARNING			
YEAR 13 -			
KEY			
THEMES /			
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YEAR 13 -			
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CONTENT/			
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