		Year 3	Year 4	Year 5	Year 6
Biology	Animals including humans	**Animals, skeletons and movement** **Knowledge Block 1- Skeletons protect vital organs** • All **vertebrates** have internal **skeletons** that protect **vital organs**. • **Invertebrates** have **exoskeletons** that protect **vital organs**. **Knowledge Block 2- Skeletons support weight** • Skeletons support the weight of land animals. • Stronger bones can **support** a greater **mass.** **Knowledge Block 3- Skeletons support movement** • Bones are **connected** (but can move relative to each other) at joints. • **Muscles** connect to bones and move them when they **contract**. • Stronger bones can **anchor** stronger muscles.	**Knowledge Block 1- Food groups** ○ Animals need a variety of foods to help them grow and survive. The main food groups are: • **Meat**, **dairy** and pulses provide **protein** for muscles. • **Grains** and **root vegetables** provide **carbohydrates** for energy. • **Fat** for **insulation** and energy. • **Fruit** and **vegetables** for **minerals, vitamins and fibre**. These are essential to keep our bodies working well and protect us from illnesses. **Knowledge Block 2- Variation in animals' diet** • Different animals require different foods to survive. • Animals get their food from plants and other animals. This can be shown in a **food chain**. (From Year 2) • A food chain begins with a **producer**. This is often a green plant because plants can make their own food. (From Year 2) • A living this that eats other plants is called a **consumer**. (From Year 2) • Humans require a balanced diet to remain **healthy** but healthy diets vary depending upon the type of activity that humans do. • Humans have 2 sets of teeth in their lifetimes • Humans have three main types of teeth- incisors, canines and molars. • Incisors help to bite off and chew pieces of food. • Canines are used for tearing and ripping food. • Molars help to crush and grind food. **Knowledge Block 3- How humans digest food** • The **nutrients** in food have to get to every part of the body. The **blood** transports them. The role of **digestion** is to get the nutrients in food to dissolve in the blood, if it doesn't dissolve it can't enter the blood and be transported.	**Circulation** **Knowledge Block 1: Getting oxygen into the blood** • All animals need **oxygen** to survive. • Air is breathed into the **lungs** where the oxygen in the air is passed into the blood. • Every part of animals' bodies need oxygen, especially **muscles**. • Muscles need a supply of oxygen and **sugar (glucose)** to make them work, they are supplied by the blood. **Knowledge Block 2: The blood circulation model** • The heart is a vital organ pumps blood through the blood vessels. • Blood Vessels are the tubes that blood flows through. • The blood **circulates** around the body in a way that ensures all muscles in the body get a supply of oxygen and sugar. • The **heart** pumps blood to every muscle in the body. The circulatory route must allow the blood to collect oxygen from the lungs, sugar from the intestines and visit muscles. • The blood then returns to the heart where it is pumped again. • Exercise helps the heart to work more efficiently. • Eating a healthy diet helps to keep the blood vessels from getting blocked. Avoiding smoking and alcohol puts less stress on the whole system and keeps it healthier.	
	Plants	**Plants and their food production** **Knowledge Block 1- Plants don't go to McDonalds** • Plants do not eat food so have to make their own. • This food provides then with energy, and materials to grow • To make the food (sugar) plants need water from the ground, **carbon dioxide** from the air and light from the sun. ○ The water is taken up through the **roots** from the **soil** ○ The carbon dioxide is taken in through the **leaves** As well as food, plants also make **oxygen** which is given out back into the air through the leaves	**Knowledge Block 1- The reproductive parts of a flowering plant** • Flowering plants **reproduce** by the process of **pollination** • Pollination leads to the formation of a **seed** which can grow into a new plant • Flowering plants have evolved specific parts to carry out pollination and seed growth • Those parts are **stamen** where pollen is produced, **stigma** where pollen is collected, and the **ovaries** which contains the eggs that become a seed when the pollen travels down the stigma and meets the egg • Flowers have **petals** also are a range of colours, patterns, and smells to attract insects **Knowledge Block 2- All flowers are similar but different** • Plants and flowers look different because they pollinate in different ways. • There are two types of pollination Insect and wind • Insect pollinated flowers are usually bright coloured and strong scents • Wind pollinated flowers have less colourful petals and much less scent **Knowledge Block 3- Seed dispersal** • Plants have evolved many different ways to **disperse** their seeds • Seed dispersal increases the chances of seeds **germinating** and growing into a mature plant **Knowledge Block 4- What a seed does** • A seed contains a miniature, undeveloped version of the plant • They contain a food store for the first stage of growth (until the plant can make its own food) They are surrounded with a protective coat.		

	Variation & Evolution		**Living things** **Knowledge Block 1- Classifying living things** • Living things can be divided into groups based upon their characteristics • **Classification keys** help group, identify and name living things • Animals can be classified as **vertebrates** (having a spine) or **invertebrates** (lacking a spine) • In any habitat there are **food chains** and webs where **nutrients** are passed from one **organism** to another when it is eaten • If the population of one organism in the chain or web is affected, it has a knock-on effect to all the others **Knowledge Block 2- Life cycles** • Mammals, amphibians, insects and birds have different life cycles. • Lifecycles vary in time depending on the species of animal- it can be as short as just a few weeks for insects, to up to 200 years for sea urchins. Larger animals often have longer life cycles but not always. • All animal life cycles begin with growth and development followed by reproduction. • Some animals undergo a complete **metamorphosis** as they grow. Metamorphosis is a process where animals undergo an abrupt and obvious change in the structure of their body and their behaviour. • Some animals are eusocial. This means they live in colonies (groups) with one animal or group producing young and the others working to care for them. **Knowledge Block 2- Environmental change** • **Environmental change** affects different habitats differently • Human activity significantly affects the environment Different organisms are affected differently by environmental change	**Fossils, geological time and classification** **Knowledge Block 1- What is evolution and how do we know it happened?** • The Earth is very old. Around 4.2 **billion** years. We know this from dating rocks • Life first appeared on Earth around 3.8 billion years ago. • Life was, at first, very simple but over **millions** and millions of years life became more complex through the process of **evolution** **Knowledge Block 2- Evidence for evolution** • There are many sources of evidence for evolution • **Fossils** are one of the main sources of evidence for evolution. They show when new organisms appear and when they go **extinct**. • Due to the nature of fossil formation and discovery, fossils only provide an incomplete record of evolution. • Scientists use fossils along with other pieces of evidence *(DNA, Embryology, comparative anatomy, artificial selection)* to work out how organisms have evolved • Fossils form when dead organisms are rapidly buried or leave an imprint and are turned to stone over a long period of time. If they survive in the Earth, they then have to be found by a **palaeontologist** who will study them. **Knowledge Block 3: Classification of life** • All living (and **extinct**) **organisms** are classified into groups based upon their physical features. • This includes animals, plants, fungi, and **microorganisms** like **bacteria**. • Within each of these broad groups, organisms are classified into small subgroups. Animals- invertebrates, mammals, birds, amphibians, reptiles and fish, Plants- flowering plants, ferns, conifers, moss. • Bacteria are a group of organisms that are not visible to the naked eye but are very abundant and have distinct physical features we can only see under powerful **microscopes**.	**Classification and Evolution** **Knowledge Block 1: Natural selection** • **Evolution** is the change of physical form in a population over a long-time span • **Natural selection** is the process which controls that change. • In any **population** there is **variation** and **competition** for resources (food, water, mates). • Within that variation, organisms that have features which make them better **adapted** at securing food, water, and mates, are more likely to survive and produce **offspring** which have **inherited** those same successful features. Those that are not well adapted will eventually go **extinct**. • Over a long enough timeline all organisms in a population will have those successful features. • This is known as the *Theory of Evolution by Natural Selection* and was developed by **Charles Darwin** in 1859 **Knowledge Block 2: How Charles Darwin discovered the process of Evolution by Natural selection** • Before Darwin, **Lamarck's** Idea of acquired characteristics was proposed. (Giraffes stretch their necks in life, which made their children have longer necks). Darwin as a young man travelled around the world on the **HMS Beagle**. On this 5-year voyage he saw lots of things and recorded down lots of evidence which allowed him to work out how organisms change over time by a different mechanism of Natural selection

Chemistry	Materials	**Solids, liquids and gases** **Knowledge Block 1- Properties of solids, liquids and gases** • Materials can be divided into solids, liquids and gases. • **Solids** hold their shape unless forced to change. • **Liquids** flow easily but stay in their container because of **gravity**. The more **viscous** a liquid the less runny it is. • **Gases** move everywhere and are not held in containers by **gravity**. **Knowledge Block 2- Changing state** • **Heating** causes solids to **melt** into liquids and liquids to **evaporate** to gases. • **Cooling** causes gases to **condense** to liquids and liquids to **freeze** to solids. **Knowledge Block 3- Melting, freezing, boiling and condensation temperatures** • Different substances change **state** at different temperatures but the temperatures at which given substances changes state is always the same. **Knowledge Block 4- All about the water cycle** • The temperature at which a substance **melts** from a solid to a liquid is the same at which it **freezes** from a liquid to a solid. • The temperature at which a substance **boils** from a liquid to a gas is the same at which it **condenses** from a gas to a liquid. • Liquids **evaporate** slowly, even below their boiling temperatures. • The water cycle is the process by which water is continuously transferred between the surface of the earth and the atmosphere. Liquid water evaporates into water vapor, condenses to form clouds, and precipitates back to earth in the form of rain and snow. **Knowledge Block 1- The different types of rocks** • A **rock** is a solid material made up of **minerals** forming part of the surface of the Earth • Rocks are exposed on the surface at cliffs, hills and mountains but are also under the surface. • Some rocks, called **ores** contain metals • Some rocks are made of **grains** squashed together and can contain the remains of long-dead organisms, called **fossils**. This type of rock is called **sedimentary** rock, an example would be **limestone**, **sandstone** or **mudstone** • Some rocks are made of **crystals** that are locked tightly together. These are called **igneous** and **metamorphic** rocks; an example of igneous rock is **granite,** and an example of metamorphic rock is **slate** **Knowledge Block 2- The properties of rocks** • These three types of rocks all have different properties to each other, including **porosity**, **hardness**, reaction to chemicals • The properties of the rock depend on how the rock was formed, e.g. Some igneous rocks form from lava from volcanoes and cool very quickly leading to very small crystals **Knowledge Block 3- The structure of soils** • **Soil** is made up of small broken-down pieces of rock. • Soil contains a range of different size rock pieces, e.g., sand grains or stones. • Soil also contains **humus** (rotted plant material) • Soil made of very fine rock is called **silt** or **clay**.	**Mixtures and separating them** **Knowledge Block 1- What mixtures are** • A **substance** is an object with the same properties throughout. • A **mixture** is when more than one substance is present in the same container **Knowledge Block 2- What dissolving is** • When a substance is added to a liquid the substance can disappear- this is called **dissolving** • A mixture of a substance that has dissolved in a liquid is called a **solution** • Not every substance can dissolve in water **Knowledge Block 3- Separating mixtures** • Mixtures can be separated if the substances have different properties • This is because the substances in the mixture are still present and are unchanged • There are different techniques for separating mixtures. - Filtration requires the substances be one that does not dissolve in a liquid to work. - Sieving requires the substances to be of different sizes to work - Magnets requires the substances to be some magnetic materials and some non-magnet materials to work. - Evaporation requires a solid substance dissolved in water and the solid has a higher boiling point in water to work. - Floating requires some substances to float and some substances to sink to work.	**Making new substances** **Knowledge Block 1: Reversible and irreversible changes** • All matter, including gas, has **mass**. • Sometimes, mixed substances **react** to make a new substance. These changes are usually **irreversible**. • Heating can sometimes cause materials to change permanently. When this happens, a new substance is made. These changes are not reversible. • Indicators that something new has been made are the properties of the material are different (colour, state, texture, hardness, smell, temperature) If it is not possible to get the material back easily it is likely that it is not there anymore and something new has been made (irreversible change)	

Physics	Earth and Space			**Knowledge Block 1: Our Solar system** • A **Solar system** is a collection of **planets**, which **orbit** (a curved path) a **star**. • There are huge number of stars in space and therefore a huge number of solar systems • Our solar system consists of 8 planets, many of those planets have **moons** which orbit around them. • Earth's moon is not a planet but is a satellite which orbits Earth. It is around a quarter of the size of Earth. • As the Moon orbits the Earth, the Sun lights up different parts of it, making it seem as if the Moon is changing shape. We call these the phases of the moon. • The Moon doesn't emit (give off) light itself, the 'moonlight' we see is actually the Sun's light reflected off the lunar surface. • Our solar system can be represented with a model (see diagram), but it isn't possible to draw it to scale. • The planets and moons are **rotating** (spinning) • The time it takes one planet to rotate is called a **day**. On Earth this is 24 hours • The time it takes a planet to complete one orbit around its star is called a **year**. On Earth this is 356.25 days • The solar system is with a massive collection of stars called the **galaxy** (called the Milky way) • The Milky way is one of billions of galaxies in the **Universe**. **Knowledge Block 2: What else is in the solar system?** • Stars are huge balls of gas that produce vast amounts of light and heat. • **Asteroids** are lumps of rock that orbit a star (there are millions in between Mars and Jupiter) • **Comets** are objects that are made of Ice, which melts when they get closer to the sun leaving a tail. **Knowledge Block 3: Gravity and its effects** • **Gravity** is force of attraction between two objects with **mass** (a quantity of matter) • The bigger the mass the bigger force it exerts • Gravity works over distance but gets weaker as distance increases • Stars, planets, moons have a very large amount of mass. They exert a gravitational attraction on each other Differences in gravity result in smaller mass objects orbiting around lager mass objects, e.g., planets around stars and moons around planets	
	Energy	**<u>Light</u>** **Knowledge Block 1- Light and sight** • There must be light for us to see. • Light comes from a **source**. • We need light to see things, even **shiny** things. • Light from the sun can be dangerous and that there are ways to protect their eyes **Knowledge Block 2- What light does when it hits materials** • If an object is **transparent** light will go through it and we will be able to see through it. • If an object is **opaque,** it will block the light and no light will get through. This is what forms shadows. • The closer to the light source an object is, the bigger the shadow will be. This is because the object blocks more of the light. • The further away from the light source an object is, the smaller the shadow will be. This is because the object blocks less of the light. • If an object is perfectly **reflective,** light will bounce back off it and we will see reflections of objects. • If the material is **translucent,** it will allow light through, but we won't be able to see through it.			**<u>How light behaves</u>** **Knowledge Block 1: How light travels** • When light is emitted from a light source, it travels in straight lines until it hits an object. This can be represented by an arrow. • **Shadows** form when light hits an **opaque** object. The area behind the object is in darkness because light can only travel in straight lines. • Shadows have the same shape as the objects that cast them. **Knowledge Block 2: How light behaves when it hits objects** • When light hits a **transparent** object, it goes through it in a straight line so we can see a clear image through it. • When light hits a **translucent** material, it goes through it but is scattered, this means light can pass through, but we can't see an image through it. • When light hits a mirrored surface, it reflects off it in straight lines, so we can see an image in the reflective material. • Sometimes when light hits a material it **reflects** off it in many different directions (it is scattered). In this case light will be reflected but no image will be seen in the material. • Shiny surfaces are better reflectors and rough surfaces scatter light more. Opaque objects don't allow any light to pass through them

					Knowledge Block 3: How we see • Animals see objects when light is reflected off the object and enters the eye through the **pupil**. • The pupil changes its size to allow enough, but not too much light into the eye. • Too much light damages the eye and too little results in poor quality images. **<u>Sound</u>** **Knowledge Block 1: Describing Sound** ● Sounds can be produced in a variety of ways. ● Sounds have the properties of **pitch** and **volume.** ● When a sound is produced it spreads out from its source in all directions **Knowledge Block 2: How sound is made and travels** ● Sound is caused by **vibration** (objects move rapidly back and forth or up and down) ● When objects vibrate it makes the objects in contact with it also vibrate. This includes the air. ● The vibration travels through the air and makes other objects it is in contact with vibrate including your **ear drum**. **Knowledge Block 3: Pitch and Volume changes** • Pitch and volume are caused by how the material vibrates • The pitch of a sound is caused by how fast an object vibrates. This is called the **frequency** of vibration. Higher the frequency, higher the pitch • Smaller objects or tighter strings tend to vibrate with a higher frequency • The volume of sound is caused by how big each vibration is. This is called the **amplitude** of vibration. The bigger the amplitude the higher the volume. Sounds get fainter as the distance from the sound source increases
	Electricity		**<u>Electricity</u>** **Knowledge Block 1- Electricity as a power source** • Lots of **devices** are powered by **electricity** • Electricity comes from a source There are two main sources- **batteries and mains** **Knowledge Block 2- What batteries do** • A battery pushes electricity to the device. • To be able to push electricity the battery must be connected to the device using **wires** • This is called a **circuit** **Knowledge Block 3- Making devices work harder** • If there are more batteries added to a circuit this provides a bigger push on the electricity • This will make the device work harder e.g., brighter bulbs, faster spinning motor, louder buzzer **Knowledge Block 3- Insulators and conductors** • Some materials will allow electricity to flow through them- **Conductors** • Metals such as silver, gold and copper are good conductors. Water is also a conductor of electricity. • Other materials will not allow electricity to flow through them- **Insulators** • Plastic, wood, glass and rubber are good electrical insulators. That is why they are used to cover materials that carry electricity. • A switch opens and closes a circuit		**<u>Controlling electrical circuits</u>** **Knowledge Block 1: Pushing electrical current** • Current is the flow of electricity around a circuit. • The power supply in a circuit pushes the current round the circuit • The voltage of the power supply is a measure of this push • Voltage is measure in volts • Batteries have a limited store of energy and when this is gone, they can no longer push the current **Knowledge Block 2: Electrical current** • Current is the flow of electricity through a **conductor** • When current passes through a device it makes it work • Increasing the voltage (the number of cells in the battery) increases the current. The larger the flow of current, the harder the device works **Knowledge Block 3: Electrical resistance** • All parts of a circuit offer **resistance** to electrical current including the wires. • Resistance is the slowing down of electrical current • The more devices added into a circuit the greater the resistance This means less current flows around the circuit

	Forces	**Magnets** **Knowledge Block 1- What magnets do** • Magnets exert **attractive forces** on some **metals** **Knowledge Block 2- Magnets don't need to touch** • Magnetic forces work through other materials including air, so magnets don't need to be touching to **exert** their force. It is called a **non-contact force** **Knowledge Block 3- Magnets attract and repel** • Each end of a magnet is called a **pole**, opposite poles are called north and south. • Magnets exert **attractive** forces on each other when the poles facing each other are north and south (opposites). • Magnets exert **repulsive** forces on each other when the poles facing each other are the same. **Knowledge Block 4- what affects magnetic strength** The strength of magnetic forces is affected by: • The strength of the magnet. • The distance between the magnet and the object. The material the object is made from.		**Forces that oppose motion** **Knowledge Block 1: Water and air resistance.** • When objects move through air and water, they have to push it out of the way. The water and air push back with forces called **water resistance** and **air resistance**. The harder it is to push the material out of the way the greater the resistance. • Gases weigh less than liquids and so water resistance is greater than air resistance. **Knowledge Block 2: Friction** • **Friction** is a **force against motion** caused by two surfaces **rubbing** against each other. It occurs because no surfaces are perfectly smooth; they have bumps and **undulations** that can **interlock** when placed on top of each other. • To move one **interlocking** surface over another, one of three things must happen: • The surfaces must rise slightly • The bumps on the surface must bend • The bumps on the surface must break • All of these actions require a force, this is what causes friction **Knowledge Block 3: Managing Forces** • Some objects require large forces to make them move; **gears**, **pulley** and **levers** can reduce the force needed to make things move. • The use of levers can reduce the force needed to move things. The object you are lifting is called the **load**, and the force you apply to the arm to make the object move is called the **effort**. • The use of pulleys can reduce the force needed to move things (These are particularly complex ideas. It might be better to teach them through a design technology project where children make toys using cogs, pulleys and lever)	