Science Curriculum Map- KS3 Physics

Intent:

- Inspire students about the world around them through a topical and challenging curriculum- give them curiosity about the world around them. Inspire a love of learning Science and aspirations to study Science at a higher level. To understand the careers that can evolve from learning different areas of Science.
- Support student's emotional, social, physical, and political development. To be able to form non biased and educated discussions around development of challenging scientific technologies and ideas, within a changing world.
- Provide students with the knowledge and understanding to make links across subjects and contexts throughout their lives.
- Support students to develop empathy and understand their role and responsibility to the world around them

Intrinsic Subject Value

Science knowledge itself.
Careers, wider world, big ideas threaded through the curriculum.

KS2 *'Subject'* Curriculum

Pupils should have studied living things and their habitats, animals including humans, properties and changes of materials, earth and space, forces, evolution and inheritance, light, electricity, seasonal changes, rocks, states of matter, and sound.
Pupils should have also been taught to plan different types of scientific enquiries to answer questions, take measurements, use a range of scientific equipment, record data and results, use test results to make predictions, report and present findings from enquires and identify scientific evidence that has been used to support or refute ideas or arguments.

***Science* themes that run through the curriculum**

- Careers, wider world,
- Forces and Motion
- Waves and Energy
- Electricity and Magnetism
- Space

Non biased discussions around new technologies

Empathy in the world around them

Links across subjects

Fundamental building block forces linked through the curriculum

Disciplinary Knowledge:

Scientific attitudes
Experimental Skills and investigation
Analysis and Evaluation
Measurement

Themes	Year 7	Year 8	Year 9
Forces and Motion	***SOL Title: Forces*** ***Wider world and careers: Careers in engineering, transport, space exploration, telecommunications, manufacturing, robotics and architecture*** **Substantive Knowledge:** • A force is a push or a pull • Forces explain why objects move the way that they do • A contact force is when a force is acting on something that it is touching e.g. friction, air resistance • Gravity is a non-contact force • Forces always come in pairs called interaction pairs • Force is measured using a newtonmeter • All forces are measured in Newtons • Forces can compress or stretch objects • The amount of stretch is known as the extension • **Tension is a stretching force** • **The elastic limit is the point at which a spring will not go back to its original length** • **Hooke's Law states that if you double the force on an object the extension will double** • Forces are balanced when the forces acting on an object are the same size • Forces acting on an object which are different are known as unbalanced forces **Disciplinary Knowledge:** • **Using Hooke's Law** • Using a newton meter to measure force **Prior learning / retrieval:** Pupils should be able to: • Compare how things move on different surfaces **Links to KS3 NC:** Forces- • Forces as pushes or pulls • Force is measured in Newtons • Hooke's Law • Non-contact forces • Stretching/Squashing **Disciplinary literacy:** Students will have the opportunity to read scientific texts from textbooks and non-fiction books. Students will also answer and practice writing extended writing answers using scientific language. Key scientific terms for each lesson will be highlighted on objective sheets, knowledge organiser and key word sheets	**SOL: Motion and Forces** ***Wider world and careers: Careers in engineering, transport, space exploration, telecommunications, manufacturing, robotics and architecture*** **Substantive Knowledge:** Speed = distance/time, measured in metres per second (m/s). • Average sped is the total distance travelled/total time taken • Instantaneous speed is the speed at any time that the object is moving • **Relative motion is how fast one thing is travelling compared to another e.g. being on a moving train while looking at a stationary one.** • If cars are moving at the same speed in the same direction their relative speed is zero. • You can show what is happening to the position of an object on a distance-time graph. The slope of the distance is the speed • A horizontal line on a distance-time graph means that the object is stationary. Friction is a force that opposes motion. Friction can be reduced through lubrication • Drag forces – air resistance/water resistance are forces which oppose motion. • Drag forces can be reduces when an object is made more streamlined. **Disciplinary Knowledge:** • Be able to calculate speed • Interpret distance-time graphs • Calculate speed using a distance-time graph **Prior learning / retrieval:** • Forces can be transferred using gears, pulleys, levers and spring • Unbalanced forces changes the speed of an object **Links to KS3 NC:** Describing motion • Speed and the relationship between average speed, distance and time • The representation of a journey on a distance time graph • Relative motion **Disciplinary literacy:** Students will have the opportunity to read scientific texts from textbooks and non-fiction books. Students will also answer and practice writing extended writing answers using scientific language. Key scientific terms for each lesson will be highlighted on objective sheets, knowledge organiser and key word sheets	**SOL Title: Pressure** ***Wider world and careers:*** Careers in physiotherapy, airline pilot, sports product design, car design **Substantive Knowledge:** • Review Particles from Chemistry • Gas pressure is due to collisions of gas molecules with the sides of the container or object. If the gas molecules in the same space, there will be more collisions and the pressure will be greater • As gas is pumped into a container, it becomes compressed. There are more molecules in the same space, so there are more collisions. • Atmospheric pressure is due to the collisions of air molecules with objects. • Atmospheric pressure decreases with height because there are fewer air molecules higher up • Gas has a higher density at sea level • Smaller atmospheric pressure makes it hard to breathe in enough oxygen • Water exerts a pressure. The water molecules are pushing on each other and on surfaces. This liquid pressure acts in all directions. • Liquids are incompressible. The pressure at a particular depth in a liquid depends on the weight of the water above. • Pressure increases with depth • Liquid pressure produces upthrust which is the force that keeps things afloat. • When an object is in contact with a surface it exerts a force e.g. standing on the ground. Pressure = force/area, measured in N/m2 or N/cm2. The pressure tells you how the force is spread out over an area • Certain objects can increase or decrease pressure. E.g. studs on football boots decrease the area in contact with the ground so therefore increase pressure so it is easier to grip when running. Skis increase the area that is in contact with the ground so make it easier to move **Disciplinary Knowledge:** • Be able to calculate pressure • Apply ideas of pressure to different situations **Prior learning / retrieval:** • Students should recall theory on gas pressure which is covered in Year 7 Chemistry topic 'Particles and their behaviour' **Links to KS3 NC:** Pressure in fluids • Atmospheric pressure

	Summative assessment: Short Answer recall question assessment End of term assessment	**Summative assessment:** Short Answer recall question assessment End of term assessment	• Pressure in liquids, increasing with depth; upthrust effects, floating and sinking • Pressure measured by ratio of force over area **Disciplinary literacy:** Students will have the opportunity to read scientific texts from textbooks and non-fiction books. Students will also answer and practice writing extended writing answers using scientific language. Key scientific terms for each lesson will be highlighted on objective sheets, knowledge organiser and key word sheets **Summative assessment:** Short Answer recall question assessment End of term assessment
Waves and Energy	***SOL Title: Waves 1*** ***Wider world and careers:*** *Careers in music production, media and entertainment, teaching, manufacturing, telecommunications, robotics, architecture* **Substantive Knowledge:** • **Review Particles from Chemistry** A wave is an oscillation or vibration that transfers energy or information. • Amplitude is the distance from the middle to the top or bottom of a wave Frequency is the number of waves that go past a particular point per second • Wavelength is the distance from one point on a wave to the same point on the next wave • The top of the wave is called a peak • The bottom of the wave is called the trough • When a wave bounces off surfaces and barriers, this is called reflection • A vibration produces a sound wave • **Sound needs a medium like a solid, liquid or gas to travel through** • The pitch of a note depends on its frequency • Frequency is measured in hertz (Hz) • High pitched sounds have a high frequency and low pitched sounds have a low frequency A source of light e.g. a light bulb emits light Light reflects off objects and into your eye • Something that gives out light is luminous • Transparent substances are see through • Translucent objects allow light to travel through but the light is scattered • Materials that do not transmit light are opaque • An empty space is called a vacuum. • The ray of light hitting a mirror is called the incident ray. The ray that reflects off the mirror is called the reflected ray. The angle between the incident ray and the normal is the angle of incidence. The angle between the normal and the reflected ray is the angle of reflection • **The law of reflection states that the angle of incidence will be equal to the angle of reflection** • **Reflection from a smooth surface is called specular reflection. Reflection from a rough surface is called diffuse scattering**	**SOL Title: Waves 2: Detecting Sound and Light** ***Wider world and careers:*** *Careers in music production, media and entertainment, teaching, manufacturing, telecommunications, robotics, architecture* • Retrieval of Light and Sound Waves • The ear detects sound waves • The ear contains the, pinna, auditory canal, eardrum, ossicles, cochlea and auditory nerve. • The pinna directs the sound wave into the auditory canal • The sound wave travels through the auditory canal until it reaches the ear drum • The ear drum vibrates and passes the sound wave onto the ossicles (ear bones) • The ossicles amplify the sound • This vibration is passed onto the liquid that is in the cochlea. The liquid moves tiny hairs. These hairs convert the movement to an electrical signal. • The signal travels down the auditory nerve to the brain. • Sound intensity is measured in decibels (dB) Hearing/The ear can be damaged by loud sounds, the build-up of ear wax, something sharp piercing the ear drum • The chance of ear damage can be reduced by using ear defenders • An amplifier is used to make the sound louder • **A microphone contains equipment that work similarly to the ear. Sound waves hit the diaphragm which vibrates similar to the ear drum. It produces an electrical signal, similar to the cochlea in the ear.** • Sound reflects off a surface producing an echo • When lots of echoes join together to produce a sound, it is called reverberation Frequencies below 20 Hz are called infrasound. Frequencies above 20,000 Hz are called ultrasound • Ultrasound can be used produce images of unborn babies. It can also be used for sonar on ships. • A lens is used to focus light Light travels through the pupil of the eye • The iris in a muscle that controls the size of the pupil. • The cornea and the lens focus the light onto the retina • The image is inverted but the brain changes it so that the image is seen the correct way. • **The retina of the eye is a photosensitive material that contains cells that respond to light (photoreceptors)** • **There are two types of photoreceptors; rods/cones**	**Waves 3** ***Wider world and careers:*** *Careers in music production, media and entertainment, teaching, manufacturing, telecommunications, robotics, architecture* • Retrieval of Waves Basics Longitudinal vs Transverse - In a transverse wave the oscillation is at 90º to the direction of the wave • In a longitudinal wave the oscillation is parallel to the direction of the wave • Examples of longitudinal waves are sound waves • Examples of transverse waves are EM waves – light waves, radio waves etc. EM spectrum - Work of Herschel and Ritter – How the EM spectrum was discovered. • The electromagnetic spectrum is made up of radio waves, microwaves, infrared, visible light, ultraviolet, X-rays and gamma rays. • **Our eyes can detect different colours in visible light. This is described as the visible spectrum – Red, Orange, Yellow, Green, Blue, Indigo, and Violet.** **The colour of the visible light depends on its frequency. Lower frequencies of light appear more red, with higher frequencies of light appearing more blue.** Light changing the direction it is travelling is, is known as refraction. Refraction happens when light travels from one medium (material) to another • When light travels into a glass block it slows down and speeds up when it leaves • Light bends towards the normal when it enters the glass block • There are two lens in the body. The lens in our eyes are converging lens. It focuses the light and enables us to see. • White light is make up of seven different colours which can be split into a spectrum, using a prism. • **Dispersion happens because different colours of light are refracted by different amounts.** The primary colours are red, green and blue. When you mix two primary colours you get secondary colours: cyan, yellow and magenta. **Disciplinary Knowledge:** • Understanding the work of Herschel and Ritter in their discovery of the EM spectrum • Using a slinky to model Transverse and Longitudinal Waves • **Refraction diagrams using a ray box and glass block**

	Disciplinary Knowledge: • Draw a wave and label the amplitude and wavelength • **Use an oscilloscope to see a representation of sound waves** • **Draw and label ray diagrams** **Prior learning / retrieval:** • Identify how sounds are made • Recognise that vibrations from sound travel through a medium to the ear • Recognise that sounds get fainter as the distance from the sound source increases • Recognise that light travels in straight lines • Use the idea that light 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 **Links to KS3 NC:** Waves (Sound Waves) • Frequencies of sound waves measured in Hz • Sound needs a medium to travel in • The speed of sound in air/water/solids • Sound produced by the vibrations of objects Waves (Light Waves) • Similarities and differences between light waves and waves in matter • Light waves travelling through a vacuum • Transmission of light through material • Use of ray model to explain imaging in mirrors **Disciplinary literacy:** Students will have the opportunity to read scientific texts from textbooks and non-fiction books. Students will also answer and practice writing extended writing answers using scientific language. Key scientific terms for each lesson will be highlighted on objective sheets, knowledge organiser and key word sheets **Summative assessment:** Short Answer recall question assessment End of term assessment	• **Rods are sensitive to dim light. Cones are sensitive to bright light and colour.** • Chemical reactions produce an electrical impulse that travels up the optic nerve to the brain. • The eye is like a camera. One of the simplest is the pinhole camera. **Disciplinary Knowledge:** • **Making links between how the eye works is similar to how a camera works.** • **Making links between how the ear works similar to a microphone** **Prior learning / retrieval:** Waves 1 – Year 7 Physics Particles – Year 7 Chemistry **Links to KS3 NC:** Waves (Sound Waves) • Frequencies of sound waves measured in Hz • Sound needs a medium to travel in • The speed of sound in air/water/solids • Sound produced by the vibrations of objects • Auditory range of humans and animals • The ear Waves (Light Waves) • Similarities and differences between light waves and waves in matter • Light waves travelling through a vacuum • Transmission of light through material • The human eye **Disciplinary literacy:** Students will have the opportunity to read scientific texts from textbooks and non-fiction books. Students will also answer and practice writing extended writing answers using scientific language. Key scientific terms for each lesson will be highlighted on objective sheets, knowledge organiser and key word sheets **Summative assessment:** Short Answer recall question assessment End of term assessment	**Prior learning / retrieval:** Waves 1 and 2 – Year 7 and 8 Physics **Links to KS3 NC:** Waves – (Sound wave) • Frequencies of sound waves measured in Hz • Sound needs a medium to travel in • The speed of sound in air/water/solids • Sound produced by the vibrations of objects • Auditory range of humans and animals Waves (Light Waves) • Similarities and differences between light waves and waves in matter • Light waves travelling through a vacuum • Transmission of light through material • Use of ray model to explain imaging in mirrors, the pinhole camera, the refraction of light and action of convex lens in focusing • Light transferring energy from source to absorber • Colours and different frequencies of light **Disciplinary literacy:** Students will have the opportunity to read scientific texts from textbooks and non-fiction books. Students will also answer and practice writing extended writing answers using scientific language. Key scientific terms for each lesson will be highlighted on objective sheets, knowledge organiser and key word sheets **Summative assessment:** Short Answer recall question assessment End of term assessment

SOL Title: Energy 1

Wider world and careers:

Careers in nuclear, solar, wind, biomass, geothermal energy, drilling engineer, geochemist, geoscientist, hydrogeologist, petroleum engineer

- There is energy in the chemical stores associated with food and fuel.
- Energy is measured in joules (J).
  Kilojoules – 1kJ = 1000J
- Food labels tell you how much energy is stored in food
- You need different amounts of energy for different activities
- An adult should only take in the energy that they need for activities. If they take in too much energy than they need, their body will store it as fat to use in the future.
- Energy cannot be created or destroyed, it can only be transferred between stores
- This is the law of conservation of energy.
- Energy is transferred from one store to another when you burn the fuel or respire.
- Energy stores include; Chemical, Thermal, Kinetic, Gravitational Potential and Elastic
- Light, sound and electricity are ways of transferring energy between stores
- In many situations energy is transferred to the thermal store of the surroundings. The energy has been dissipated.
- Energy tells you what changes are possible but forces explain why things moved.
- We measure temperature using a thermometer in degrees Celsius
- The temperature doesn't depend on the amount of material, but the amount of energy in the thermal store does.
- Heating changes the movement of particles. In a solid the particles vibrate more. In a liquid or a gas the particles move faster and vibrate more.
- The energy needed to increase the temperature of a material depends on the mass of the material, what the material is made of and the temperature rise that you want.
- When a hot object is in contact with a colder one energy is transferred from the hot object to the colder one.
- Energy will be transferred, and the temperature difference will decrease, until the objects are in equilibrium
- If the energy transferred to an object is less than the energy transferred from it the object will cool down

Disciplinary Knowledge:

- Convert between Joules and Kilojoules

Prior learning / retrieval:

- Particles – Year 7 Chemistry
- Light – Year 7 Physics

Links to KS3 NC:

Energy changes and transfers

- Other processes that involve energy transfer: a changing motion, dropping an object, completing an electrical circuit, burning fuels

Disciplinary literacy:

Students will have the opportunity to read scientific texts from textbooks and non-fiction books. Students will also answer and practice writing extended writing answers using scientific language. Key scientific terms for each lesson will be highlighted on objective sheets, knowledge organiser and key word sheets

SOL Title: Energy 2

Wider world and careers:

Careers in nuclear, solar, wind, biomass, geothermal energy, drilling engineer, geochemist, geoscientist, hydrogeologist, petroleum engineer

- Energy can be transferred by conduction, convection and by radiation
- In conduction particles transfer energy by colliding with other particles when they vibrate. Energy transfer will happen until the two surfaces are at the same temperature.
- Energy is not transferred very easily through material like wood. Materials like this are insulators.
- Gases do not conduct hear well as their particles are much further apart.
- Energy is transferred in liquids and gases by convection.
- **The particles at the bottoms move faster. This causes the particles to move further apart making the liquid less dense. The less dense liquid will ruse and the cooler, denser liquid or gas will take its place. This is called a convection current.**
- Energy is transferred by radiation, which does not need a medium to travel through. Light and infrared reach the Earth from the Sun by travelling through space
- Space is a vacuum – This means there are no particles
- All objects emit radiation.
- The type of radiation they emit depends on their temperature,
- How much radiation they emit per second depends on the type of surface
- Your skin or a thermal imaging camera can detect infrared radiation.
- A Sankey diagram shows the amount of energy transferred. The width of the arrow represents the amount of energy in joules.
- Energy efficiency is a way of describing how good a machine is at transferring energy into useful forms. The efficiency of a machine is given as a number between 0 and 1. The higher the number the more efficient the machine.
- Efficiency is calculated by dividing the useful energy transferred by the device by the total energy supplied to the device.

Disciplinary Knowledge:

- Be able to draw Sankey Diagrams
- Calculate Efficiency

Prior learning / retrieval:

- Energy 1 – year 7 Physics

Links to KS3 NC:

- Heating and thermal equilibrium – Conduction, convection, radiation

Disciplinary literacy:

Students will have the opportunity to read scientific texts from textbooks and non-fiction books. Students will also answer and practice writing extended writing answers using scientific language. Key scientific terms for each lesson will be highlighted on objective sheets, knowledge organiser and key word sheets

Summative assessment:

Short Answer recall question assessment
End of term assessment

SOL Title: Energy 3

Wider world and careers:

Careers in nuclear, solar, wind, biomass, geothermal energy, drilling engineer, geochemist, geoscientist, hydrogeologist, petroleum engineer

- Retrieval of Energy 1 and Energy 2
- Power is the rate at which energy is transferred and is measured in Watts (W)
- Power can be calculated by dividing work done (J) by the time taken.
- Electrical items have a power rating in Watts (W) or Kilowatts
- When paying for an electricity bill, the payment is so that the fuel can be burnt in a power station. The power station generated the potential difference which we call 'mains electricity'
- Energy use is calculated in kilowatt hours (kWh)
- A kilowatt hour is calculated by multiplying the power rating of the appliance by the time it is used for
- The energy transferred by a force is called work done
- Work done is calculated by multiplying force x distance.
- Simple machines like levers and gears can make it easier to do work but you do not get more energy out than you put in
- A lever is a simple machine that multiples the force
- A gear system is a simple machine. You can use a gear system to increase the force, change direction or go faster.
- The turning effect of a force is called a moment
- You calculate a moment by multiplying the force by the distance from a pivot
- If the clockwise moments acting on an object equal the anticlockwise moments the object will be in equilibrium. This is how see-saws balance
- All objects have to act through a point called the centre of gravity.
- If centre of gravity is to the left or right of the pivot there will be a turning force.

Disciplinary Knowledge:

- Calculate the moment of force
- Calculating Power

Prior learning / retrieval:

- Energy 1 and 2 – Year 7 and 8 Physics

Links to KS3 NC:

- Simple machines give bigger force at the expense of smaller movements

Calculation of fuel uses and costs in the domestic context

- Comparing energy values of different foods
- Comparting power ratings of appliances in watts
- Comparing amounts of energy transferred
- Domestic fuel bills, fuel use and costs

Disciplinary literacy:

Students will have the opportunity to read scientific texts from textbooks and non-fiction books. Students will also answer and practice writing extended writing answers using scientific language. Key scientific terms for each lesson will be highlighted on objective sheets, knowledge organiser and key word sheets

	Summative assessment: Short Answer recall question assessment End of term assessment		**Summative assessment:** Short Answer recall question assessment End of term assessment
Electricity and Magnets	**SOL Title: Electricity and Magnets** ***Wider world and careers:*** ***Careers in Electrical engineer, electrical technician, biomedical engineering, design engineer, computer engineering, robotics, renewable energy, MRI technicians*** **Substantive Knowledge:** • There are two types of electric charge; positive charge (+) and negative charge (-) • Like charges repel and unlike charges attract • Everything is made of particles called atoms Atoms are made up of protons, neutrons and electrons. Protons are positive charged, neutrons have no charge and electrons are negatively charged. Atoms contain an equal number of protons and electrons. Overall it has no charge – it is neutral. • In a thundercloud air moves around and produces areas that have a positive or a negative charge. Electrons jump from one area to another. This produces a big current which quickly heats the air. You hear the lightning and hear thunder. • When you complete a circuit, charged particles or charges move in the metal wires. Electric current is the amount of charge flowing per second. You measure current in amps (A) using an ammeter • The cell or battery pushes charge around the circuit. The charges are already in the wires. In a metal the charged particles that move are electrons. • Symbols can be used to draw circuits. • The potential difference across a cell tells you about the size of the force on the charges. It also tells you how much energy can be transferred to the components in the circuit by the charges. • You measure potential difference in volts (V) using a voltmeter. The rating of a cell or battery tells you the potential difference at which it operates • Magnets have a north pole and a south pole. Like poles repel and unlike poles attract. Models of current flow in a circuit – A rope model can be used to show what is happening in a circuit. One person pulls the rope and the other grips the rope lightly. The rope represents the charges in the circuit and the amount of rope moving past a point per second is the current. The person pulling the rope is like the battery. The bigger potential difference across the cell would come from the 'battery' person pulling harder. • Magnets have north pole and a south pole • North poles repel north poles. South poles repel south poles. North and South poles attract.	**SOL Title: Electricity and Magnets 2** ***Wider world and careers:*** ***Careers in Electrical engineer, electrical technician, biomedical engineering, design engineer, computer engineering, robotics, renewable energy, MRI technicians*** **Substantive Knowledge** • Retrieval of Electricity and Magnets 1 Series circuits contain only one loop and the current is the same everywhere. Parallel circuits have branches and the currents in all the branches add up to make the total current. • Parallel circuits are useful because if one bulb breaks the other lights stay on. • The current in a series circuit is the same everywhere. • If you add components to a series circuit the current will get smaller. • In a series circuit the potential difference across each component adds up to the potential difference across the battery. • The current in all the branches of a parallel circuit add together to make the total current. • If you add another branch to a parallel circuit the current in the other branches stays the same but the total current increases. • In a parallel circuit the potential difference across each component is the same as the potential difference across the battery. Electricity Safety – 3-pin plug. • Earth wire – Connects the metal parts of the appliance to a large metal spike that is pushed into the ground. It is for safety and is at 0V if the circuit is correctly connected. • Neutral wire – The return path to the power station. If the circuit is correctly connected it is at a voltage of 0V. • Live wire – Connects the appliance to the generators at a power station. • Fuse – A safety device marked with the current it can carry. This is usually 3A, 5A or 13A. • A fuse is a tube with a thin wire inside. The current passes through the wire and the wire gets hotter. If the current exceeds a certain value the wire melts. This breaks the circuit and stops the current • Circuit breakers can be used as an alternative to fuses. They detect a change in the current and safely switch off the supply. • An advantage to circuit breakers is that once a fault is fixed they can be switched back on, whereas a fuse has to be replaced. **A current flowing in a coil of wire wrapped around a magnetic material is an electromagnet** • It behaves like a bar magnet but you can turn it on and off • The shape of the magnetic field is like the shape of the magnetic field of a bar magnet.	**SOL Title: Electricity and Magnets 3** ***Wider world and careers:*** ***Careers in Electrical engineer, electrical technician, biomedical engineering, design engineer, computer engineering, robotics, renewable energy, MRI technicians*** **Substantive Knowledge** • Retrieval of Electricity 1 and 2 • Each circuit component has its own resistance. This tells you how easy or difficult it is for charges to pass through the component. • Resistance is measured in ohms. This is calculated by dividing the potential difference by the current. • Metals are good conductors. They have a very low resistance because they contain lots of electrons that can move. Other materials such as plastics, do not have many electrons that are free to move. The resistance of plastic objects is very high. • Other components in a circuit – Light=Emitting Diode (LED) LEDs are versatile and can be fitted into clothing and phones. • Light –Dependent Resistor (LDR). LDRs are sensors that detect changes in its surroundings. The resistance of a LDR will change in different light levels. If the light level is high the resistance of the LDR will be low. • Thermistors – Temperature can be monitored using a thermistor. The resistance of a thermistor changes with temperature. If the temperature increases the resistance decreases. If the temperature decreases the resistance increases. • Fossil fuels such as coal, oil and gas were formed over millions of years ago and are non-renewable. **They can be used to drive a generator in a thermal power station. A fuel burns to heat water and produce steam. The steam drives a turbine. The turbine drives a generator. This provides the push that means a current flows in the appliances in home.** One problem with burning fossil fuels is that they produce a lot of carbon dioxide Carbon dioxide is a greenhouse gas. Carbon dioxide contributes to climate change • The alternative is to use renewable resources as they do not run out. Many renewable resources come from the nuclear store of energy of the Sun • Renewable resources include, wind, tidal, waves, biomass, solar, hydroelectric and geothermal. • Renewable resources do not produce much carbon dioxide when they produce a current. They do produce carbon dioxide when they are being built.

	• Only certain materials are attracted to a magnet. They are called magnetic materials. • In a magnetic field there is a force on a magnet or a magnetic material. • You can find out the shape of a magnetic field in two ways – Using plotting compasses or using iron filings. • Magnetic Field Lines can be drawn to represent the field. The lines go from the north pole to the south pole. • If the magnetic field lines are closer together this shows that the magnetic field is stronger. **Disciplinary Knowledge:** • Be able to set up a electrical circuit including different components; switch, battery, bulb, ammeter, voltmeter • **Explain how rope can be used to model a circuit** • **Be able to draw the magnetic field around a magnet.** **Prior learning / retrieval:** Pupils should be able to recall: • Lots of appliances run on electricity • A complete loop for an electric circuit to work • Some materials, like metals, are good conductors of electricity • The brightness of a lamp can be changed the number of cells • Switches can control lamps and buzzers • Magnets have two poles and attract or repel, depending which poles are facing each other • Some metals are magnetic. The Earth is a giant magnet **Links to KS3 NC:** Current electricity • Electric current, measured in amperes, in circuits, series and parallel circuits • Potential difference, measured in volts, battery and bulb ratings; Magnetism • Magnetic poles: attraction and repulsion • Magnetic fields by plotting with compass; representation by field lines **Disciplinary literacy:** Students will have the opportunity to read scientific texts from textbooks and non-fiction books. Students will also answer and practice writing extended writing answers using scientific language. Key scientific terms for each lesson will be highlighted on objective sheets, knowledge organiser and key word sheets **Summative assessment:** Short Answer recall question assessment End of term assessment	• Electromagnets have a magnetic material in the centre of the coil, called a core. This makes the electromagnet much stronger. • Most cores are made of iron as iron is easy to magnetise, however it loses it magnetism easily. • Steel is hard to magnetise but it keeps it magnetism. • The strength of an electromagnet depends on the number of turns or loops on the coil, the current flowing in the wire, and the type of core. • Electromagnets are used in maglev trains, hospitals and cars • **In an X-Ray machine - A relay can use a small current to operate a switch in another circuit. When the switch is closed the coil becomes an electromagnet. The two pieces of iron inside and magnetised. They attract each other and turn on the X-Ray machine.** • In a car the car battery can be switched on safely using an electromagnet. • An electromagnet can be used to sort out scrap metal. Iron and steel will be attracted to the electromagnet. Other metals, such as aluminium will not. **Disciplinary Knowledge:** • Be able to set up a series and a parallel circuit including different components; switch, battery, bulb, ammeter, voltmeter **Prior learning / retrieval:** Electricity and Magnetism – Year 7 Physics **Links to KS3 NC:** Current electricity • Electric current, measured in amperes, in circuits, series and parallel circuits • Potential difference, measured in volts, battery and bulb ratings Magnetism • Magnetic poles: attraction and repulsion • Magnetic fields by plotting with compass; representation by field lines • The magnetic effect of a current, electromagnets **Disciplinary literacy:** Students will have the opportunity to read scientific texts from textbooks and non-fiction books. Students will also answer and practice writing extended writing answers using scientific language. Key scientific terms for each lesson will be highlighted on objective sheets, knowledge organiser and key word sheets **Summative assessment:** Short Answer recall question assessment End of term assessment	**Disciplinary Knowledge:** • **Calculate the resistance of a component and of a circuit** • Be able to set up a series and a parallel circuit including different components; switch, battery, bulb, ammeter, voltmeter, LED's, LDR's and Thermistors. **Prior learning / retrieval:** Electricity and Magnetism 1 and 2 – Year 7 and 8 Physics **Links to KS3 NC:** • Differences in resistance between conducting and insulating components • Potential difference, measured in volts, battery and bulb ratings; resistance, measured in ohms **Disciplinary literacy:** Students will have the opportunity to read scientific texts from textbooks and non-fiction books. Students will also answer and practice writing extended writing answers using scientific language. Key scientific terms for each lesson will be highlighted on objective sheets, knowledge organiser and key word sheets **Summative assessment:** Short Answer recall question assessment End of term assessment

Space

Space 1

Substantive Knowledge

- There are different objects in the night sky – The nearest object that you can see are artificial satellites. They orbit the Earth.
- The moon orbits the Earth
- There are five planets that most people can see with the naked eye – Mercury, Venus, Mars, Jupiter and Saturn.
- Like Earth, they orbit the Sun.
- The plants form part of the Solar System
- The inner planets, Mercury, Venus, Earth and Mars are terrestrial planets – They are made of rocks.
- Between the orbits of Mars and Jupiter there is an asteroid belt.
- The outer planets are called gas giants. They are mainly made of gases such as hydrogen and helium.
- There are thousands of pieces of rock in the asteroid belt. Some are very small but some are large enough to be called a dwarf planet.
- A comet a huge snowballs that orbit the Sun
- Meteors are bits of rock or dust that burn up as they move through the Earth's atmosphere and produce streaks of light
- Any meteor that makes it to the ground is called a meteorite
- A galaxy is a collection of starts and there are billions of stars in the Milky Way
- The Milky Way, is one of the billions of galaxies that make up the Universe.
- There is day and night on Earth because Earth spins on its axis. It takes 24 hours to complete one full spin.
- The Earth moves around the Sun once each year.
- The Earth takes 365.2422 days to orbit the Sun. There is an extra day in a leap year every four years.
- The height of the Sun, average temperature and the stars you see at night change during the different seasons.
- **The Earth's axis is titled by 23.4 degrees. It is hotter in the summer than the winter because the tilt of the Earth's axis means that the Sun's rays spread over a smaller area and the days are longer.**
- The group of stars or constellations that we see in the summer at night are different to the stars that we see in the Winter. This is because the Earth is moving around the Sun.
- The Moon takes 27 days and 7 hours to orbit the Earth once.
- Half the Moon is lit up by the Sun at all times.
- The changing shape of the Moon are called phases of the moon
- A lunar month is the period of time from one new moon to the next new moon.
- **When the Moon comes between the Sun and the Earth it makes a shadow on the Earth's surface. The moon blocks the light from the sun and you see a total solar eclipse.**
- **A lunar eclipse happens when the Earth comes between the Sun and the Moon.**

Space 2

Substantive Knowledge

- Models of space – Thousands of years ago there were many different theories about the shape of the Earth, the Sun and the Moon.
- When scientists began to notice patterns and make observations they tried to explain them by making models.
- Models help use to explain what we see and to predict what will happen.
- The geocentric model suggested that the Sun, Moon, planets and stars moved around the Earth.
- Plato and Aristotle wrote books explaining this model.
- People accepted this theory because the ground did not seem to move, the Sun and the Moon did appear to move and the stars appeared to move.
- **However, sometimes the planets appeared to go backwards. This is called retrograde motion. It was difficult to explain these observations using the geocentric model.**
- Aristarchus described a different model in which planets orbited the Sun. This was called the heliocentric model.
- Copernicus published a book in 1543 with the heliocentric model.
- Galileo Galilei began to use a telescope to observe planets. The telescope used two lens – This is called a refracting telescope. The objective lens produces a real image of distant objects. The eyepiece lens magnifies the image of the object.
- Most scientists think that the Universe began with the Big Bang.
- All of space and time expanded from something smaller than the atom. The Universe has been expanding ever since.
- **The Big Bang theory explains why galaxies are moving apart and why the galaxies that are further away are moving faster.**
- Scientists believe that the Big Bang happened about 14 billion years ago.
- After 150 million years the first stars started to appear
- Galaxies started to form after billions of years.
- After 9 billion years after the Big Bang, our Solar System was formed – that is around 5 billion years ago.
- A model can be used to make it easier to understand the timescale of the Universe.
- If the Big Bang happened on the 1st January, the Solar System would have formed in August and humans would appear on the 31st December.

Disciplinary Knowledge:

- **Understand how models can be used to explain the Big Bang**
- **Understand how scientists decided on their models of the Universe**

Prior learning / retrieval:

Space 3

Substantive Knowledge

Gravity on Earth and other planets

Weight is the force of gravity acting on you. Your weight depends on your mass and the gravitational field strength (g) of Earth

- On Earth gravity is 9.81 N/kg
- As you move away from Earth the gravitational field strength gets weaker. Mass does not change but weight will change.
- Satellites are launched by rockets which they are attached to. Fuel burns inside the rocket and pushes waste gases out the bottom if it.
- The Moon is the only natural satellite of Earth
- Satellites are used for communication, monitoring the weather, studying Earth and Space.
- Some satellites stay over the same position on the Earth all the time. They are in a geostationary orbit.
- A geostationary satellite is about 36,000 km from Earth.
- It takes one day for a geostationary satellite to orbit the Earth.
- A satellite in a geostationary orbit can broadcast television signals.
- There are lots of satellites such as the International Space Station, in low Earth orbit (LEO) This is an orbit below 1000km from Earth
- Some LEO satellites go over the North Pole and the South Pole in a polar orbit.
- An orbit is the path taken by one body in space around another
- It takes light about eight minutes to reach the Earth from the Sun. This is distance of around 150 million km.
- A light year is how far light travels in a year.
- There were problems with Galileo's telescope. Instead it was better to produce an image with a curved mirror. This is called a reflecting telescope.
- The Hubble Space Telescope uses a 2.4m curved mirror.
- The HST takes detailed pictures of objects in our Solar System. It even produced images of planets around other stars called exoplanets

Disciplinary Knowledge:

- Calculate weight using weight = Mass x Gravity
- Be able to calculate weight on different planets where gravity is different

Prior learning / retrieval:

Space 1 and 2 – Year 7 and 8 Physics

Links to KS3 NC:

- Gravity Force, Weight = Mass x Gravitational Field Strength (g)
- Gravity on Earth = 9.81N/kg
- Light years as a unit of astronomical distance

	Disciplinary Knowledge: **Prior learning / retrieval:** • Changes that happen over the seasons • Describe the movement of the Earth, and other planes, relative to the Sun in the solar system • Describe the movement of the Moon relative to Earth • Describe the Sun, Earth and Moon as approximately spherical bodies • Use the idea of the Earth's rotation to explain day and night **Links to KS3 NC:** • The seasons • The Earth tilt • Day length at different times of the year in different hemispheres **Disciplinary literacy:** Students will have the opportunity to read scientific texts from textbooks and non-fiction books. Students will also answer and practice writing extended writing answers using scientific language. Key scientific terms for each lesson will be highlighted on objective sheets, knowledge organiser and key word sheets **Summative assessment:** Short Answer recall question assessment End of term assessment	Space 1 – Year 7 Physics Microscopes – Year 7 Biology **Links to KS3 NC:** • Changes that happen over the seasons • Describe the movement of the Earth, and other planes, relative to the Sun in the solar system • Describe the movement of the Moon relative to Earth • Describe the Sun, Earth and Moon as approximately spherical bodies • Use the idea of the Earth's rotation to explain day and night **Disciplinary literacy:** Students will have the opportunity to read scientific texts from textbooks and non-fiction books. Students will also answer and practice writing extended writing answers using scientific language. Key scientific terms for each lesson will be highlighted on objective sheets, knowledge organiser and key word sheets **Summative assessment:** Short Answer recall question assessment End of term assessment	**Disciplinary literacy:** Students will have the opportunity to read scientific texts from textbooks and non-fiction books. Students will also answer and practice writing extended writing answers using scientific language. Key scientific terms for each lesson will be highlighted on objective sheets, knowledge organiser and key word sheets **Summative assessment:** Short Answer recall question assessment End of term assessment