Year 5 – Forces

National Curriculum Objectives	Core Knowledge	Vocabulary	
• Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object and the impact of gravity on our lives. • Identify the effects of air resistance, water resistance and friction, which act between moving surfaces. • Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.	Not a Core Knowledge unit Key knowledge required - • Air resistance and water resistance are forces against motion caused by objects having to move air and water out of their way. • Friction is a force against motion caused by two surfaces rubbing against each other. • Some objects require large forces to make them move; gears, pulley and levers can reduce the force needed to make things move.	Friction, Gravity, Newton, Gears, Pulleys, force, push, pull, machine, brake, opposing, streamline, mechanism, lever, cog, Air resistance, Water resistance, motion, surface area, velocity, interaction	
		Key Scientists	**Linked Texts**
		Galileo Galilei (Gravity and Acceleration) Isaac Newton (Gravitation) Archimedes of Syracuse (Levers)	*The Enormous Turnip (Katie Daynes)* *Leonardo's Dream (Hans de Beer)* *The Aerodynamics of Biscuits (Clare Helen Welsh)*

Prior Learning	Key Questions	Future Learning
• Find out how the shapes of solid objects made from some materials can be changed by squashing, bending, twisting and stretching. (Y2) • Compare how things move on different surfaces. (Y3) • Know how a simple pulley works and use making lifting an object simpler. (Y3)	• What actually is a force? • How can a force act on an object? • How can we see forces? • How can we measure forces? • How does the length of a piece of a paper helicopter's wings affect the time it takes to fall? • How does the changing the shape of a piece of plasticine affect water resistance? • How does adding holes to a parachute affect the time it takes to fall? • How does the amount/depth of tread affect the friction between a shoe and a surface? • How can we use levers to lift more? • How do see-saws work? • Can you create a pulley system to life a given load?	• Forces as pushes or pulls, arising from the interaction between two objects. (KS3) • Using force arrows in diagrams, adding forces in one dimension, balanced and unbalanced forces. (KS3) • Moment as the turning effect of a force. (KS3) • Forces: associated with deforming objects; stretching and squashing – springs; with rubbing and friction between surfaces, with pushing things out of the way; resistance to motion of air and water. (KS3) • Forces measured in Newtons, measurements of stretch or compression as force is changed. (KS3)

Comparative & Fair tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question: Assessment Opportunity
How does the angle of launch affect how far a paper rocket will go? How does the surface area of an object affect the time it takes to sink?	Can you label and name all the forces acting on the objects in each of these situations?	How long does a pendulum swing for before it stops?	Do all objects fall through water in the same way? How does surface area of parachute affect the time it takes to fall?	How do submarines sink if they are full of air?	How and why do objects move?

Year 5 – Chemistry: Basic Concepts

National Curriculum Objectives	Core Knowledge	Vocabulary
• Identify the part played by evaporation and condensation in the water cycle and associate the rate of evaporation with temperature. • 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, including through filtering, sieving and evaporating.	ATOMS • All matter is made up of particles too small for the eye to see, called atoms • Atoms are made up of even tinier particles: protons, neutrons, electrons. PROPERTIES OF MATTER • Mass, volume, density, vacuum ELEMENTS • Elements are the basic kinds of matter, of which there are a little more than one hundred. • Familiar elements, such as gold, copper, aluminium, oxygen, iron • Most things are made up of a combination of elements. SOLUTIONS • A solution is formed when a substance (the solute) is dissolved in another substance (the solvent), • Concentration and saturation (as demonstrated through simple experiments with crystallisation)	Solid, liquid, gas, particles, state, materials, properties, matter, melt, freeze, water, ice, temperature, process, condensation, evaporation, water vapour, energy, precipitation, collection. Substance, solution, compound, atoms, dissolve, reversable, transparent, sieving, filtering, evaporate, separating, soluble, insoluble, crystallisation,

Key Scientists	Linked Texts
Spencer Silver, Arthur Fry and Alan Amron (Post-It Notes) Ruth Benerito (Wrinkle-Free Cotton)	*Itch (Simon Mayo)* *Astonishing Atoms & Matter Mayhem (Colin Stuart)* *On a Beam of Light : the Story of Albert Einstein (Jennifer Berne)*

Prior Learning	Key Questions	Future Learning
Matter (Y3) • Everything is made of matter, and that all matter is made up of parts too small to see. • Basic concept of atoms • Names and common examples of three states of matter: o Solid (for example, wood, rocks) o Liquid (for example, water) o Gas (for example, steam) • Water as an example of changing states of matter of a single substance • Units of measurement: Length & Volume • Temperature: degrees Celsius	• What are mixtures? • What does 'dissolving' mean? • Which of the following dissolve in water: sugar, bicarbonate of soda, oil, chocolate, coffees, dark vinegar and wax? • How does the amount of water used affect how much sugar will dissolve in it? • Which sweets dissolve in water? • How can we separate mixtures? • How can we clean our dirty water?	• All matter (including gas) has mass. (Y6) • Sometimes mixed substances react to make a new substance. These changes are usually irreversible. (Y6) • Heating can sometimes cause materials to change permanently. When this happens, a new substance is made. These changes are not reversible. (Y6) • Indicators that something new has been made are: The properties of the material are different (colour, state, texture, hardness, smell, temperature). (Y6) • 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). (Y6)

 Comparative & Fair tests	 Identify & Classify	 Observation over time	 Pattern Seeking	 Research	BIG Question: Assessment Opportunity
How does the temperature of tea affect how long it takes for a sugar cube to dissolve? Which type of sugar dissolves the fastest?	Can you group these materials based on whether they are transparent or not?	How does a container of salt water change over time? How does a sugar cube change as it is put in a glass of water?	Do all stretchy materials stretch in the same way? How does temperature affect how much solute we can dissolve?	What are microplastics and why are they harming the planet?	How can we separate a mixture of water, iron filings, salt and sand?

Year 5 – Human Body: Circulation

National Curriculum Objectives

- Identify and name the main parts of the human circulatory system, and describe the 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.

Core Knowledge

THE CIRCULATORY SYSTEM

- Pioneering work of William Harvey
- Heart: four chambers (atrium/atria or atriums [plural] and ventricle/ventricles), aorta
- Blood & Blood vessels
- Filtering function of liver and spleen
- Fatty deposits can clog blood vessels and cause a heart attack.
- Blood types (four basic types: A, B, AB, O) and transfusions

THE RESPIRATORY SYSTEM

- Process of taking in oxygen and getting rid of carbon dioxide
- Nose, throat, voice box, trachea (windpipe)
- Lungs, bronchi, bronchial tubes, diaphragm, ribs, alveoli (air sacs)
- Smoking: damage to lung tissue, lung cancer

Vocabulary

Oxygenated, deoxygenated, valve, exercise, respiration, circulatory system, heart, lungs, blood vessels, blood, artery, vein, alveoli, liver, spleen, digestive, transport, gas exchange, nutrients, water, oxygen, alcohol, drugs, tobacco, chambers, ventricle, aorta, trachea
capillary, pulmonary, bronchial tubes

Key Scientists	Linked Texts
Justus von Liebig (Theories of Nutrition and Metabolism) Leonardo Da Vinci (Anatomy) Ernest Everett Just (Biologist)	*Pig-Heart Boy (Malorie Blackman)* *Skellig (David Almond)* *A Heart Pumping Adventure (Heather Manley)* *Breathtaking Lungs & Rocking Respiratory System (Paul Mason)*

Prior Learning

- Introduce the idea of body systems, and have children identify basic parts of the following body systems:
  Skeletal system: skeleton, bones, skull
- Muscular system: muscles
- Digestive system: mouth, stomach
- Circulatory system: heart and blood
- Nervous system: brain and nerves (Y2)
- Cells (Y3)
- The Digestive system (Y3)
- Muscular system (Y4)
- Skeletal system (Y4)
- Nervous system (Y4)

Key Questions

- Why do we need oxygen?
- How do we breathe?
- Do fish and plants breathe?
- Do all living things need oxygen?
- Are there ways to increase/decrease our lung capacity? Is lung capacity fixed?
- Why do we have blood?
- How does our heart work?
- How does size of muscle affect our pulse rate?
- How does exercise effect our pulse rate?
- How might the circulatory system of an elephant, a hummingbird, or a polar bear differ?

Future Learning

HUMAN GROWTH STAGES (Y6)

- Puberty

THE REPRODUCTIVE SYSTEM (Y6)

- Male & female reproductive systems
- Sexual reproduction:

THE ENDOCRINE SYSTEM (Y6)

- Endocrine glands & hormones
- Pituitary gland
- Thyroid gland
- Pancreas:
- Adrenal glands:

Comparative & Fair tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question: Assessment Opportunity
How does the length of time we exercise for affect our heart rate? Can exercising regularly affect your lung capacity?	Which organs of the body make up the circulation system, and where are they found?	How does my heart rate change over the day? How much exercise do I do in a week?	Is there a pattern between what we eat for breakfast and how fast we can run?	How have our ideas about disease and medicine changed over time?	How do our choices affect how our bodies work? Why does my heart beat?

Year 5 – Electricity

National Curriculum Objectives

- identify common appliances 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 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.
- associate the brightness of a lamp or the volume of a buzzer with the number and voltage 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 when representing a simple circuit in a diagram.

Core Knowledge

- Through reading and observation, and experiment, examine the following:
- Electricity as the charge of electrons
- Static electricity
- Electric current
- Electric circuits, and experiments with simple circuits (battery, wire, light bulb, filament, switch, fuse)
- Closed circuit, open circuit, short circuit
- Conductors and insulators
- Electromagnets: how they work and common uses
- Using electricity safely

Vocabulary

Electricity, neutrons, protons, electrons, nucleus, atom, electric current, appliances, mains, crocodile clips, wires, bulb, battery cell, battery holder, motor, buzzer, switch, conductor, electrical insulator, conductor.
Amperes, volts, positive and negative charge

Key Scientists

Alessandro Volta
(Electrical Battery)

Nicola Tesla
(Alternating Currents)

Jagadish Chandra Bose
(Involved in the invention of the radio)

Linked Texts

You Wouldn't Want to Live without Electricity (Ian Graham)
Charging About (Jacqui Bailey)
Goodnight Mr Tom (Michelle Magorian)

Prior Learning

- Static electricity (Y2)
- Basic parts of simple electric circuits (for example, batteries, wire, bulb or buzzer, switch) (Y2)
- Conductive and nonconductive materials (Y2)
- Safety rules for electricity (for example, never put your finger or anything metallic in an electrical outlet, never touch a switch or electrical appliance when your hands are wet or when you're in the bathtub, never put your finger in a lamp socket, etc.) (Y2)

Key Questions

- What is electricity?
- How does the voltage of a batters affect how much current is pushed?
- How does the length of time I leave the current flowing for affect the brightness of the bulb?
- How does number of bulbs affect the brightness of a bulb?
- Why are wires insulated in plastic? Does type of material make a difference?
- Does length of wire make a difference?
- What renewable ways can we generate electricity?
- How does current affect heat?
- What are the dangers of a short circuit?

Future Learning

Current electricity

- electric current, measured in amperes, in circuits, series and parallel circuits (KS3)
- potential difference, measured in volts (KS3)
- differences in resistance between conducting and insulating components (KS3)

Static electricity

- separation of positive or negative charges when objects are rubbed together (KS3)
- the idea of electric field, forces acting across the space between objects not in contact(KS3)

Comparative & Fair tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question: Assessment Opportunity
How does the voltage of the batteries in a circuit affect the brightness of the lamp? How does the voltage of the batteries in a circuit affect the volume of the buzzer?	How would you group electrical components and appliances based on what electricity makes them do?	How does brightness of bulb change as the battery runs out? How can we measure how quickly a battery is used up?	Does the temperature of a light bulb go up the longer it is on?	How has our understanding of electricity changed over time?	Can we vary the effects of electricity?

Year 5 – Geology

National Curriculum Objectives	Core Knowledge	Vocabulary	
• **Not linked to NC**	• **The Earth's Layers:** Crust, mantle, core (outer core and inner core). Movement of tectonic plates: earthquakes & volcanoes • **How mountains are formed:** Folded mountains, fault-block mountains, dome-shaped mountains • **Rocks:** Formation and characteristics of metamorphic, igneous, and sedimentary rock • **Weathering & erosion**: Physical and chemical weathering. Weathering and erosion by water, wind and glaciers. The formation of soil: topsoil, subsoil, bedrock •	Crust, mantle, core, tectonic plates, fault lines, magma, lava, active, dormant, extinct, continental drift Fold, fault-block, dome-shaped, metamorphic, igneous, sedimentary, weathering, erosion, topsoil, subsoil, bedrock Evaporation, condensation, precipitation, cirrus,	
		Key Scientists	**Linked Texts**
		James Hutton – father of modern geology Richard Fiske - volcanologist	*The Street Beneath my Feet – Yuval Zommer (Earth's layers)* *Mountains of the World – Deiter Braun* *Everest – Alexandra Stewart & Joe Todd Stanton (mountains)* *The Rhythm of the Rain – Graham Baker Smith (Water Cycle)*

Prior Learning	Key Questions	Future Learning
In Year 3, children learn about the different types of rocks and how they are formed. In Year 4, children learn about the earth, sun and moon and how the earth's rotation causes day and night, and how the orbit around the sun causes the seasons	• What is a mountain and how are mountains formed? • How does climate change and human activity impact on the mountain environment? • How are volcanoes formed? • What does a volcano look like inside? •	• the composition of the Earth (KS3) • the structure of the Earth(KS3) • the rock cycle and the formation of igneous, sedimentary and metamorphic rocks (KS3) • Earth as a source of limited resources and the efficacy of recycling

Comparative & Fair tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question: Assessment Opportunity
Volcano – how can we change the size of the explosion (changing amounts of ingredients)	How can plants and animals be classified according to their biomes?	How does the hardness of rocks affect erosion?	How has the climate changes over the last x years? https://www.metlink.org/resources-for-year-6-post-sats/	How are different rocks created? https://www.geolsoc.org.uk/LessonPlanChocolateRock	What impact are humans having on the earth?

Year 5 –Meterology

National Curriculum Objectives	Core Knowledge	Vocabulary	
• **Not linked to NC**	• **Meteorology**: The water cycle (review from Year 3): evaporation, condensation, precipitation Clouds: cirrus, stratus, cumulus (review from Year 3) • **The atmosphere**. Troposphere, stratosphere, mesosphere, thermosphere, exosphere. • **Air movement:** wind direction and speed, prevailing winds, air pressure, low and high pressure, air masses. • **Weather and climate:** Cold and warm fronts: thunderheads, lightning and electric charge, thunder, tornadoes, hurricanes.	Prevailing winds, air pressure, cold & warm front, thunderheads, lightning and electric charge, thunder, tornadoes, hurricanes Composition stratus, cumulus, cirrus Troposphere, stratosphere, mesosphere, thermosphere, exosphere	
		Key Scientists	**Linked Texts**
			The Rhythm of the Rain – Graham Baker Smith (Water Cycle)

Prior Learning	Key Questions	Future Learning
In Year 3, children learn about the water cycle and some basic observations of clouds. In Year 4, children learn about the earth, sun and moon and how the earth's rotation causes day and night, and how the orbit around the sun causes the seasons	• What is a biome? • how are animals and plants are adapted to suit their environment in different ways? • What is the role of the water cycle in a biome?	• the composition of the atmosphere (KS3) • the production of carbon dioxide by human activity and the impact on climate (KS3)

Comparative & Fair tests	Identify & Classify	Observation over time	Pattern Seeking	Research	BIG Question: Assessment Opportunity
Volcano – how can we change the size of the explosion (changing amounts of ingredients)	How can plants and animals be classified according to their biomes?	How does the hardness of rocks affect erosion?	How has the climate changes over the last x years? https://www.metlink.org/resources-for-year-6-post-sats/	How are different rocks created? https://www.geolsoc.org.uk/LessonPlanChocolateRock	