

Concept Tracker – Science Years 1-6

Objective: UNDERSTANDING	Date Assessed:	Limited Understanding	Able to mimic this with help	Off the gap list! Can explain and apply this	Can reason with this and use it in any context
Chemistry – The concept that very small particles, combining mixing and moving in different ways can be used to explain what we see					
Materials Y1 Understands 'property' e.g. most metals are shiny and hard. Show understanding by grouping them.					
Materials Y2 Correctly predict which materials will bend, squash, twist or stretch so suggests a material to use for a task.					
Materials Y3 Understands some rocks were made from millions of tiny particles of soil, animals, plants and smaller rocks being squashed together by the weight of layers on top. Can use this to explain where fossils came from. Understands why this takes longer than their lifetime.					
Materials Y4 Understands the concept that all things are made from particles that are too small for us to see with our eyes. Understands that heating these particles (atoms and molecules) gives them more energy so they can move more. Can use this to explain change of state and why heating helps evaporation.					
Materials Y5 Can explain dissolving and mixing in terms of particles and knows the material is still there so the process can be reversed.					

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Materials Y5 (Link to Energy) Understands adding energy (e.g. spark or flame) can help particles join together in a chemical reaction so they become a molecule of a new substance. Can use this concept e.g. to explain burning or acid + bicarbonate of soda. Is curious why some atoms prefer joining each other more than others and notices sometimes more energy can come out than you put in.					
Evolution – Understand reproduction and how living things have adapted over time					
Evolution Y1 Concept of variety in plants and animals and identifying some common features					
Evolution Y2 Understand all living things have offspring that grow into adults. Applies this to seeds, bulbs, animals and humans. The offspring share features from each parent but are different.					
Evolution Y3 Understands how flowering plants can be ‘parents’ even though they can’t get up and meet each other! Explains the role flowers, pollination, seed formation and seed dispersal play in this.					
Evolution Y4 Understands environments can change and this puts pressure on a species. Some offspring are better suited to be successful in their environment at getting food or reproducing and in the wild these will be more likely to have healthy offspring. Understands that over time this could lead to a species ‘evolving’					

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Evolution Y5 Understands why sexual reproduction is an advantage to evolution (as opposed to asexual) and can describe how it happens in plants and animals including how the sex cells are formed and combine.					
Evolution Y5 Can use the concept of evolutionary advantage to try and explain differences in the life cycles of mammals, amphibians, insects and birds.					
Evolution Y6 (Timescale & Process) Has mastered the timescale and the process of evolution. So can use the concept of evolution to propose and explain specific adaptations.					
Evolution Y6 (Classification) Has a concept of common ancestors from millions of years ago and this helps them explain groupings of plants and animals in broad groups in classification keys based on common observable features.					
Ecosystems – What all living things need and starting to understand how they depend on each other.					
Staying Alive Y1 Understand some things are alive, some dead and some were never alive,					
Plants Staying Alive Y2 Understand plants need water, air, a suitable temperature and sunlight to make their own food. Can use this to explain why they need roots and leaves and why some trees lose their leaves in the winter.					
Animals Staying Alive Y2 Understand animals need the right amounts of water, (oxygen from the) air and food. They can't make their own food so need to eat plants or animals. Can use this to explain why we need to eat a range of different foods (nutrients)					

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Food Chains Y2 (Link with Energy) Understands plants capture energy from the sun (remember: you can't MAKE or use up energy) and animals get their energy by eating plants or other animals. Can use this to make food chains that always start with the sun and end in a predator. Can apply this to a range of habitats including microhabitats.					
Ecosystems Y3 Understands plants and animals depend on each other. Can use food chains with producers, predators and prey in to show they understand interdependence.					
Living things are made of cells that work together to help each other live-					
Plants keeping their cells healthy Y3 Understands plants, like all living things, are made of cells working together and the ones that make the food are normally green and normally in the leaves. Can use the idea of the plant 'supplying' these cells with what they need, to explain roots, stems, trunks (water and nutrients from the soil), leaves (air and sunlight)					
Animals keeping their cells healthy Y3 Understand humans grow, move about, keep warm, reproduce and repair themselves so they need lots of different raw materials. They are animals so can't make their own food so need to eat a range of different living things to get the nutrition they need. Can apply these ideas to their own diet and other animals.					
Getting nutrition to your cells Y4 Understands the food we eat has to be broken up by our teeth, broken into molecules (link) in our stomach and carried by our blood to the cells. What we don't need is excreted. Uses knowledge of types and function of teeth and parts of the digestive system correctly when explaining this.					

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Cells getting old Y5 Understands that cells make copies of themselves throughout their life to repair damage but only so many times. They can use ideas like this to explain the changes they see in humans. E.g. growth and the features of old age.					
Getting nutrition to your cells Y6 Understands that every cell needs a really good circulation system to bring it food and oxygen and take away its waste. Can use this idea to explain the part that the heart, blood vessels and blood play in this. Can also use this to describe the role the kidneys play in keeping the right amount of water in the blood and the liver for the right nutrients to feed the cells correctly.					
Keeping your cells healthy Y6 Understands that role of exercise and healthy diet in keeping cells healthy. E.g. Not too much fat to block arteries, exercise to keep blood and oxygen flowing, right diet for the right balance of nutrients etc. Avoiding drugs that alter the balance.					
Energy travelling from one place to another – Using light, using sound and using electricity					
Energy travelling as Light Y3 Understands that some objects when they get hot or excited can emit very small packets of energy called photons. Some of these we can see with our eyes (light). Can use this to explain the difference between a source of light and something that reflects light. Can use this model of photons as small balls to explain reflection and shadows. Can use it to explain why looking at the sun directly is dangerous.					

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Energy travelling as Sound Y4 Understands and can use the analogy of sound travelling through air or solid objects to waves on a pond but in 3D. Can use this model to explain a bang (one splash in the pond), a noise (vibrations), louder noises (taller waves), sounds getting fainter the further you are from them (Energy spreading out)					
Types of Sound Y4 Understands that more vibrations each second is heard by our ear as higher pitch. Can use this to suggest and test why some objects make different sounds based on how quickly they can vibrate. Can also explain why making the sound louder doesn't change the pitch.					
Energy travelling as Electricity Y5 Understands that Voltage is a measure of how much energy electrons have. Can use this to predict how loud buzzers will be and how bright bulbs will be in different circuits. Can describe electricity in terms of a flow of energy so knows that electrons are just the carriers and are not 'used up'					
Energy travelling as Light Y6 Uses the concept of light as photons travelling in straight lines to create ray diagrams and use these to explain why we can see an object with reflected light and why shadows have the same shape as the object that cast them.					
Forces – Understand objects stay in one place or moving with constant speed and direction unless a force acts on them → acceleration					

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<p>Forces Y3 Understands that to make something move, slow down, speed up or change direction needs a FORCE. Can use this understanding to notice that some forces like magnetism can act at a distance without actually touching the object. Can also not be caught out by puzzles like what ‘throws you forward’ when a bus stops?</p>					
<p>Forces Y3 (Link with energy) Understands that same poles of a magnet repel each other and so it takes energy for push them together and when you let go, this energy is released (they accelerate away from each other). They know the same is true for electrons but can’t test this yet. Equally they know that same poles attract and so it takes energy to keep them apart. Knows why repulsion is the only test for something being a magnet.</p>					
<p>Forces Y4 Understands that an electric cell attracts electrons into one end and pumps them out the other end. This squashes all the electrons together. Electrons repel like the same poles of magnets so if you have a wire connecting the two sides of the cell the electrons will flow around it. Can use this to explain why you need a complete circuit for electricity. Also to devise a test to see if something is a good conductor of electricity or not.</p>					
<p>Forces Y5 (Gravity a force at a distance) Understands that gravity is a force that is always attractive and acts at a distance. Can use this to explain why objects speed up when falling, why they always speed up towards the Earth, even when you throw them up in the air.</p>					

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Forces Y5 (Earth and Space) Understands that the Earth, Moon, Sun and Planets in the solar system are approximately spherical objects. So can use gravity to explain why the Moon is orbiting the Earth and the Earth orbiting the sun. (Always falling but never hitting because it is a sphere)					
Day and Night Y5 (doesn't fit elsewhere!) Understands the Earth is spinning so sometimes we are facing the sun and other times we are not. Can use this to explain day and night and why the sun and moon appear to move across the sky. Can explain why, if it is spinning, you don't fall off!					
Forces Y5 Understands that for something to slow down a force must be acting. Can use this to explore the ideas of water resistance, friction and air resistance. Understands the idea of forces being balanced if no acceleration is happening.					
Forces Y5 Understands that to make an object turn or spin, you need less force the further you are from the pivot. Can use this to explain why levers, pulleys and gears are useful.					

Science Skills – Conducting investigations	Date	Needs Practice	Mastery
Investigation Skills Y1 <ul style="list-style-type: none"> Predict – Asks questions, predicts what will happen, plans how to test this out. Carry out – uses standard and non-standard measures recorded in a table or graph Conclude – See patterns in the evidence and conclude if their prediction was right? 			
Investigation Skills Y2 <ul style="list-style-type: none"> Predict – As above but based on some science knowledge. Says if fair or not. Carry out – create a table of measurements and block graph or drawing if needed. Conclude – As above but explain with a new theory if their prediction was wrong or justify by making references to the data they have collected if it was right. 			
Investigation Skills Y3 <ul style="list-style-type: none"> Predict – As above but plan for sufficient evidence and add steps to make it fairer. Carry out – As above but using equipment to ensure standard measures. Bar chart. Conclude – As above but spot patterns and relate to their science knowledge. 			
Investigation Skills Y4 <ul style="list-style-type: none"> Predict – Prediction uses correct science. Test is fair with reasoned equipment choice. Carry out – As above but repeats outliers, takes measures requiring specialist equipment such as force, time, temperature and reasons choice of bar chart or table. Conclude – Identifies trends and patterns from tables and graphs and suggest scientifically plausible reasons. Gives a balanced assessment of their prediction. 			
Investigation Skills Y5 <ul style="list-style-type: none"> Predict – As above but showing conceptual understanding. Uses this in their planning so they control a range of variables to make this fair. Plan at least 5 results. Carry out – Repeat measurements to increase accuracy. Plots on a line graph. Conclude – To consider argument for and against their prediction being true. Use the data to support both sides and consider if results were sufficient or repeated enough. 			
Investigation Skills Y6 <ul style="list-style-type: none"> Predict – As above but predict each possible variable to make decisions about which to control and how, based on conceptual science. Plan detailed ways to ensure fairness. Carry out – As above but with greater understanding of errors and so a more efficient systematic way of ensuring reasonable accuracy including choice of equipment. Conclude – As above but with good explanations for any outliers based on scientific understanding. Explanation of how evidence supports the prediction and how this could be improved to give an answer with more certainty. Allows deeper prediction. 			