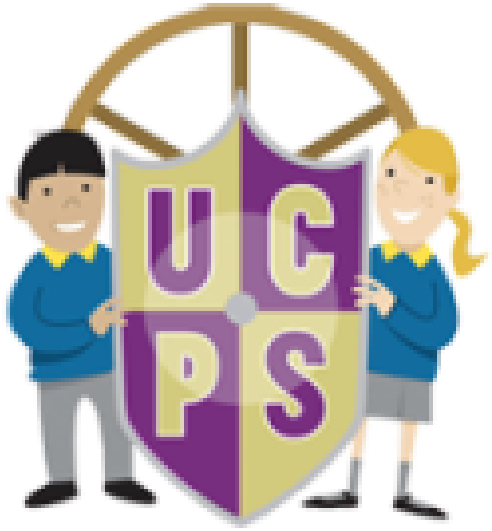


Science in Year 4

Working Scientifically

Year 3/4	Working Scientifically Skills

OBJECTIVES

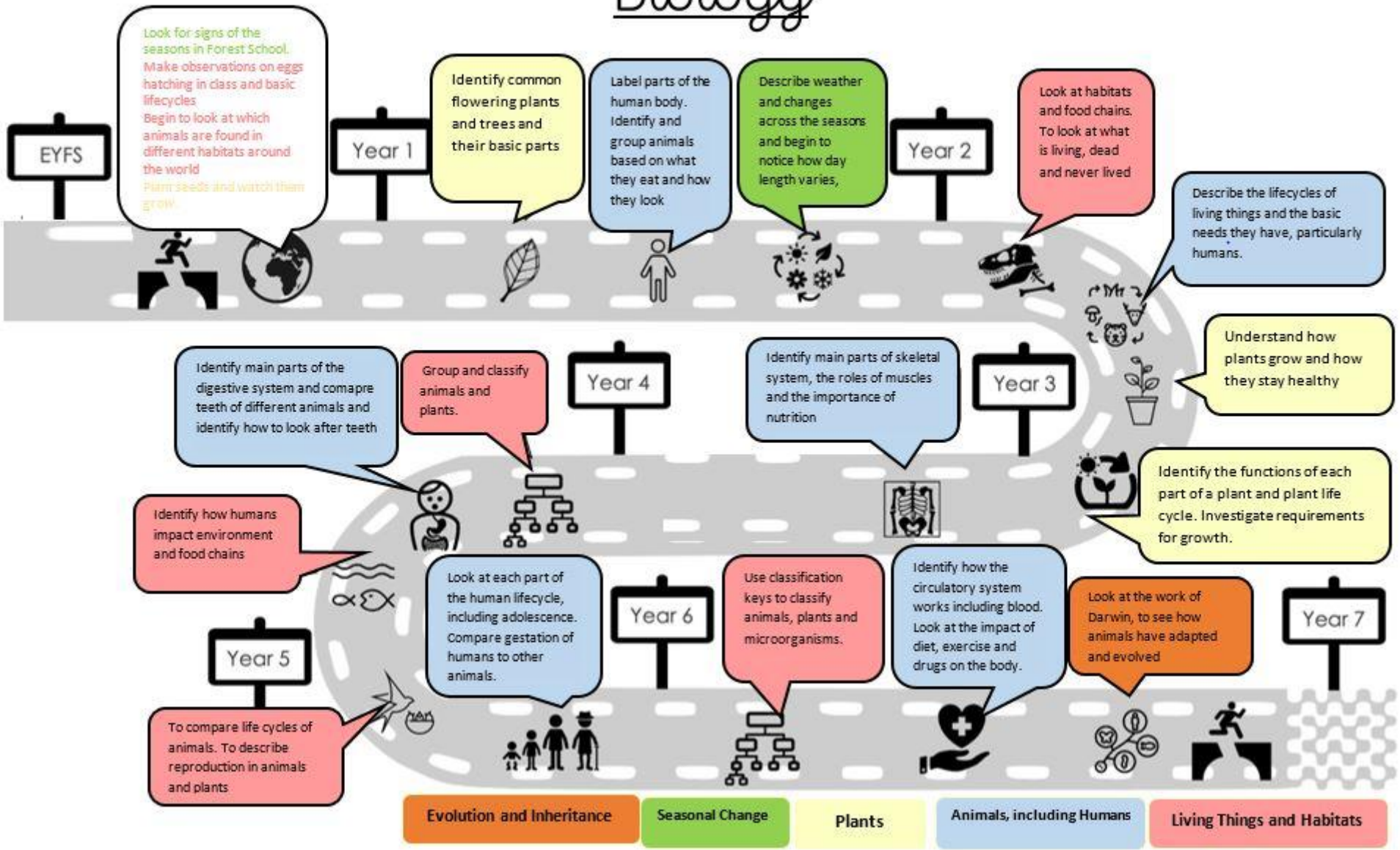
a) Begin to raise their own relevant questions about the world around them
b) Should be given a range of scientific experiences including different types of science enquiries to answer questions
c) Can make and record a prediction before testing using scientific vocabulary and simple reasons.
d) Start to make their own decisions about the most appropriate type of scientific enquiry they might use to answer questions and which information needs to be collected
e) Set up simple practical enquiries, comparative and fair tests
f) Understands what a simple fair test is, recognise what a simple fair test is, when it is necessary and how it is fair.
g) Talk about criteria for grouping, sorting and classifying; and use simple keys
h) Use secondary sources and recognise when and how they might help them to answer questions that cannot be answered through practical investigations
i) With support helps to make decisions about what systematic and careful observations to make and how long to make them for and the type of simple equipment that might be used.
j) With support, begin to look for patterns and relationships (some naturally occurring) and decide what data to collect to identify them
k) Take fair and accurate measurements using standard units and a range of equipment (including thermometers and data loggers) appropriately.
l) Collect and record data from their own observations and measurements in a variety of ways: notes, bar charts and tables, standard units, drawings, labelled diagrams, keys
m) With support, begin to make decisions about how to analyse this data
n) With help, pupils should look for changes, patterns, similarities and differences in their data in order to draw simple conclusions and answer questions from their findings
o) Use relevant simple scientific language to discuss their ideas and communicate their findings in ways that are appropriate for different audiences (including oral and written explanations, ICT, displays or presentations of results and conclusions)
p) With support discusses the success of their working methods and suggests ways of improving what they have already done.

VOCABULARY

relevant questions
reasoned prediction Appropriate enquiry
Comparative tests
Keys
fair tests
systematic and careful observations
Accurate measurements
Standard units
Data collection
Dataloggers
Simple conclusion
findings
labelled diagrams keys
analyse
Improve
Working methods
Presentation/present
success
plan
variables
classification keys
classify

Child friendly version to be put in the back of children's books/floor book	

Biology


EYFS
Look for signs of the seasons in Forest School.
Make observations on eggs hatching in class and basic lifecycles
Begin to look at which animals are found in different habitats around the world
Plant seeds and watch them grow.
Year 1
Identify common flowering plants and trees and their basic parts
Label parts of the human body. Identify and group animals based on what they eat and how they look
Describe weather and changes across the seasons and begin to notice how day length varies,
Year 2
Look at habitats and food chains. To look at what is living, dead and never lived
Describe the lifecycles of living things and the basic needs they have, particularly humans.
Year 3
Understand how plants grow and how they stay healthy
Identify the functions of each part of a plant and plant life cycle. Investigate requirements for growth.
Identify main parts of skeletal system, the roles of muscles and the importance of nutrition
Year 4
Identify main parts of the digestive system and comapre teeth of different animals and identify how to look after teeth
Group and classify animals and plants.
Identify how humans impact environment and food chains
Year 5
To compare life cycles of animals. To describe reproduction in animals and plants
Year 6
Look at each part of the human lifecycle, including adolescence. Compare gestation of humans to other animals.
Use classification keys to classify animals, plants and microorganisms.
Identify how the circulatory system works including blood. Look at the impact of diet, exercise and drugs on the body.
Year 7
Look at the work of Darwin, to see how animals have adapted and evolved
Evolution and Inheritance
Seasonal Change
Plants
Animals, including Humans
Living Things and Habitats

<table>
<tr><td>Year 4</td><td colspan="3">Area of NC: Living Things and Habitats (Biology)</td></tr>
<tr><td>Learning Objectives

(in suggested order of teaching sequence)</td><td colspan="3"><u>Prior Learning relevant to this topic:</u>. Children in Y1 looked at different types of animals and what they eat and in Y2 looked at the habitats of different animals and how animals are suited to those environments. In Y2 children, have looked at a simple food chain.
• Identify that animals can be grouped in a variety of different ways (including by their actual groups mammals, fish, amphibians, birds and reptiles, vertebrates and invertebrate, their habitats and what they eat)
• Explore and use classification keys to identify and group animals (primarily in the local environment)
• Identify that plants can be grouped in different ways (e.g. flowering and non-flowering, in the local environment or wider environment, by colour, can it be eaten etc)
• Explore and use classification keys to identify and group plants (primarily in the local environment)
• Identify how human action can change environments and impact living things (positive and negative)
• Construct and interpret food chains for different habitats (producer, consumer, predator, prey)
<u>Pupils do not need to be taught the following content, which they will learn in later year groups:</u> Children do not need to look at plant or animal lifecycles which will be looked at in Y5. Also, they do not need to look at all the specific plant groups when classifying or complex classification systems, as this will be done in Y6 along with specific reasoning for classifying.</td></tr>
<tr><td>Working Scientifically Objectives that link to this topic:</td><td colspan="3">• Talk about criteria for grouping, sorting and classifying; and use simple keys
• Use secondary sources and recognise when and how they might help them to answer questions that cannot be answered through practical investigations
• With support, begin to look for patterns and relationships (some naturally occurring) and decide what data to collect to identify them
• Collect and record data from their own observations and measurements in a variety of ways: notes, bar charts and tables, standard units, drawings, labelled diagrams, keys
• Use relevant simple scientific language to discuss their ideas and communicate their findings in ways that are appropriate for different audiences (including oral and written explanations, ICT, displays or presentations of results and conclusions)
Others could be relevant dependant on which practical enquiries you choose to plan</td></tr>
<tr><td rowspan="2">Learning Objective</td><td colspan="3">Objective Broken Down into Differentiation</td></tr>
<tr><td>Below</td><td>Expected</td><td>Above</td></tr>
<tr><td>Identify that animals can be grouped in a variety of different ways (including by their actual groups mammals, fish, amphibians, birds and reptiles, vertebrates and invertebrate, their habitats and what they eat)</td><td>Pupil can sort animals based on the animal groups, explaining differences with support</td><td>Pupil can name the main animal groups independently, and sort animals based on them using correct scientific vocabulary</td><td>Pupil can independently group and sort animals based on a wide variety of criteria</td></tr>
<tr><td>Explore and use classification keys to identify and group animals (primarily in the local environment)
Forest school</td><td>Pupil can use a simple key to identify animals</td><td>Pupil can use and create simple keys to identify animals in their local environment</td><td>Pupil can use and keys for a range of audiences to identify animals in their local and wider environment</td></tr>
</table>

Identify that plants can be grouped in different ways (e.g. flowering and non-flowering, in the local environment or wider environment, by colour, can it be eaten etc) **Forest school**	Pupils can sort plants based on basic differences with support	Pupil can sort plants in the local environment based on similarities and differences	Pupil can independently group and sort plants based on a wide variety of criteria
Explore and use classification keys to identify and group plants (primarily in the local environment) **Forest school**	Pupil can use a simple key to identify plants	Pupil can use and create simple keys to identify plants in their local environment	Pupil can use and keys for a range of audiences to identify plants in their local and wider environment
Identify how human action can change environments and impact living things (positive and negative)	With support, a pupil can identify some ways environments change over time and the effects on living things	Pupil is aware that man's actions can have an impact upon the lives of other living creatures at a local and global scale Pupil can suggest some ways to address and/or reverse environmental change	Pupil can research long-term effects on living things and environments due to human impact. Pupils can link this knowledge with work on food chains and how ecosystems may possibly be impacted.
Construct and interpret food chains for different habitats (producer, consumer, predator, prey)	Pupil can create simple food chains which identify predators, prey and producers	Pupil can create food chains of a wide range of habitats, identifying producers, consumers, predator and prey	Pupil can link their work on change in environments and human impact explain how that may affect a food chain or food web

Scientific Enquiry/Activity Ideas:

Ensure experiments/enquires are significantly different to Year 6

Pattern Seeking	**Observations Over Time**	**Identifying, classifying and grouping**	**Practical Tests**	**Research**
	• Make a guide of living things found in the local environment and how they have changed throughout the year •	• Can you classify liquorice all sorts? Create a classification key to get used to how to use them. • Identify characteristics of children in the class using a whole - class key - (***See the book 'A Creative Approach to Teaching Science' Whole Class Key and Human Classification pg. 48 and 49)*** • Mini-beast hunt around the school grounds then use classification charts to identify (do not make classification key). Same with plants and birds. Create top trump cards https://www.stem.org.uk/resources/elibrary/resource/264436/fera-resources-classification	• Why are plastics dangerous? •	• Why are people cutting down the rainforests and what effect does that have? • Research animals that are endangered and present a mini project on them (**See the book 'A Creative Approach to Teaching Science' pg. 50)** • How does pollution affect habitats? • Write and perform a three-minute speech that explores the threats to temperate plants and explains why this is a problem. Investigate why so many temperate plants are threatened. What is causing this and why does it matter? https://endeavour.kew.org/app/os (links to plants) • How are habitats being destroyed? • Create food chains and webs for different environments

		• Can you group animals into mammals, birds, reptiles, fish and amphibians? • Identify parts of a food chain - presenting food chains, pg. 35 ***See the book 'A Creative Approach to Teaching Science')*** • *Be environmental scientists- use the* school grounds/local area as a habitat and go on a search for living things (incl. plants) in the grounds - https://pstt.org.uk/resources/curriculum-materials/assessment - Y4 focused assessment plan – local survey •		

Non statutory NC ideas

Could work scientifically by: observing animals in their local habitats throughout the year, identifying any changes throughout the year and making a guide to local living things they have observed and researched

Scientists to Consider

David Attenborough, Rachel Carson, James Lovelock

Bright Ideas Time Suggestions	Vocabulary to be Taught	Possible Trips/Experiences	Possible Cross-Curricular Links	Potential Books to use
Odd one out – Rabbit, giraffe, frog PMI – What if humans were banned from all rainforests? PMI – What If we ate insects? B	Classification, Classification keys, Groups, Environment, Habitat, Ecosystem, plants - flowering and non-flowering, Animals, fish, Amphibians, Reptiles, Birds, Mammals, Vertebrates Invertebrates, Human impact, Positive	• Washington Wildfowl and Wetlands Trust - https://www.wwt.org.uk/learn/learn-at-washington/learning-sessions/details/where-does-my-water-come-from-and-how-can-i-look-after-it/12/ - water cycle and how humans can effect environment • Gibside - Habitat exploration and discovery - https://nt.global.ssl.fastly.net/gibside/documents/gibside-information-packs-for-primary-schools.pdf • Life Centre - https://education.life.org.uk/workshop/habitats • Bugs N Stuff - http://www.bugsnstuff.com/our-	**English:** Write a letter to Greenpeace about the impact of humans on the environment An oral presentation about conservation and environmental issues Balanced argument – deforestation Create an observer guide for other children to use when in local environment **Maths:** Venn and Carroll diagrams to sort animals **ICT/iPads:** *Padlet can be used to generate the questions the*	• The big book of Bugs, The Big Book of Bea The Big Book of Birds, The Big Book of the The Big Book of Blooms by Yuval Zommer able to identify that plants can be grouped in different ways, To be able that animals can be grouped in different ways • What a waste, rubbish, recycling and prote the planet by Jess French - y4 - To be able to ider human action can change environments and impact living things (positi negative) • A planet full of plastic and how you can hel Neal Layton - To be able to identify how human action can ch environments and impact living things (positive and negative) • The Blue Giant by Katie Cottle - To be able t how human action can change environments and impact living things (p negative) • If Sharks disappeared by Lily Williams - - To identify how human action can change environments and impact living t (positive and negative) and to be able to interpret and construct food ch different habitats. • There's a Rang-Tan in my bedroom – Jam Sellick - To be able to identify how human a can change environments and impact living things (positive and negative)

	(natures reserves, planned parks, garden ponds), Conservation, Negative - population, deforestation, pollution, litter producer, Consumer, Predator, prey, food chain, Sun	workshops/schools/ - Food Chain Workshop • *Gibside* - https://nt.global.ssl.fastly.net/gibside/documents/gibside-information-packs-for-primary-schools.pdf - *Habitat Exploration and Discovery* • *Elba Park*	*children want to investigate in each topic.* *Kahoot can be used as an assessment tool in lessons or at the end of each unit.* *Post it app/pic collage sorting and grouping* *Explain everything on why they have classified that way and why- upload to seesaw* Pic Collage labelled diagrams of Food Chain	• How to help a hedgehog and Protect a pola by Jess French and Angela Keoghan - To be identify how human action can change environments and impact living t (positive and negative) • Somebody Swallowed Stanley – Sarah Rol To be able to identify how human action can change environments and living things (positive and negative) • The brilliant deep, rebuilding the world's co reefs by Kate messner - To be able to identify how hu action can change environments and impact living things (positive and • The Wonder of Trees; Nicola Davies - To b to identify that plants can be grouped in diff ways, *To be able to identify that animals can be grouped in differen*

Year 4	**Area of NC: Animals, including Humans (Biology)**
Learning Objectives *((in suggested order of teaching sequence)*	***Prior Learning relevant to this topic:*** **In Y2 and Y3 children have found out about the importance of a healthy diet for humans and that we get our nutrition from food. In Y1 children learnt the terms herbivore, omnivore and carnivore when discussing animals and in Y2 they learnt the importance of hygiene in humans – which could include looking after teeth.** • Identify the main parts of the digestive system in humans and their functions • Describe and explain the process of digestion • Identify the different types of teeth in humans and their functions • Compare the teeth of carnivores and herbivores, • Identify what damages teeth and how to look after them ***Pupils do not need to be taught the following content, which they will learn in later year groups:*** **In Y6 children will look in more detail at the functions of all internal organs.**
Working Scientifically Objectives that link to this topic:	• Can make and record a prediction before testing using scientific vocabulary and simple reasons. • Start to make their own decisions about the most appropriate type of scientific enquiry they might use to answer questions and which information needs to be collected • Set up simple practical enquiries, comparative and fair tests • Understands what a simple fair test is, recognise what a simple fair test is, when it is necessary and how it is fair. • Use secondary sources and recognise when and how they might help them to answer questions that cannot be answered through practical investigations • With support helps to make decisions about what systematic and careful observations to make and how long to make them for and the type of simple equipment that might be used.

	• Collect and record data from their own observations and measurements in a variety of ways: notes, bar charts and tables, standard units, drawings, labelled diagrams, keys • Use relevant simple scientific language to discuss their ideas and communicate their findings in ways that are appropriate for different audiences (including oral and written explanations, ICT, displays or presentations of results and conclusions) • With support discusses the success of their working methods and suggests ways of improving what they have already done. ***Others could be relevant dependant on which practical enquiries you choose to plan***		
Learning Objective	**Objective Broken Down into Differentiation**		
	Below	***Expected***	***Above***
Identify the main parts of the digestive system in humans and their functions	Pupil can name some parts of the digestive system	Pupil can label the main parts of the digestive system and describe the function of each part	Can use accurate scientific vocabulary when labelling and explaining each part and function
Describe and explain the process of digestion	Can describe what happens in each part of the digestive system.	Can use diagrams, creative writing or a model to describe the journey of food through the body explaining what happens in each part.	Pupil can suggest some problems which may occur if one part of the digestive system is not working as it should
Identify the different types of teeth in humans and their functions	Pupil understands that there are different types of teeth and recognises some of their functions	Can point to the three different types of teeth in their mouth and talk about their shape and what they are used for.	Can record the teeth in their mouth (make a dental record) and explain the role of different teeth.
Compare the teeth of carnivores and herbivores,	With support, pupils can look at diagrams of carnivore and herbivore teeth and suggest similarities and differences	Can explain how the teeth in animal skulls show they are carnivores or herbivores and gives reasons for their different teeth	Can explain how the teeth in animal skulls show they are carnivores, herbivores or omnivores and gives reasons for their different teeth as well as similarities between them
Identify what damages teeth and how to look after them	Pupil recognises the importance of good oral hygiene to prevent tooth decay	Pupil can explain how tooth decay occurs and ways to prevent decay	Pupil can design an investigation to replicate the conditions leading to tooth decay and use this to suggest prevention strategies

Scientific Enquiry/Activity Ideas:

Pattern Seeking	**Observations Over Time**	**Identifying, classifying and grouping**	**Practical Tests**	**Research**
• Compare the teeth of different animals - herbivores, omnivores, carnivores. Can		• What are the names for all the organs involved in the digestive system? Can you make a model? (use food, tights, etc) • How can we organise teeth into groups?	• Healthy drinks and toothpaste http://www.ciec.org.uk/resources/healthy-drinks-tasty-toothpaste.html	• How has a visit to the dentist changed since ancient times? • What are some of the things that damage healthy

you spot a link between the animal's diet and their teeth?		• Identify which teeth are needed to eat certain foods. Take a bite ***See the book 'A Creative Approach to Teaching Science')*** • Classifying animals based on whether they are herbivore, carnivore, omnivore and how they know.	• Test the effect of different substances on the teeth. Extension: introduce the protective effect of toothpaste into the experiment. • Which drink causes the most damage to teeth? (Leaving dirty coins in different drinks to compare the effects) • How does toothpaste protect teeth? Test to see which toothpaste removes a stain from a ceramic tile the best	teeth?Use books and internet to find out: • Why do humans develop two sets of teeth? Do other animals develop two sets? • Why do humans not need to photosynthesise like plants? (looking at digestive system) • If human's didn't have teeth how would our diet and bodies be different

Non statutory NC ideas

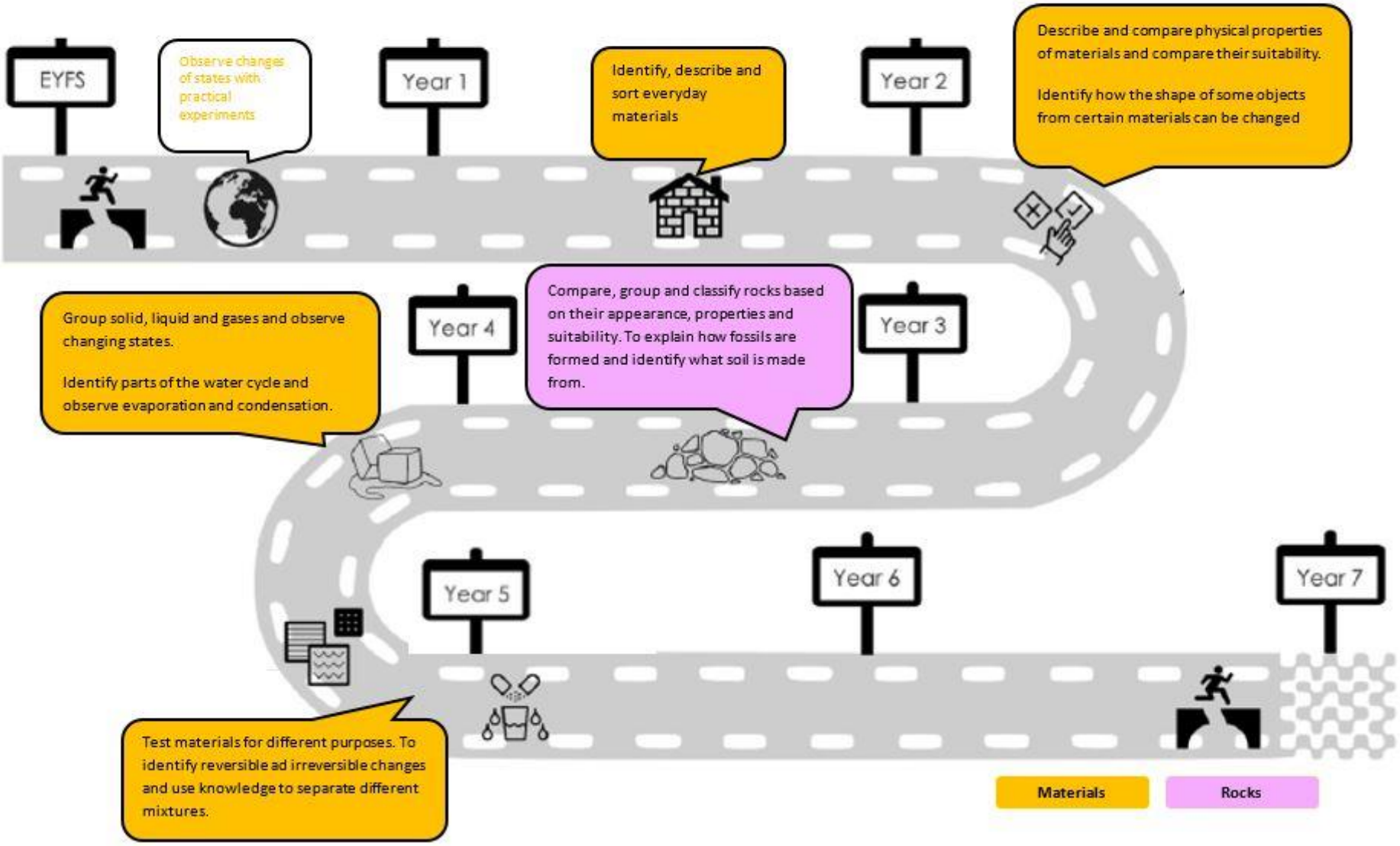
- Pupils might work scientifically by: comparing the teeth of humans with other animals (carnivores and herbivores) and suggesting reasons for differences, finding out what damages teeth and how to look after them.
- They might draw, create models and discuss their ideas about the digestive system and compare them with models or images.

Scientists to Consider

Weston price; William Beaumont

Bright Ideas Time Suggestions	Vocabulary to be Taught	Possible Trips/Experiences	Possible Cross-Curricular Links	Potential Books to use
• Why do all animals not have the same teeth? • PMI – What if toothbrushes didn't exist? • PMI – What if humans had teeth like a snake? • Odd one out – tooth, intestines, heart	canine, incisor, molar, premolar, Rip, tear, chew, grind , cut, slice , brush , floss , dentist , root; gum; jaw bone; tooth decay; plaque; enamel; Digestive system, digestion, tongue, mouth, teeth, oesophagus, stomach, small intestine, pancreas, large intestine, rectum, anus, nutrients, - mixes, moistens, saliva, transport, Acid Enzymes , vitamins	• Greenshift Education http://greenshifteducation.co.uk/workshops/ • Hands on Science - https://www.hands-on-science.co.uk/workshop/ks2-our-bodies-digestion-workshop/ - Digestion Workshop • Hands on Science - https://www.hands-on-science.co.uk/workshop/teeth/ - Teeth Workshop • Life Centre - https://education.life.org.uk/workshop/teeth-and-digestion - hands on experiments • Life Centre - https://education.life.org.uk/workshop/habitats • Dental hygiene and visit from dentist or dental nurse	**English:** • Write instructions for how to take care of our teeth • Creative writing of food going through the digestive system **Maths:** **ICT/iPads:** • *Visual anatomy 3Dapps - inside the human body* • *Green screen news report n discovering an animal skull - identifying based on teeth.* • *Green Screen Borrowers video – inside the mouth* • *Padlet can be used to generate the questions the children want to investigate in each topic.* • *Kahoot can be used as an assessment tool in lessons or at the end of each unit.* • *Curiscope virtual T-shirt app to see inside the human body for digestive system* • *Google Expeditions – The digestive system*	• A Journey Through the Digestive System by Emily Sohn - *Describe and explain the process of digestion)*

Chemistry


EYFS
Observe changes of states with practical experiments
Year 1
Identify, describe and sort everyday materials
Year 2
Describe and compare physical properties of materials and compare their suitability.
Identify how the shape of some objects from certain materials can be changed
Group solid, liquid and gases and observe changing states.
Identify parts of the water cycle and observe evaporation and condensation.
Year 4
Compare, group and classify rocks based on their appearance, properties and suitability. To explain how fossils are formed and identify what soil is made from.
Year 3
Year 5
Year 6
Year 7
Test materials for different purposes. To identify reversible ad irreversible changes and use knowledge to separate different mixtures.
Materials
Rocks

Year 4	Area of NC: Materials, States of Matter (Chemistry)		
Learning Objectives *(in suggested order of teaching sequence)*	***Prior Learning relevant to this topic:*** **In Y1 and Y2 children have learnt basic properties of materials, primarily solids, in Y2 they have also learnt that materials can be changed by twisting, bending etc. In Y3 children have also learnt which materials are magnetic.** • Compare and group materials together, according to whether they are solid, liquid or gas • Observe materials changing state and describe the changes when they are heated or cooled • Measure or research the temperature at which changes in state happen • Explore and observe evaporation and condensation • Identify the parts condensation and evaporation play in the water cycle ***Pupils do not need to be taught the following content, which they will learn in later year groups:*** **In Y4 children will learn about irreversible changes/chemical changes, in Y4 it should only be reversible. In Y5 children will also look at separating mixtures.**		
Working Scientifically Objectives that link to this topic:	• Should be given a range of scientific experiences including different types of science enquiries to answer questions • Can make and record a prediction before testing using scientific vocabulary and simple reasons. • Start to make their own decisions about the most appropriate type of scientific enquiry they might use to answer questions and which information needs to be collected • Set up simple practical enquiries, comparative and fair tests • Understands what a simple fair test is, recognise what a simple fair test is, when it is necessary and how it is fair. • Talk about criteria for grouping, sorting and classifying; and use simple keys • Use secondary sources and recognise when and how they might help them to answer questions that cannot be answered through practical investigations • With support helps to make decisions about what systematic and careful observations to make and how long to make them for and the type of simple equipment that might be used. • Take fair and accurate measurements using standard units and a range of equipment (including thermometers and data loggers) appropriately. • Collect and record data from their own observations and measurements in a variety of ways: notes, bar charts and tables, standard units, drawings, labelled diagrams, keys • Use relevant simple scientific language to discuss their ideas and communicate their findings in ways that are appropriate for different audiences (including oral and written explanations, ICT, displays or presentations of results and conclusions) • With support discusses the success of their working methods and suggests ways of improving what they have already done. ***Others could be relevant dependant on which practical enquiries you choose to plan***		
Learning Objective	**Objective Broken Down into Differentiation**		
	Below	***Expected***	***Above***
Compare and group materials together, according to whether they are solid, liquid or gas	Pupil can identify solids, liquids and gases	Pupil can define and group a range of materials as solids, liquids and gases based on their properties. .	Can give reasons to justify why something is a solid, liquid or gas and can discuss how some materials may show properties of more than one.

Observe materials changing state and describe the changes when they are heated or cooled	Pupils are beginning to understand that matter can change state Pupils recognise that water can exist in 3 states – ice (solid); liquid water and water vapour	Pupil can explain that materials can change their state and that this is affected by temperature	Can give everyday examples of melting and freezing. Pupil can explain the different temperatures at which water changes state and can suggest how this could be investigated/measured
Measure or research the temperature at which changes in state happen	Can measure temperatures using a thermometer.	Can give examples of things that melt/freeze and how their melting points vary.	Pupils explore the temperatures at which a range of materials change state and compare / group then
Explore and observe evaporation and condensation	Pupil can see that evaporation and condensation is happening around them and offer examples Pupil can describe that the rate of evaporation seen	Pupil can describe the process of evaporation and condensation giving examples from the environment around them Pupil can associate the rate of evaporation with temperature.	Pupil can explain factors, such as wind, temperature, surface of materials which may be perceived to affect the rate of evaporation and/or condensation
Identify the parts condensation and evaporation play in the water cycle	Can describe the water cycle, with support.	Pupil can describe how evaporation and condensation occur within the water cycle	Pupil can give detailed account of the Water Cycle noting clearly the changes of state which occur

Scientific Enquiry/Activity Ideas:

Pattern Seeking	**Observations Over Time**	**Identifying, classifying and grouping**	**Practical Tests**	**Research**
• How is wool the same as glass? • Are all liquids runny? • Is there a pattern in how long it takes different sized ice lollies to melt? • How does evaporation rate change as you add more salt to your water?	• How does the level of water in a glass change when left on the windowsill? • How does the mass of an ice cube change over time? • Place 2 different coloured ice cubes on the same plate and allow them to melt at room temperature. Children to predict, as to what would happen to the ice cubes, the 2 colours and why. • Put some boiling water in a dish and place some clingfilm over the dish, Put a large block of ice on top of the cling film. Observe what happens or create a window watercycle. • What melts in the sun? (***See the book 'A Creative Approach to Teaching Science'- pg 88)***	• Can you group these materials from my weekly shop and objects into solids, liquids, and gases? Use Venn diagrams for potential overlap (***See the book 'A Creative Approach to Teaching Science'- pg 85/86)*** • Why could you be drinking water that you have already drunk before? (Identify stages of the water cycle) Could make a water cycle in a bag - https://www.mobileedproductions.com/blog/how-to-make-a-water-cycle-in-a-bag • Is custard a liquid? • Identify properties of solid, liquids and gasses - (***See the book 'A Creative Approach to Teaching Science'- pg 85- Ballooning Around)*** • How would you sort these objects/materials based on their temperature? • Which type of chocolate melts fastest? (large or small chocolate buttons)	• Does seawater evaporate quicker than fresh water? • How does temperature affect how fast evaporation takes place? • Runny Liquids http://www.ciec.org.uk/resources/runny-liquids.html • Test the 'Mpemba Effect'https://www.bbc.com/teach/terrific-scientific/KS2/zbgnrj6 • How does the surface area of a container of water affect how long it takes to evaporate? • Can you speed up evaporation? • Where is the best place to put our newly made crispy cakes, straight from the oven? (***See the book 'A Creative Approach to Teaching Science'- pg 86/87)***	• At what temperature do particular materials change state - make cards and have a game of play your cards right - (***See the book 'A Creative Approach to Teaching Science'- pg 89)*** • Why do puddles go in a few days but lakes are around forever? • Why do igloos not melt?

	• How does the temperature of ice cream change over time?	• Which conditions make washing dry quicker? • Give all the children a post-it to write a material on. They must move around the room and pair up – they can ask questions to work out what material their partner has. Their partner can only respond yes or no. How many materials can they work out? Ask the children as a class to sort them into 3 groups -solids, liquids and gases. Is everyone in the right group? Is there anyone we can't place?	• *Investigate melting and freezing points* (***See the book 'A Creative Approach to Teaching Science'- pg 87)*** • Which melts fastest – ice cream, butter or ice? • Which evaporates quickest – water, vinegar or nail varnish remover? • What are the best conditions for drying a sock?	

Non statutory NC ideas

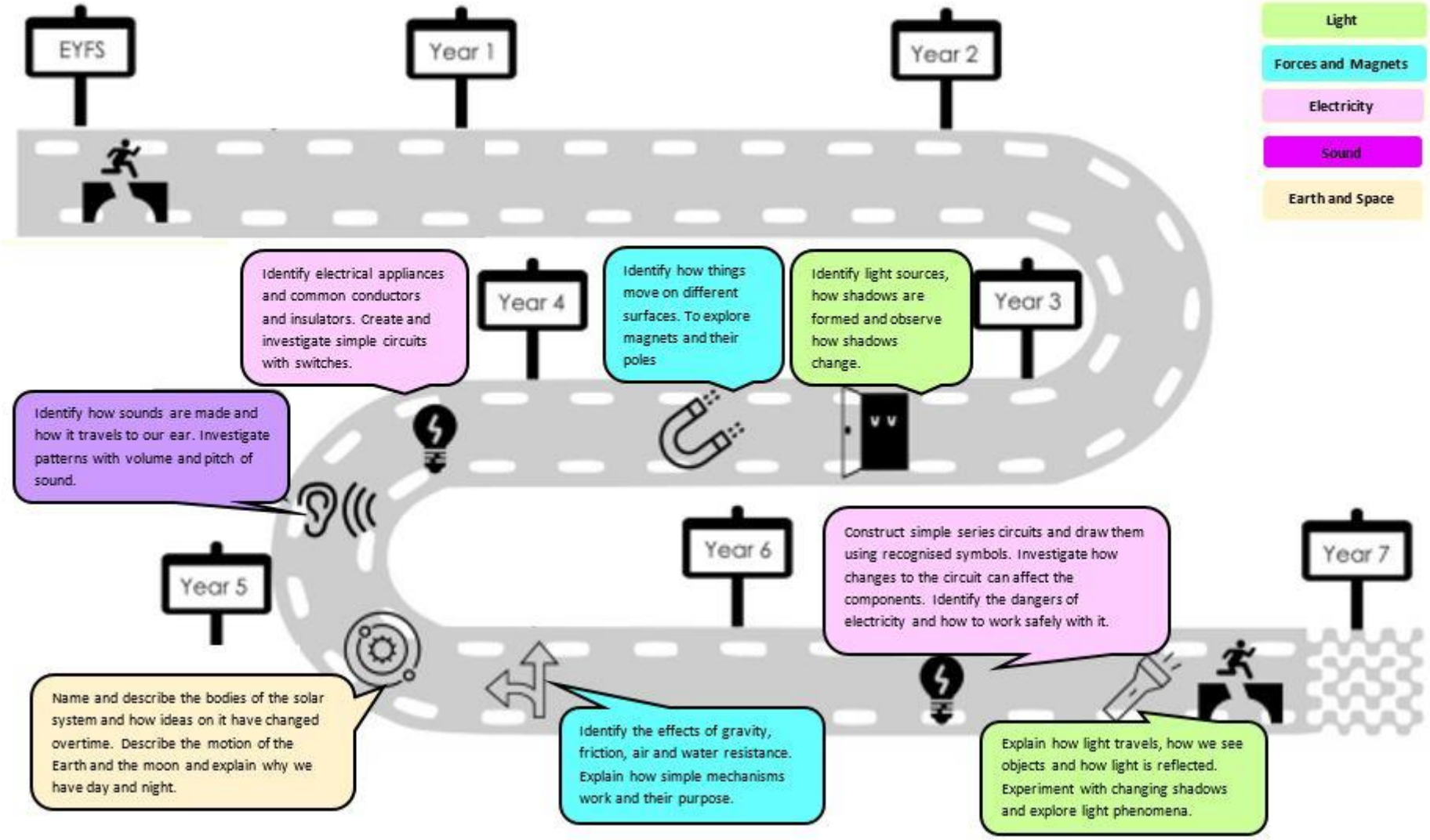
- Pupils might work scientifically by: grouping and classifying a variety of different materials; exploring the effect of temperature on substances such as chocolate, butter, cream (for example, to make food such as chocolate crispy cakes and ice cream for a party).
- They could research the temperature at which materials change state, for example, when iron melts or when oxygen condenses into a liquid.
- They might observe and record evaporation over a period of time, for example, a puddle in the playground or washing on a line, and investigate the effect of temperature on washing drying or snowmen melting.

Scientists to Consider

Lord Kelvin, Anders Celsius, Daniel Fahrenheit, Sir Humphry Davy

Bright Ideas Time Suggestions	Vocabulary to be Taught	Possible Trips/Experiences	Possible Cross-Curricular Links	Potential Books to use
• PMI – What if the sea was like ketchup? • What would life be like without solids? • What if chairs were made of chocolate? • Can you have a chocolate teapot? • What if water couldn't freeze? • Odd one out - Chocolate, a stone and water • PMI - The freezing point of water becomes 10^0C • Where does a puddle go? • PMI – What if chairs were made from chocolate? •  What do you notice?	States of matter - solids hold their shape; liquids form a pool not a pile; gases escape from an unsealed container. particles, state, materials, properties, matter, melt, freeze, water, ice, temperature, degrees Celsius, process, state change, melting, freezing, melting point, boiling point, steam, water vapour heat/heated/heating, cool/cooled/cooling, melting, melting point, , solidify, boil, condensation, evaporation, water vapour, energy, precipitation, collection, water cycle , transpiration	• Greenshift Education - http://greenshifteducation.co.uk/workshops/ • National Glass Centre - Changing States Workshop - http://www.nationalglasscentre.com/learn/schools/primary/changingstates/ • *Hands on Science* - https://www.hands-on-science.co.uk/workshop/water-cycle/ - *Water Cycle Experiment - GOOD PRACTICAL EXPERIMENT* • *Life Centre* - https://education.life.org.uk/workshop/solids-liquids-and-gases • *Sunderland Winter Gardens - Wonderful Water - https://www.seeitdoitsunderland.co.uk/learning-sessions/295/natural-world* • *Newcastle University – Chemistry in your shopping basket workshop - https://www.ncl.ac.uk/sage/stemoutreach/workshops/ks2chemistryworkshops/*	**English:** • Creative writing as a water droplet in part of water cycle. **Maths:** • Use a thermometer or datalogger to measure temperature • Looking at positive and negative numbers when researching temperatures in which materials change when heated or cooled. • Three way venn diagrams to sort solid, liquids and gases **ICT/iPads:** • *Padlet can be used to generate the questions the children want to investi- gate in each topic.* • *Kahoot can be used as an assessment tool in lessons or at the end of each unit.* • *Post it app/pic collage sorting and grouping* • *Explain everything for water cycle.* • *Use of data loggers for temperature*	• ***Once Upon a Raindr The Story of Water***(J Carter) - *To be able to identi condensation and evaporation p water cycle* • ***https://clarefearon.files.wordpress.com/2021/03/water-cycle2-1.pdf*** - *Walter the Water droplet* - *To be able to identify the parts condensation and evaporation play in the water cycle*

Physics


EYFS
Year 1
Year 2
Year 3
Year 4
Year 5
Year 6
Year 7
Light
Forces and Magnets
Electricity
Sound
Earth and Space
Identify electrical appliances and common conductors and insulators. Create and investigate simple circuits with switches.
Identify how things move on different surfaces. To explore magnets and their poles
Identify light sources, how shadows are formed and observe how shadows change.
Identify how sounds are made and how it travels to our ear. Investigate patterns with volume and pitch of sound.
Construct simple series circuits and draw them using recognised symbols. Investigate how changes to the circuit can affect the components. Identify the dangers of electricity and how to work safely with it.
Name and describe the bodies of the solar system and how ideas on it have changed overtime. Describe the motion of the Earth and the moon and explain why we have day and night.
Identify the effects of gravity, friction, air and water resistance. Explain how simple mechanisms work and their purpose.
Explain how light travels, how we see objects and how light is reflected. Experiment with changing shadows and explore light phenomena.

Year 4	Area of NC: Electricity (Physics)		
Learning Objectives *(in suggested order of teaching sequence)*	***Prior Learning relevant to this topic:*** **This is the first time children will be learning about electricity in science. In Y3 they may have identified light sources that were electric.** • Identify common appliances that run on electricity • Construct a simple electrical circuit, identifying and naming its basic parts • Predict and identify whether or not a lamp will light in simple circuit • Identify some common conductors and insulators • Recognise that a switch opens and closes a circuit • Explain the importance of electrical safety ***Pupils do not need to be taught the following content, which they will learn in later year groups:*** **In Y6 children will use symbols to represent a circuit in a diagram, this does not need to occur in Y4. In Y6, children will learn about how voltage can affect components and can discuss how to change volume, brightness speed of components in a circuit.**		
Working Scientifically Objectives that link to this topic:	• Should be given a range of scientific experiences including different types of science enquiries to answer questions • Can make and record a prediction before testing using scientific vocabulary and simple reasons. • Use secondary sources and recognise when and how they might help them to answer questions that cannot be answered through practical investigations • Use relevant simple scientific language to discuss their ideas and communicate their findings in ways that are appropriate for different audiences (including oral and written explanations, ICT, displays or presentations of results and conclusions) ***Others could be relevant dependant on which practical enquiries you choose to plan***		
Learning Objective	**Objective Broken Down into Differentiation**		
	Below	***Expected***	***Above***
Identify common appliances that run on electricity	Pupil understands that appliances need electricity to operate and name some common appliances.	Pupil can identify appliances which run on electricity – specifying if this is mains or battery and offering simple reasons for the difference	Pupil can identify common appliances that may use both mains and battery e.g. a mobile phone, laptop etc.
Construct a simple electrical circuit, identifying and naming its basic parts	Pupil can build a simple circuit using a battery, wire and one component.	Can make electrical circuits using multiple components – including cells, wires, bulbs, and buzzers. Can name the components in a circuit.	Pupil draws simple diagrams (pictorial representation/**not recognised symbols**) to show the sequence of components in the circuit.

			Can begin to compare and give reasons or variations in how components function, including the brightness of bulbs and the loudness of buzzers
Predict and identify whether or not a lamp will light in simple circuit	Pupil understands that a circuit must be complete for a lamp to light	Can identify why lamps will or will not light in a simple circuit	Can identify why lamps are not lighting in a simple circuit and can adapt them so that they work and also talks about them in terms of open and closed circuits.
Identify some common conductors and insulators	Pupil can define what an electrical conductor and insulator is	Can name some metals that are conductors and associate metals with being good conductors Can name some materials that are insulators.	Pupil can devise investigations to classify materials as electrical conductors or insulators.
Recognise that a switch opens and closes a circuit	Pupil understands that a circuit must be closed for components to work and can explain a switch stops this	Can incorporate a switch into a circuit to turn a lamp on and off explain how it works.	Can connect a range of different switches or make switches Can give reasons for choice of materials for making different parts of a switch Can describe how their switch works
Explain the importance of electrical safety	Pupil knows that electricity is dangerous and can give one way it can be dangerous	Pupil understands that electricity is dangerous and how to keep safe when using electricity.	Pupil can identify a number of ways electricity is dangerous and a variety of ways we can keep ourselves safe.

Scientific Enquiry/Activity Ideas:

Pattern Seeking	**Observations Over Time**	**Identifying, classifying and grouping**	**Practical Tests**	**Research**
• Are objects that are magnetic always good electrical conductors?		• How would you group these electrical devices based on where the electricity comes from? (Cut it out! Pg 135 ***'A Creative Approach to Teaching Science')*** • What conducts electricity? • Children to have a range of circuit pictures - children to predict and identify whether the lamp will light or not– focus on explaining why.	• Create a scribblebot https://www.ogdentrust.com/assets/general/Phizzi_Practicals_scribblebot.pdf • Which metal is the best conductor of electricity? • Can you make a circuit from play dough?Can you make the bulb light with the equipment in front of you? • Can you make a switch with given materials and what you know about conductors?	• How has electricity changed the way we live? • How is electricity useful at home and school?

Non statutory NC ideas

• Pupils might work scientifically by observing patterns. For example, the bulbs get brighter if more cells are added, that metals tend to be conductors of electricity and that some materials can and some cannot be used to connect across a gap in a circuit.

Scientists to Consider

Bright Ideas Time Suggestions	**Vocabulary to be Taught**	**Possible Trips/Experiences**	**Possible Cross-Curricular Links**	**Potential Books to use**

• Odd one out – torch, lamp, fridge • PMI – What if all transport was electric? • https://explorify.wellcome.ac.uk/en/activities/zoom-in-zoom-out/inside-out • PMI - A world without electricity • Odd one out - A battery, a light bulb and a motor • Odd one out - https://explorify.wellcome.ac.uk/en/activities/odd-one-out/battery-bonanza	Electricity, appliances, devices, mains, crocodile clips, wires, bulb, battery cell, battery holder, motor, buzzer, conductor, electrical conductior, component. electrical circuit, complete circuit, component, cell, battery, positive, negative, connect/connections, bulb, insulator, metal, non-metal , loose connection , bright/dim switch - open/closed Conductor - metal and water insulator - wood, rubber, plastic and glass danger , Electrical safety , Warning sign	• Dr Research Workshops into School - http://drresearch.co.uk/?page_id=20 - Electricity Workshop • Hands On Workshops - https://www.hands-on-science.co.uk/workshop/electricity-and-circuits/ (MAY BE GOOD DUE TO OUR LACK OF RESOURCES) • Life Centre - https://education.life.org.uk/workshop/circuits-and-conductors	**English:** • Create an information leaflet or poster about how to keep safe in the home, when it comes to electricity. **Maths:** • Intersecting Venn diagram to sort things that run on electricity (mains, battery or both) **ICT/iPads:** • Sorting appliances on pic collage/post -it not plus. • Padlet can be used to generate the questions the children want to investigate in each topic. • Kahoot can be used as an assessment tool in lessons or at the end of each unit. • Explain everything/green screen report on the danger of electricity.	• Oscar and the Bird: A Book about Electricity (Geoff Waring) - *Explain the importance of electrical safety AND Identify common appliances that run on electricity*

Year 4	**Area of NC: Sound (Physics)**
Learning Objectives *(in suggested order of teaching sequence)*	***Prior Learning relevant to this topic:*** **This is the first time children are learning about sound in science. In music lessons, children may have become aware of vocabulary such as pitch prior to this.** • Identify and compare sounds and how they are made • Explain what happens to sound as it travels to our ear. • Find patterns in the volume of a sound and the strength of vibrations that produced it • Recognise a relationship between volume and distance from the sound source • Find patterns in the pitch of a sound and the features of an object that produce it ***Pupils do not need to be taught the following content, which they will learn in later year groups:*** **Children will look at sound in KS3, they will then look at sound waves and frequencies of sound.**
Working Scientifically Objectives that link to this topic:	• Should be given a range of scientific experiences including different types of science enquiries to answer questions • Set up simple practical enquiries, comparative and fair tests • With support, begin to look for patterns and relationships (some naturally occurring) and decide what data to collect to identify them • Take fair and accurate measurements using standard units and a range of equipment (including thermometers and data loggers) appropriately. • Use relevant simple scientific language to discuss their ideas and communicate their findings in ways that are appropriate for different audiences (including oral and written explanations, ICT, displays or presentations of results and conclusions) ***Others could be relevant dependant on which practical enquiries you choose to plan***

Learning Objective	Objective Broken Down into Differentiation		
	Below	***Expected***	***Above***
Identify and compare sounds and how they are made	Can identify and describe sound sources around school	Can name sound sources and state that sounds are produced by the vibration of the object.	To compare different sounds associating the similarities and differences with the vibrations.
Explain what happens to sound as it travels to our ear.	Pupil can explain that sound travels by vibrations through a medium.	Can state that sounds travel through different mediums such as air, water and metal.	Pupil can describe how a sound comes from a vibration travelling through a medium e.g. air to the ear, which transmits it to the brain
Find patterns in the volume of a sound and the strength of vibrations that produced it	Pupil understands that sound can vary in volume Pupil understands that some materials can insulate sounds	Can give examples of how to change the volume of a sound e.g. increase the size of vibrations by hitting or blowing harder. Pupil can suggest simple ways to create sound insulators to protect the ear from loud sounds.	Pupil explains how they could investigate the types of sound made by different types of sources to demonstrate volume getting louder or quieter Pupil can describe how materials can be sound insulators and create models to demonstrate their effectiveness.
Recognise a relationship between volume and distance from the sound source	Can identify how sounds change over distance.	Can give examples to demonstrate that sounds get fainter as the distance from the sound source increases.	Pupil can suggest how sounds can be amplified when the distance from the source increases – eg string telephones
Find patterns in the pitch of a sound and the features of an object that produce it	Pupil understands that sound can vary in pitch - high and low sounds.	Can give examples to demonstrate how the pitch of a sound is linked to the features of the object that produced it.	Pupil explains how they could investigate the types of sound made by different types of sources to demonstrate pitch variance.

Scientific Enquiry/Activity Ideas:

Pattern Seeking	**Observations Over Time**	**Identifying, classifying and grouping**	**Practical Tests**	**Research**
• Does the size of the object (string, water in the bottle, tube, straw) determine the pitch of the sound? Provide a selection of instruments and objects that make a sound and allow the children to explore these, which will help them sort (high and low pitch) and	•	• How can we make sounds? Identify that vibrations made through vibrations - see a range of ideas in Vibrations stations - ***See the book 'A Creative Approach to Teaching Science' pg 118*** • How do you change the volume and pitch of sound? • Children to pose a question they could investigate about the pitch of	• Which material is best to use for muffling sound in ear defenders/soundproof box? • What is the best material to sound proof a room? Children to consider how to design a fair test to sound proof a box and used a data logger to measure the volume of sound in decibels. They can decide which variable should change; e.g. the material - felt, cardboard, newspaper, egg box and nothing at all and which variables should be kept the same; the box, the object making the sound (ringing from mobile phone), distance from the box when measuring the volume and the	• Can we hear sound in space? How can we make sounds? ***See the book 'A Creative Approach to Teaching Science' pg 118-119*** • Why do people put glass against a wall to hear things?

more importantly to seek patterns • Which medium can you hear sound through the best? See Vibration stations 2 - - ***See the book 'A Creative Approach to Teaching Science' pg 119*** • Which materials vibrate better and produce louder sounds? Can we identify any patterns? • Is there a link between how loud it is in school and the time of day? If there is a pattern, is it the same in every area of the school? Plan an enquiry to find out how noise levels in our school change – Is there a link between how loud it is in school and the time of day/location? If there is a pattern, Is it the same in every area of the school		one of the instruments. Children to investigate i.e. by changing one element such as the size of the elastic bands. • How does the size of an ear trumpet affect the volume of sound detected?	equipment measuring the volume (data logger). Look at type of material and thickness. • Can you give a secret message across the hall? (make string telephones) Does the length of the sting effect the message or sound? • How does the volume of sound change the further you are away form the sound source? Use a data logger to record decibels as children are close to a sound on the yard and as they move further away. • Which materials make the best string telephone components? (tin cans, paper cups, plastic cups, wire, cable, string, plastic or elastic – predict and test) • How does the length of a guitar string/tuning fork affect the pitch of the sound?	• Research different scientists ideas about sound https://www.ogdentrust.com/assets/general/Research-cards_ideas-about-sound.pdf • Do all animals have the same hearing range?

Non statutory NC ideas

- Could work scientifically by: Investigating which materials give the best insulation for sound when making ear muffs
- Could work scientifically by: Finding patterns between sounds made from similar but different objects eg elastic bands of different thickness and metal pans of different sizes
- Could work scientifically by: They could make and play their own instruments by using what they have found out about pitch and volume.

Scientists to Consider

Alexander Graham Bell -Invented the telephone

Bright Ideas Time Suggestions	Vocabulary to be Taught	Possible Trips/Experiences	Possible Cross-Curricular Links	Potential Books to use
• PMI – What if humans had hearing like a bat • Odd one out - A guitar, a piano and a drum • Zoom in, Zoom out - https://explorify.wellcome.ac.uk/en/activities/zoom-in-zoom-out/hidden-depths • PMI - What if all sounds were the same	Sound, Sound source / object, Noise, Vibrate/vibration /vibrating/, strength of vibrations, medium: solid, liquid, gas, air , ear , hear , Travel , Pitch, Tune , high/low Volume, quiet, loud/louder/ ,quiet, faint/fainter, muffle, insulation , instrument, Percussion , strings , brass, Woodwind , tuned instrument.	• Dr Research Workshops into School - http://drresearch.co.uk/?page_id=20 - Sound Workshop • Hands On Science - https://www.hands-on-science.co.uk/workshop/surprising-sounds/ - Sound • Life Centre - https://education.life.org.uk/workshop/sound-of-science	**English:** • Poetry – The sounds I hear? • Diary entry – what would it be like tomorrow if I could no longer hear? • Instructions – how to make junk instruments **Maths:** • Record data in tables and charts to look for trends **ICT/iPads:** • Padlet can be used to generate the questions the children want to investigate in each topic. • Kahoot can be used as an assessment tool in lessons or at the end of each unit. • Use of data-loggers and apps that measure in decibels	

Other Useful Websites / Resources

For Bright Ideas Time

- https://explorify.wellcome.ac.uk
- Curriculum Coverage Document with Bright Ideas examples on
- Concept Cartoons on the School Server

For Class Resources and Planning

- https://www.ogdentrust.com/resources-cpd/resources
- https://explorify.wellcome.ac.uk
- https://pstt.org.uk/resources
- https://www.primarysciencebee.com – **example medium term plans**
- https://ypte.org.uk/audiences/teachers
- https://www.stem.org.uk (excellent resources for all topics and areas of science curriculum)
- http://www.ciec.org.uk/interactive-planning-tool.html **(good interactive planning tool)**
- https://www.bbc.com/teach/terrific-scientific
- https://www.bbc.com/teach/ks1-science/zhsr2sg (KS1)
- https://www.bbc.com/teach/ks2-science/zf3kt39 (KS2)
- http://www.ciec.org.uk/primary.html#resources
- https://wowscience.co.uk
- https://sites.google.com/view/primary-science-bee/home - **Examples of medium term planning that could support planning**
- http://www.rsc.org/learn-chemistry/resource/listing?searchtext=&filter=all&fLevel=LEV00000001&eMediaType=MED00000009&reference=primaryresource - Good cross-curricular links to science and topic
- https://endeavour.kew.org/app/os - good real life contexts and challenges surrounding plants
- https://nustem.uk/primarycareers/#tab-id-10 - **gives children a context for learning science by showing jobs related to the topic being taught.**
- https://www.linnean.org/learning/teaching/primary/discovery-kits - email for free resources to use of plants, life cycles, habitats, classification and evolution.
- https://www.bbc.com/teach/terrific-scientific/amazing-people/zhy4hbk - information on some influential scientists
- https://www.youtube.com/watch?v=gEGYU-0AtaM&list=PLg7f-TkW11iU11yatk_TcbA2tGH_WLe8d - Brian Cox School Experiments videos - a range of ideas for experiments in schools.
- https://nustem.uk/loans-boxes/ - free loan boxes of resources to have for 6 weeks
- A creative Approach to Teaching Science book - copy given to all teachers
- Concept Cartoons on the School Server
- Curriculum coverage document on the server
- Science cupboard resource list on the server
- Resources in subject > science > then individual year group folders - these have ideas for experiments or other useful resources when planning.

Science in the News

- https://www.reachoutreporter.com
- https://www.bbc.co.uk/newsround
- https://www.bbc.co.uk/news/science_and_environment

For CPD

- https://www.reachoutcpd.com
- https://www.pstt.org.uk/resources/cpd-units
- http://primaryscienceonline.org.uk/glossary-of-terms/
- Science Glossary on the server