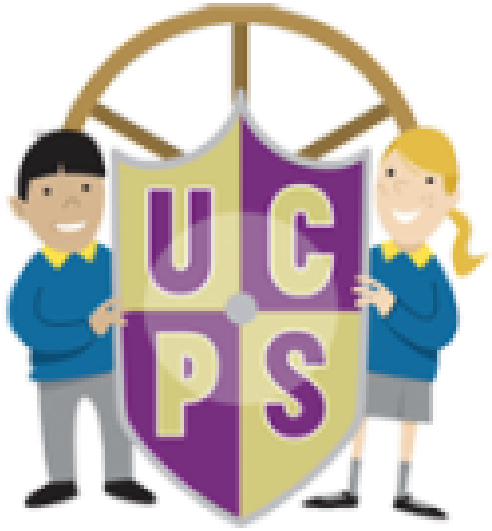


Science in Year 5

Working Scientifically

Year 5/6	Working Scientifically Skills

OBJECTIVES

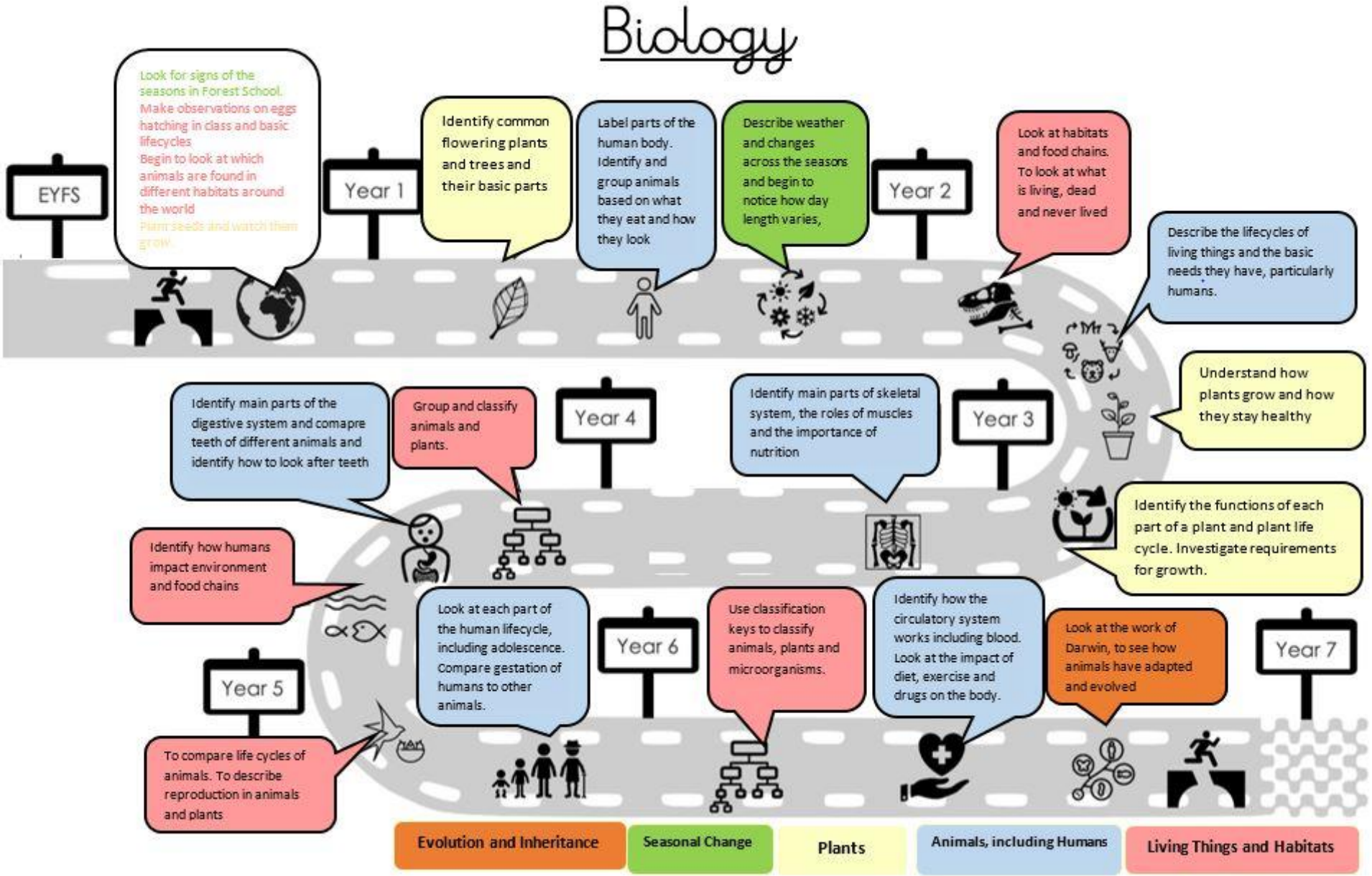
a) Use their science experiences to explore ideas and raise relevant questions
b) Select and plan the most appropriate type of scientific enquiry to use to answer scientific questions and explain why.
c) Recognise when and how to set up comparative and fair tests and explain which variables need to be controlled and why
d) Makes reasoned predictions using evidence to support their ideas and making links to other scientific knowledge.
e) Use and develop keys and other information records to identify, classify and describe living things and materials, and identify patterns that might be found in the natural environment
f) Recognise which secondary sources will be most useful to research and use information from relevant different sources to begin to plan an investigation.
g) Make their own decisions about what observations to make, what variables are needed and what measurements to use and how long to make them for.
h) Choose the most appropriate equipment to make measurements with increasing accuracy and precision, taking repeat measurements where appropriate.
i) Decide appropriate way to record complex data and results (scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs)
j) Draw conclusions from their work and link their conclusions to scientific knowledge and vocabulary
k) Look for different causal relationships in their data and identify evidence that refutes or supports their ideas
l) Uses graphs to answer scientific questions.
m) Use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas,
n) To use oral, ICT and written forms such as displays and other presentations to report conclusions, causal relationships and explanations of degree of trust in results
o) Use their results to make further predictions and identify when further enquires, observations, comparative and fair tests might be needed
p) Independently discusses the success of their working methods and suggests ways of improving their work and say why they think this.
q) To discuss how scientists, have breakthroughs and how they have developed scientific ideas over time. Identify scientific evidence that has been used to support or refute ideas over time.

VOCABULARY

Controlled/independent/dependent variable
Time graph
scatter graphs
line graphs
support/not support
independent decisions
scientific equipment
systematic precision/accuracy
complex data
report
reliability
justify
link ideas and knowledge
fact opinion causal relationships labelled scientific diagrams quantitative measurements
reliability/reliable repeat
scientific breakthroughs
causal relationships
degree of trust
refutes
pie charts
quantitative data
Qualitative data

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
Year 2
Describe weather and changes across the seasons and begin to notice how day length varies,
Look at habitats and food chains. To look at what is living, dead and never lived
Year 3
Describe the lifecycles of living things and the basic needs they have, particularly humans.
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.
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 main parts of skeletal system, the roles of muscles and the importance of nutrition
Year 5
Identify how humans impact environment and food chains
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

Year 5	Area of NC: Animals, including Humans- Human Development (Biology)		
Learning Objectives *(in suggested order of teaching sequence)* ***Should be taught alongside PSHCE***	***Prior Learning relevant to this topic:*** **In Y2 children have learnt that animals, including humans, have offspring that grow into adults and they have looked at basic lifecycles of humans and other animals.** • Describe the changes as humans develop to old age. • Describe the period of adolescence, describing changes that happen to both girls and boys in puberty • Research the gestation periods of other animals and compare them with humans • Draw a timeline to indicate the stages of growth and development in the human life cycle ***Pupils do not need to be taught the following content, which they will learn in later year groups:*** **In KS3 children will learn in more detail about the reproduction of humans (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta.**		
Working Scientifically Objectives that link to this topic:	• Use their science experiences to explore ideas and raise relevant questions • Recognise which secondary sources will be most useful to research and use information from relevant different sources to begin to plan an investigation. • Use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas, ***Others could be relevant dependant on which practical enquiries you choose to plan***		
Learning Objective	**Objective Broken Down into Differentiation**		
	Below	***Expected***	***Above***
Describe the changes as humans develop to old age.	Pupils can describe some of the physical changes that happen to humans from baby to when they get older.	Pupils can describe the changes to the human body and limitations this brings as a human gets older e.g. skin, walking, hair.	Pupils compare the life expectancy of humans to other animals
Describe the period of adolescence, describing changes that happen to both girls and boys in puberty	Pupil can describe some changes which happen to the body during adolescence	Pupil can explain the changes which happen to the human body during adolescence	Pupil can explain the changes that happen during puberty, relating to hormones – describing a hormone and giving examples.
Research the gestation periods of other animals and compare them with humans	Pupil recognises that human gestation period is different to other animals.	Pupils compare the gestation periods of various mammals and compare the similarities and differences	Pupil can present data about various gestation periods and explain the relationship and pattern they have identified.

Draw a timeline to indicate the stages of growth and development in the human life cycle	Pupil can describe the life cycle of a human in simple periods	Pupil can explain the life cycle of a human from conception to old age	Pupil can compare the stages of the human life cycle with those of other animal life cycles, evaluating differences.

Scientific Enquiry/Activity Ideas:

Pattern Seeking	**Observations Over Time**	**Identifying, classifying and grouping**	**Practical Tests**	**Research**
• Do we slow down as we get older? • Is there a relationship between a mammal's size and its gestation period? • Are there any patterns between vertebrate animals and their gestation periods?		• Can you identify all the stages in the human life cycle? • What changes do we go through during puberty? • Can they match the baby milestones to the age (in months) and put them in order? Centiles – explain how these work and look at a graph for a toddler. Children to accurately measure their own height and place themselves on the graph – which centile do they fall into? Can they plot a graph of their predicted growth using the chart?	• How does age affect a human's reaction time? • Who grows the fastest, girls or boys?	• Why do people get grey/white hair when they get older? • How will I look when I am old? (Aging app, time-lapse videos, face morph progression) • How and why has life expectancy in the UK changed since the Middle Ages? • Why do humans change? • Explore some of the characteristics of aging and suggest support available – *possible research with local charities?*

Non statutory NC ideas

• Could work scientifically by: researching the gestation periods of other animals and comparing them with humans, by finding out and recording the length and mass of a baby as it grows

Scientists to Consider

Bright Ideas Time Suggestions	**Vocabulary to be Taught**	**Possible Trips/Experiences**	**Possible Cross-Curricular Links**	**Potential Books to use**
• How can we stay fit and healthy as we get older? • PMI – What if the average life span was 200 for humans? • Odd one out – elderly woman, baby, teenager • PMI – What If we didn't visibly age? • PMI – What if we aged backwards?	Foetus, Embryo, Womb, Gestation, Growth, Development, Puberty, Hormone, Physical, Emotional, Human development, Baby, toddler, child, teenager/adolescent, mature adult, elderly , length , Mass, Grows/grow /growing	• School nurse to discuss puberty • Visits form charities that support the elderly eg Age UK • A midwife could visit to discuss human gestation • Children to be given a bag of flour to take care of for the week. They must have the flour with them at all	**English:** Write up of explanations, research etc. **Maths:** Graph on differing gestation periods **ICT/iPads:** Explain everything video on human development and upload to seesaw iMovie Timeline Timeline 3D App Padlet can be used to generate the questions the children want to investigate in each topic.	• Nine Months: Before a Baby is Born By Miranda Paul - *Research the gestation periods of other animals and compare them with humans*

• Why are baby clothes sizes for only a few months (e.g. size 2-3months) but once they turn 2 the sizes are for a year interval?		times and keep it safe (and whole). Children to keep a flour baby diary.	Kahoot can be used as an assessment tool in lessons or at the end of each unit.	

Year 5	**Area of NC: Living things and Habitats – Lifecycles (Biology)**		
Learning Objectives *(in suggested order of teaching sequence)*	***Prior Learning relevant to this topic*: In Y2 children have looked at simple lifecycles of humans and other animals. In Y4 children have grouped animals in various ways, one way is likely to have been the vertebrate animal classes. in Y3 children have learnt about the life cycle of flowering plants, including: pollination, seed formation and seed dispersal.** • Research life cycles of a range of animals (including some in the local environment) • Compare similarities and differences of the life cycles of animals • Describe the life process of reproduction in some animals • Research the work of well-known naturalists and animal behaviourists • Describe the life process of reproduction in some plants • Describe the life process of reproduction in some plants ***Pupils do not need to be taught the following content, which they will learn in later year groups:* In Y6 children will group animals and plants based on observable characteristics, giving their reasons and similarities and differences. In KS3 children will look at more complex and detailed information on the reproduction of humans and plants.**		
Working Scientifically Objectives that link to this topic:	• Recognise which secondary sources will be most useful to research and use information from relevant different sources to begin to plan an investigation. • Use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas, ***Others could be relevant dependant on which practical enquiries you choose to plan***		
Learning Objective	**Objective Broken Down into Differentiation**		
	Below	***Expected***	***Above***
Research life cycles of a range of animals (including some in the local environment)	Can draw the life cycle of at least two animals. Pupil, with support, can describe the life cycles of some animals from their local environment.	Pupil can explain the life cycle of animals including mammals, insects, amphibian, fish, reptiles and birds. Pupil can independently describe the life cycles of some animals from their local environment.	Pupil can explain each part of a range of animal lifecycles, using correct scientific vocabulary .

Compare similarities and differences of the life cycles of animals	Can compare two lifecycles studied.	Pupil is beginning to identify some similarities and differences between the life cycles of studied animal groups. Eg. Compare mammal and bird or insect and amphibian	Pupil can identify similarities and differences between the life cycles of studied animal groups and spot patterns within them. Pupil can compare the lifecycles of animals from their local environment with other animals from around the world.
Describe the life process of reproduction in some animals	With support, I can describe the process of reproduction in mammals using the life cycles created	Pupil can describe the process of reproduction in some animals (eg frogs, dragonflies and hedgehogs). Lifecycles research can be used to discuss this.	Pupil can understand terms such as cells and fertilisation.
Research the work of well-known naturalists and animal behaviourists	With support, can research the work of well-known naturalists	Can independently research the work of well known naturalists and explain the contribution they have had.	Can identify the work that still needs to be done by naturalists.
Describe the life process of reproduction in some plants	Pupil can describe how some plants reproduce. Pupil recognises that plants may not all reproduce sexually.	Pupil can explain the difference between sexual and asexual reproduction and give examples of how plants reproduce in both ways Pupil can label and describe the parts of a flowering plant involved in sexual reproduction. Pupil can carry out a test to grow new plants from different parts of the parents plant so asexual reproduction can be observed.	Pupil can identify advantages and disadvantages to sexual and asexual reproduction in plants. Pupil can accurately describe the process of reproduction in a flowering plant and compare this to reproduction in at least 1 of the main non-human animal groups

Scientific Enquiry/Activity Ideas:

Pattern Seeking	**Observations Over Time**	**Identifying, classifying and grouping**	**Practical Tests**	**Research**
•	• Observe the lifecycle of a butterfly over time. • Grow and observe plants that reproduce asexually e.g. strawberries, spider plant, potatoes	• Compare this collection of animals based on similarities and differences in their lifecycle.	• What do trees do for me? https://www.bbc.com/teach/terrific-scientific/KS2/zjnmf4j • What pants can we regrow? ***See the book 'A Creative Approach to Teaching Science' pg 53 and 54)*** • What could we measure to show how humans develop as they grow older? – Y5 Growth Survey - https://pstt.org.uk/resources/curriculum-materials/assessment	• What are the differences between the life cycle of an insect and a mammal? • Why do birds lay eggs? • Give a child an animal, they research that animal's life cycle and present to the class. • What are the gestation periods for different animals?How do these gestation periods compare to humans? • How do different animal embryos change? • How did Jane Goodall learn about the habits and behaviours of chimpanzees and why does she still need to work to protect their habitat?

Non statutory NC ideas

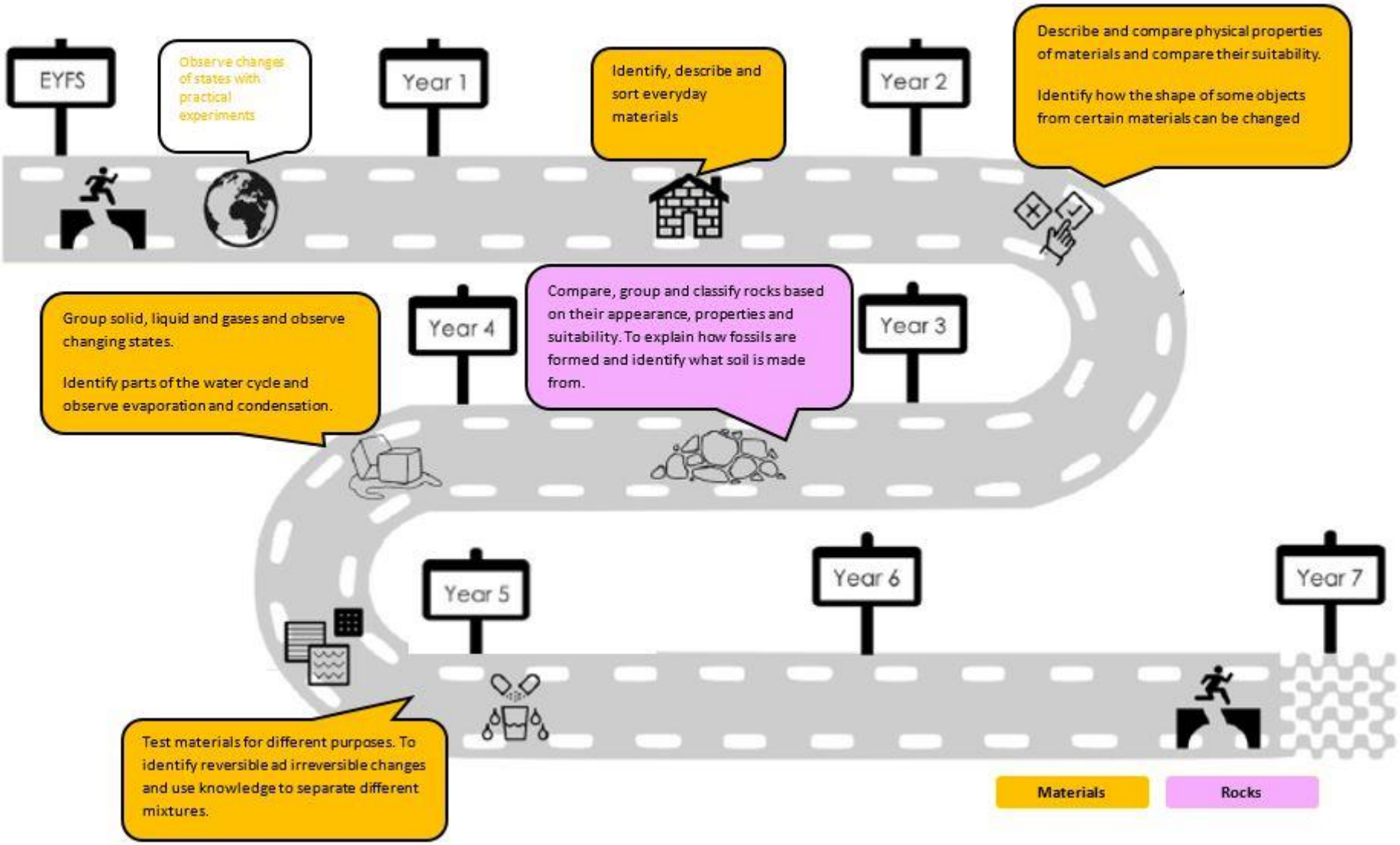
- Pupils might work scientifically by: observing and comparing the life cycles of plants and animals in their local environment with other plants and animals around the world (in the rainforest, in the oceans, in desert areas and in prehistoric times), asking pertinent questions and suggesting reasons for similarities and differences.
- They might try to grow new plants from different parts of the parent plant. For example, seeds, stem and root cuttings, tubers and bulbs.
- They might observe changes in an animal over a period of time (for example, by hatching and rearing chicks), comparing how different animals reproduce and grow.

Scientists to Consider

Jane Goodall- naturalist, Sir David Attenborough- Animal Behaviourist, Chris Peckham; Bill Oddie;

Bright Ideas Time Suggestions	Vocabulary to be Taught	Possible Trips/Experiences	Possible Cross-Curricular Links	Potential Books to use
• PMI – What if there were no sting insects like bees or wasps in the world? • Odd one out – frog, butterfly, hedgehog	Life cycle, reproduce, sexual, sperm, fertilises, egg, live young, metamorphosis, asexual, plantlets, runners, bulbs, cuttings, Pollination, Dispersal, reproduction, cell, , male, female, young, mammal, metamorphosis, amphibian, fish, reptile insect, egg, embryo, bird, plant, grow; genetic information; fruit; seed;	• Rainton Meadows Nature Reserve - https://durhamwt.com/education/ • https://www.spottygreenfrog.co.uk/For-Schools/Butterfly-Kits-&-Life-Cycle-Sets/c-1-204-124/ - *Can buy caterpillars to watch them turn onto real-life butterflies.* • *Blue Reef Aquarium - Life Cycles Under the Sea* - https://www.bluereefaquarium.co.uk/tynemouth/education-and-group-visits/school-trip/ • *Gibside* - https://nt.global.ssl.fastly.net/gibside/documents/gibside-information-packs-for-primary-schools.pdf - *Habitat Exploration and Discovery* • *Visit from a beekeeper to discuss* about the role of insects in the life cycle of flowers	**English:** • Chronological report about the life cycle of a plant/animal. • Non-fiction text about Jane Goodall or David Attenborough **Maths:** • Use venn diagrams to compare two life cycles e.g the life cycles of two birds and looking at similarities and differences. **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. • Yakkit kids/green screen as well known naturalists. • Explain everything on life cycles or i movie/book creator for each stage.	

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
Year 3
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 4
Group solid, liquid and gases and observe changing states.
Identify parts of the water cycle and observe evaporation and condensation.
Year 5
Test materials for different purposes. To identify reversible ad irreversible changes and use knowledge to separate different mixtures.
Year 6
Year 7
Materials
Rocks

Year 5	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 physical properties of everyday materials, they have also learnt to compare which materials are suitable for different purposes. In Y2 children learnt that materials can be changed by squashing, bending, twisting and stretching. In Y4 children learnt to group materials based on solids, liquids and gases and what happens when some materials are heated and cooled. In Y4 only reversible changes were looked at. In Y4 children learnt about evaporation.** • Compare and classify everyday materials based on a range of properties • Give reasons, based on evidence from comparative and fair tests, for the particular use of everyday materials • Identify soluble and insoluble materials • Identify, describe and compare mixtures and solutions • Name and describe some reversible changes • Use my knowledge of solids, liquids and gases to decide how mixtures should be separated • Explain some changes result in new materials • Conduct research about how chemists create new materials ***Pupils do not need to be taught the following content, which they will learn in later year groups:*** **In KS3 children will look at atoms and formulas when discussing chemical reactions as well as look at defining acids and alkalines.**
Working Scientifically Objectives that link to this topic:	***All of the working scientifically objectives are relevant to this unit of work as it lends itself to lots of practical enquiries.***

Learning Objective	**Objective Broken Down into Differentiation**		
	Below	***Expected***	***Above***
Compare and classify everyday materials based on a range of properties	Pupil describe a materials properties Pupil can explain what thermal and electrical conductors and insulators are.	Can create a chart or table grouping/comparing everyday materials by different properties including their hardness, , transparency, conductivity (electrical and thermal), and response to magnets Pupil understand and can define the properties of materials accurately	Pupil can group most everyday materials on the basis of their properties explaining their similarities and differences.
Give reasons, based on evidence from comparative and fair tests, for the particular use of everyday materials	Pupil can identify some materials used in everyday objects and suggest why they were suitable.	Pupil can use understanding of properties to explain everyday uses of materials Pupil can use test evidence gathered about different properties to suggest an appropriate material for a particular purpose e.g material to keep tea warm, materials to keep jacket warm etc (thermal insulation)	Pupil can record data from ta range of experiments accurately and explain the reliability of their results when stating if a material is suitable or unsuitable based on their properties.

Identify soluble and insoluble materials	Pupil can identify materials which are soluble in liquids and those that are not With support, pupils can explain what dissolving is.	Pupil can identify materials which are soluble in liquids and describe the process as dissolving. Pupil can explain the difference between melting and dissolving. Pupil can investigate factors which affect the speed of dissolving.	Pupil can investigate factors which affect the speed of dissolving, they can plan, carry out and record the investigation choosing the variables.
Identify, describe and compare mixtures and solutions	Pupil can explain the difference between a mixture and solution, with support	Pupil can compare and contrast mixtures and solutions, giving examples.	Pupils can use terms like solute and solvent accurately and independently.
Name and describe some reversible changes	Pupil is beginning to understand that some changes are reversible	Can describe some simple reversible changes to materials, giving examples	Pupils can carry out practical enquires showing reversible changes
Use my knowledge of solids, liquids and gases to decide how mixtures should be separated **Forest school – to create dirty water that can be separated and made clean**	Pupil can suggest some simple methods to separate materials in mixtures.	Can use knowledge of liquids, gases and solids to suggest how materials can be recovered from solutions or mixtures by evaporation, filtering or sieving	Can give reasons for choice of equipment and methods to separate a given solution and explain what the most efficient method is.
Explain some changes result in new materials	Pupil is beginning to understand that some changes are irreversible.	Pupil understands (and give examples) that some irreversible changes can result in the formation of new materials.	Pupil can describe the new materials created in irreversible chemical changes.
Conduct research about how chemists create new materials	Pupils with support can research chemists who created new materials (names of scientists given to pupil)	Pupil can independently research the work of chemists who created new materials (names of scientists given to pupil)	Pupil can research chemists who have recently created new materials and explain what the advantages and disadvantages of these new materials are.

Scientific Enquiry/Activity Ideas:

Pattern Seeking	**Observations Over Time**	**Identifying, classifying and grouping**	**Practical Tests**	**Research**
• What items in the kitchen cupboard dissolve? Do you notice any similarities in the materials, can you predict others you think will dissolve	• Which material is best for keeping our hot chocolate warm? • How does a container of salt	• Which materials conduct heat? Identify thermal conductors • To identify reversible and irreversible changes • What are mixtures? • What does dissolving mean?	• Which type of sugar dissolves the fastest? (cube, granulated, caste sugar, brown sugar). • Can you clean dirty contaminated water? Give children water where they need to separate the mixtures. • Which material would be the most effective for making a warm jacket or keeping my cup of tea hot for the	• What did Stephanie Kwolek discover and why was it important? • Research new materials produced by chemists e.g. Spencer Silver (glue of sticky notes) and Ruth

• How does temperature affect how much solute we can dissolve?	water change over time? • How does a sugar cube change as it is put in a glass of water? • How does a nail in salt water change over time?	• Which of the following dissolve in water: sugar, bicarbonate of soda, oil, chocolate, coffees, dark vinegar and wax? • Which sweets dissolve in water? • How can we separate mixtures?	longest time? Which container is best to stop ice cream melting? • A pinch of Salt http://www.ciec.org.uk/resources/a-pinch-of-salt.html • Kitchen conceptions and mixtures http://www.ciec.org.uk/kitchen_concoctions/ • How does the temperature of tea affect how long it takes for a sugar cube to dissolve? Keep the amount of water the same and add spoons of sugar to see when it stops dissolving • Does stirring affect quickly something dissolves? • Investigate how penguins stay warm in cold climates ***See the book 'A Creative Approach to Teaching Science' pg 92*** • What length of and different types of materials do I need for an action man to bungee jump safely? • Which material is best to use in tug of war? • Can you create lemonade that is clean, filtered and ready to sell? Could you make it fizzy? ***See the book 'A Creative Approach to Teaching Science' pg 95-96 and 98*** • *Can you create a new material using lemon juice, vinegar, a balloon and vinegar?* ***See the book 'A Creative Approach to Teaching Science' pg 97 creating new materials 2*** • Design and carry out an investigation to test the useful properties or single property (tensile or other strength, waterproofing, flexibility and/or durability) of a temperate plant/plant material - https://endeavour.kew.org/app/os (links to materials and plants) • Investigate the properties of different materials in order to recommend materials for particular functions depending on these properties e.g. test waterproofness and thermal insulation to identify a suitable fabric for a coat • How can we separate a mixture of water, iron filings, salt and sand? • How does the amount of bicarbonate of soda/vinegar/washing up liquid, effect the reaction?	Benerito (wrinkle free cotton)

Non statutory NC ideas

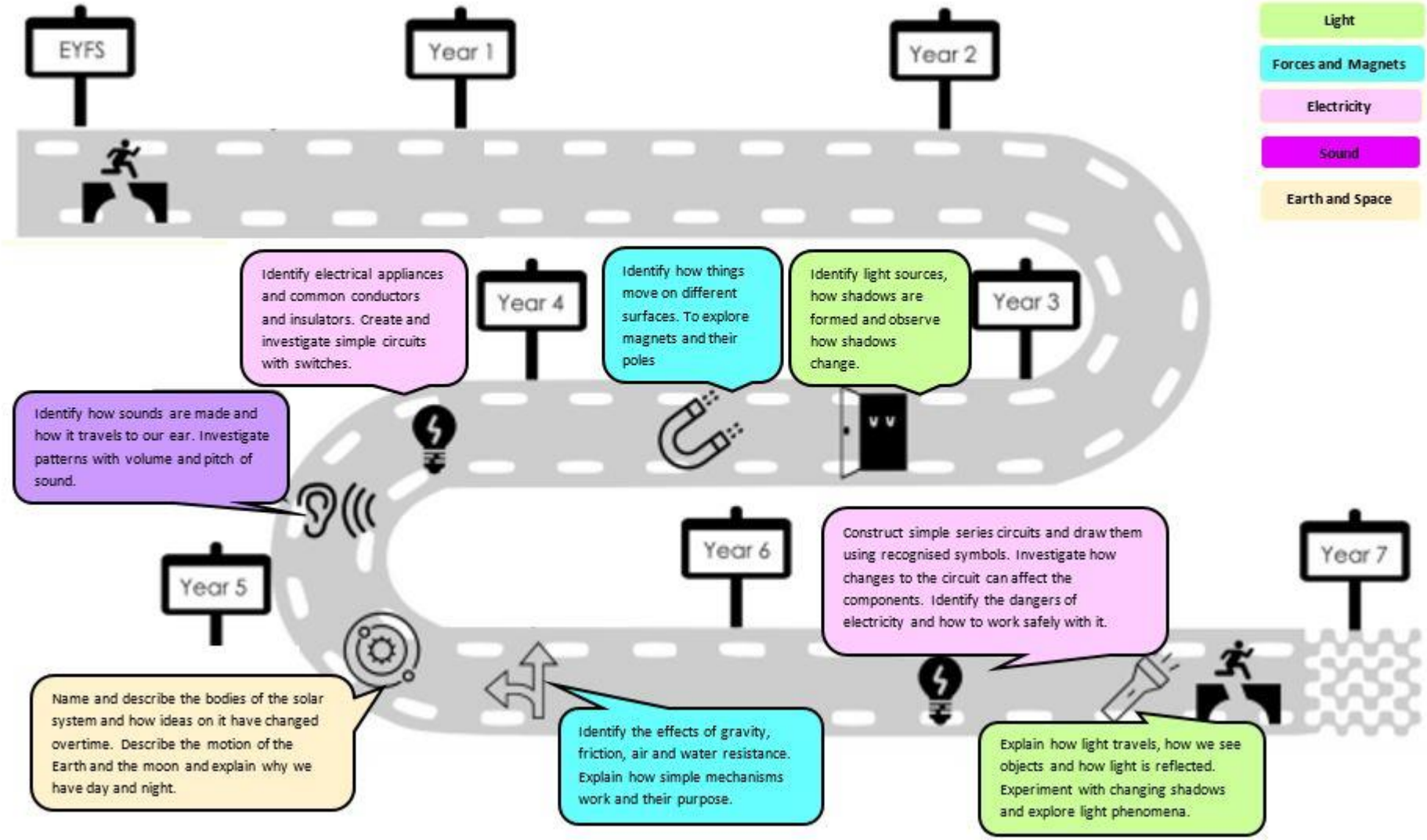
- Could work scientifically by: observing and comparing changes that take place and how chemical changes impact on our lives (eg cooking)
- Could work scientifically by: Discussing the creative use of new materials such as polymers, super-sticky and super-thin materials
- Explore the work of chemists who created new materials, e.g. Spencer Silver (glue on sticky notes) or Ruth Benerito (wrinkle free cotton).

Scientists to Consider

Sir Humphrey Davy- Separating gases, Jamie Garcia (BP website)- Invention of a new plastic, Becky Schroeder - fluorescence material, Spencer Silver, Arthur Fry and Alan Amron - Post-It Notes, Ruth Benerito - Wrinkle-Free, Stephanie Kwolek

Bright Ideas Time Suggestions	Vocabulary to be Taught	Possible Trips/Experiences	Possible Cross-Curricular Links	Potential Books to use
• Where does salt go when it is dissolved in water? • https://explorify.wellcome.ac.uk/en/activities/whats-going-on/3-2-1-lift-off • PMI – What if the whole human body could display the properties of liquid rather than a solid? • Burning candle and melting chocolate – how are these different? • Odd one out – Ice cube melting, sugar in water, effervescent tablet in water	Properties: hardness (hard, soft, stretchy, rigid, flexible, waterproof, absorbent, strong, weak, rough, smooth) solubility, transparency (reflective, transparent, opaque translucent) conductor (thermal and electrical conductivity), insulator magnetic response States of Matter: Solid , liquid, gas, particle, change of state solution, soluble , insoluble , solute, solvent , Mixture Reversible changes - dissolving/dissolve , mixing, evaporation/evaporating, filtering/filter, separating, sieving, melting, condensation/condensing Irreversible changes - new material, burning, rusting, cooking, chemical change	• Greenshift Education - http://greenshifteducation.co.uk/workshops/ • Washington Academy Trips - Could do more in-depth investigations • Life Centre - https://education.life.org.uk/workshop/solutions-and-separation-of-mixtures - separation of mixtures • Life Centre - https://education.life.org.uk/workshop/reversible-and-irreversible-changes - Reversible and irreversible changes. • Life Centre - https://education.life.org.uk/workshop/chemical-change-and-colour • Life Centre - https://education.life.org.uk/workshop/changes-of-state-and-gases-around-us	**English:** • Develop explanation writing – conclusions and describing fair tests. **Maths:** • More complex Venn diagrams and carroll diagrams to sort properties of materials. • Bar and line graphs to analyse data from experiments on dissolving, how long heat is insulated etc. • Data loggers used to measure temperature. **ICT/iPads:** • Excel for graph drawing • 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. • Post it app/pic collage sorting and grouping • Yakkit kids/green screen as well known scientists • Explain everything to discuss reversible and irreversible changes using scientific vocabulary- upload to seesaw.	

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.

<table>
<tr><td>Year 5</td><td>Area of NC: Forces (Physics)</td></tr>
<tr><td>Learning Objectives

(in suggested order of teaching sequence)</td><td><u>Prior Learning relevant to this topic:</u> In Y3 children will have been introduced to forces and how thing move on different surfaces. The children will have focused on push and pulls and friction primarily.

• Explain the effect of gravity
• Identify the effects of friction
• Identify the effects of air resistance
• Identify the effects of water resistance
• Explain how simple mechanisms (gears, levers and pulleys) work.
• Identify that simple mechanisms allow a smaller force to have a greater effect.
<u>Pupils do not need to be taught the following content, which they will learn in later year groups:</u> In KS3 they will use force arrows on diagrams as well as learn more complex science about the forces discussed in Y5.</td></tr>
<tr><td>Working Scientifically Objectives that link to this topic:</td><td>• Select and plan the most appropriate type of scientific enquiry to use to answer scientific questions and explain why.
• Recognise when and how to set up comparative and fair tests and explain which variables need to be controlled and why
• Makes reasoned predictions using evidence to support their ideas and making links to other scientific knowledge.
• Recognise which secondary sources will be most useful to research and use information from relevant different sources to begin to plan an investigation.
• Make their own decisions about what observations to make, what variables are needed and what measurements to use and how long to make them for.
• Choose the most appropriate equipment to make measurements with increasing accuracy and precision, taking repeat measurements where appropriate.
• Decide appropriate way to record complex data and results (scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs)
• Draw conclusions from their work and link their conclusions to scientific knowledge and vocabulary
• Use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas.
• Use their results to make further predictions and identify when further enquires, observations, comparative and fair tests might be needed
• Independently discusses the success of their working methods and suggests ways of improving their work and say why they think this.
• To discuss how scientists have breakthroughs and how they have developed scientific ideas over time. Identify scientific evidence that has been used to support or refute ideas over time.

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>Explain the effect of gravity</td><td>Pupil knows that an unsupported object will fall to the Earth and this is caused by gravity working at a distance, they may require support with this.</td><td>Pupil can independently explain the effect of gravity on unsupported objects falling towards the Earth.</td><td>Pupils can explain what would happen if we had no gravity and how that would impact life on Earth.</td></tr>
</table>

Identify the effects of friction Identify the effects of air resistance Identify the effects of water resistance	Pupil can understand that air resistance, water resistance and friction are contact forces and can affect the rate of movement of an object	Pupil can give examples of friction, water resistance and air resistance acting upon moving surface and can explain that the movement of objects is being resisted by these mediums. Pupil can give ideas for how the effect of air & water resistance and friction can be minimised to enable objects to move more freely through the respective medium.	Pupil can give examples of when it is beneficial to have high or low friction, water resistance and air resistance in context. Pupil can explain how to alter the effect of all these forces on objects so the object moves slower or quicker.
Explain how simple mechanisms (gears, levers and pulleys) work. **Forest school – can create pulleys outside, seesaws etc**	Pupil can identify the differences between gears, levers and pulleys.	Pupil can describe how levers, pulleys and gears work.	Pupil can identify and give examples of how gears, levers and pulleys are used in a real-life context and explain why they are useful.
Identify that simple mechanisms allow a smaller force to have a greater effect.	Pupil recognises that gears, pulleys and levers may be utilised to transfer force.	Pupil can explain how some mechanisms can use a small force to create a big effect.	Pupil has opportunity to experiment with different types and sizes of levers, pulleys and gears to identify patterns in the size of force they can create.

Scientific Enquiry/Activity Ideas:

Pattern Seeking	**Observations Over Time**	**Identifying, classifying and grouping**	**Practical Tests**	**Research**
• How do levers help us? What do pulleys do? How are they similar and different? • Make shapes out of playdough, what would the one with the most and one with the least water resistance look like? • Does playdough travel differently in oil and glue compared to water? • Will Usain Bolt run faster in the water or on land?	• How long does a pendulum swing for before it stops?	• Identify how a lever works - ***See the book 'A Creative Approach to Teaching Science' pg 132*** • *Identify the forces in the video https://www.bbc.co.uk/bitesize/clips/zp4g9j6*	• Which shape parachute takes the longest to fall? How does the surface area of a parachute affect the time it takes to fall to the ground? • Can you feel the force? http://www.ciec.org.uk/resources/feel-the-force.html • Motion investigation http://downloads.bbc.co.uk/learning/bbcteach/Motion_teacher_resource.pdf • How do forces affect my speed? https://www.bbc.com/teach/terrific-scientific/KS2/zjwrjhv • Bishops can fly *(see practical work in primary science for more detail)* All about getting a piece of a4 paper to fly across the classroom.	• How have our ideas about gravity changed over time? https://www.ogdentrust.com/resources/research-cards-gravity • How have our ideas about friction changed over time? https://www.ogdentrust.com/resources/research-cards-friction • How can the gears on a bicycle help you to climb up a hill?

Why? And Is it faster to run or swim in the water? Why?			• Can you create the most effective goal keeper's gloves? ***See the book 'A Creative Approach to Teaching Science' pg 129*** • Can you create a zip wire to get a lego figure from one tree to another on the yard? ***See the book 'A Creative Approach to Teaching Science' pg 129*** • Which piece of PE equipment can be thrown the furthest (eg javelin, rugby ball, football etc) • Can you reduce the air resistance acting on a paper aeroplane? • Slippy Shoe investigation - https://www.ogdentrust.com/assets/general/Phizzi-Enquiry_Slippy-Shoes.pdf	• How did Newton change our understanding of forces? • What is gravity? ***See Gravity Carousel for lovely ideas in the book 'A Creative Approach to Teaching Science' pg 128***

Non statutory NC ideas

- Could work scientifically by: exploring falling paper cones or cupcake cases, and designing and making a variety of parachutes and carrying out fair tests to determine which designs are the most effective. They might explore resistance in water by making and testing boats of different shapes. They might design and make products that use levers, pulleys, gears and/or springs and explore their effects.
- Research and explore how scientists, such as Galileo Galilei and Isaac Newton helped to develop the theory of gravitation

Scientists to Consider

Isaac Newton- Gravity, Albert Einstein- The theory of relativity, Galileo Galilei - Gravity and Acceleration, Archimedes of Syracuse- Levers

Bright Ideas Time Suggestions	Vocabulary to be Taught	Possible Trips/Experiences	Possible Cross-Curricular Links	Potential Books to use
• PMI- What if the Earth's gravity was reduced by half? • PMI – What if there was no gravity? • Big question – What if there was no friction? • Odd one out – parachute, aeroplane and sycamore seeds (air resistance and gavity)	Fall Earth Gravity theory of gravitation gravitational force air resistance thrust upthrust Water resistance buoyancy Mechanisms brake Springs levers fulcrum/pivot Pulleys Gears Contact force Non-contact force Effect: move/motion, accelerate/faster , decelerate/slower, stop/stationary, direction	• Greenshift Education- http://greenshifteducation.co.uk/workshops/ • Life Centre https://education.life.org.uk/workshop/pirate-forces - Forces in a pirate context • Washington Academy Trips - Could do more in-depth investigations • Hands on Science - https://www.hands-on-science.co.uk/workshop/ks2-rocket-challenge/ - KS2 Rocket Challenge and Equal and Opposite Rockets https://www.hands-on-science.co.uk/workshop/equal-and-	**English** • Write explanatory texts about forces • To write a scientist profile for Isaac Newton **Maths:** • To record data from experiments in bar graphs, tables and line graphs where relevant. • Look at taking accurate measurements and finding an average result. **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. • Slow mo split screen of experiments to identifies the effects of the forces • Yakkit kids on famous scientists • Explain everything on gravity and upload to seesaw	

	Surface area Balance streamlined Transfer	opposite-rockets/ and Mars Lander (more forces than space) - https://www.hands-on-science.co.uk/workshop/mars-lander/ • Hands on Science - https://www.hands-on-science.co.uk/workshop/elastic-racers/ - Racers		

Year 5	**Area of NC: Earth and Space (Physics)**		
Learning Objectives *(in suggested order of teaching sequence)*	***Prior Learning relevant to this topic:*** **In Y1 children will learn that day length varies when learning about seasonal change. However they do not know why day length varies. In Y3, children learn how shadows are formed and that they can vary in size.** • Name and describe the range of celestial bodies in our Solar System , comparing their similarities and differences • Describe the Sun, Earth and Moon as approximately spherical bodies • Describe the motion of the Earth and other planets relative the Sun • Research how our ideas of the solar system have changed over time • Describe the movement of the moon relative to the Earth. • Explain why we have day and night ***Pupils do not need to be taught the following content, which they will learn in later year groups:*** **In KS3, children will learn formula for working out gravitational force on Earth and other planets and stars. They will learn about other galaxies and they will learn about the light year as a unit of measurement.**		
Working Scientifically Objectives that link to this topic:	• Use their science experiences to explore ideas and raise relevant questions • Recognise which secondary sources will be most useful to research and use information from relevant different sources to begin to plan an investigation • Use relevant scientific language and illustrations to discuss, communicate and justify their scientific ideas • To discuss how scientists have breakthroughs and how they have developed scientific ideas over time. Identify scientific evidence that has been used to support or refute ideas over time. ***Others could be relevant dependant on which practical enquiries you choose to plan***		
Learning Objective	**Objective Broken Down into Differentiation**		
	Below	***Expected***	***Above***

Name and describe the range of celestial bodies in our Solar System , comparing their similarities and differences	Pupil can name some planets in the Solar system and explain simply how they are different to the Earth. They can also identify the sun and moon.	Pupil can name, place and describe some features of the planets in the Solar system. Children can also identify the sun and moon and some of their features.	Pupils can name other celestial bodies in the solar system as well as identify similarities and differences between planets.
Describe the Sun, Earth and Moon as approximately spherical bodies	Pupil understands that the Sun, Moon and Earth are spherical.	Pupil can explain that the Sun, Earth and Moon are spherical bodies.	Children can explain how we know that the sun, Earth and Moon are approximately spherical and understands why we now know the Earth is not flat.
Describe the motion of the Earth and other planets relative the Sun	Pupil understands that the Earth orbits the Sun.	Pupil can explain that the Earth and other planets orbit the Sun.	Pupil can describe the position of the Earth and Sun in relation to the wider Solar system.
Research how our ideas of the solar system have changed over time	Pupil, with support, can identify the different theories about the solar system over time.	Can use the terms heliocentric model and geocentric model accurately.	Can describe the arguments and evidence used by scientists in the past about the solar system.
Describe the movement of the moon relative to the Earth.	Pupil can explain that the Moon orbits the Earth not the Sun.	Pupil can explain how the Moon moves relative to the Earth. Pupil understands that the Moon appears to change shape over the period of 1 month.	Pupil can explain that the Moon orbits the Earth noting the number of days, apparent shape and the lunar cycle.
Explain why we have day and night	Pupil can describe that the length of day/night is determined by the position of the Earth and Sun. Pupil recognise that the apparent movement of the Sun during the day affects the size and position of shadows.	Pupil can describe how the rotation of the Earth in relation to the Sun causes day and night. Pupils can explain the apparent movement of the Sun during the day and its effect on shadow length.	Pupil can explain why night and day occur at different times in different places on Earth. Can explain how a sundial works

Scientific Enquiry/Activity Ideas:

See other space ideas and resources on the server in Science> Y5> Earth and Space

Also see website: https://www.stem.org.uk/esero/resources

Pattern Seeking	**Observations Over Time**	**Identifying, classifying and grouping**	**Practical Tests**	**Research**
• Does every planet take the same time to orbit the Sun? • Is there a relationship between the orbit of a planet around the sun and its size? • What are the sizes of the plants in a solar system ?- Put planets on a toilet roll - show the scale of how far away planets are away. 1sheet of toilet paper = ? distance or a till	• How does the moon appear over the period of a month? (Children to take a diary home and draw the phases of the moon and discuss back at class after the month)	• How could you organise all the objects in the solar system into groups? • Identify why we have night and day. Children create models using torch, football and a tennis ball to explain. • Create a role-play of the movement of planets, sun and moon in the solar system • Why do we have day/night/months/years/seasons? • Why does day length change?	• How much would I weigh on different planets? https://www.ogdentrust.com/assets/general/Phizzi-practical_planetary_picnic.pdf • Is there anyone out there? http://www.ciec.org.uk/resources/is-there-anyone-out-there.html • What can we learn about the surface of the moon? Pg 150 ***See the book 'A Creative***	• How have our ideas about the solar system changed over time? https://www.ogdentrust.com/resources/research-cards-earth-and-space • How is astronomer and planetary scientist Sara Seager changing our ideas about the universe? • What are the distances between the Sun and planets in the solar system? • What facts can I find out about the planets in the solar system?

roll. **(Resource to go alongside this on server)** • For the size of the planets, one nice model is the fruit solar system – going from peppercorn Mercury up to watermelon Jupiter: **(resource along side this on server)**		• **What is the difference between a star and a planet?**	***Approach to Teaching Science')***	• Would we still have seasons if the sun could be switched off? • How do we know the Earth is spherical? • Correct these inaccurate books about space (The loom on the moon by Chae Strathie, Goodnight Magic Moon by Janet Bingham and Whatever Next by Jill Murphy) • How does the length of daylight hours change in each season? • Who is Tom Wagg, why is he important?

Non statutory NC ideas

- Could work scientifically by: Researching and comparing the time of day at different places on Earth.
- Could work scientifically by: making simple models of the solar system
- Could work scientifically by researching how older civilisations used the sun to create astronomical clocks, e.g. Stonehenge and make their own shadow clocks to tell time throughout the school day.
- Could research how ideas about the solar system have changed, looking at scientists like Ptolemy, Alhazen and Copermicus

Scientists to Consider

Margaret Hamilton- Computer scientist (Moon Landings), Stephen Hawking- Black Holes, Mae Jemison – Astronaut, Claudius Ptolemy and Nicolaus Copernicus - Heliocentric vs Geocentric Universe, Neil Armstrong- First man on the Moon, Tim Peake – astronaut , Helen Sharman- GB astronaut , Caroline Herschel- First to find a comet, Valentina Tereshkova-Cosmonaut

Bright Ideas Time Suggestions	Vocabulary to be Taught	Possible Trips/Experiences	Possible Cross-Curricular Links	Potential Books to use
• Odd one out.- the earth, sun, moon • PMI – What if the earth stops spinning? • PMI – What if humans could all live in the moon ? • Why do the Sun and the Moon look the same size in the sky? • How do you know the Earth is a sphere? • If the Earth is constantly rotating on its axis, why don't we feel dizzy? • Who should own space? • What would you investigate on the ISS? • What if the sun rotated not the Earth? • What if there were two suns? • What if there was no moon?	Earth, Sun, Moon, Mercury, Jupiter, Saturn, Venus, Mars, Uranus, Neptune, planets, solar system, universe, Pluto, dwarf planet, Celestial Body Spherical, Solar system, rotates/rotation, star, orbits, planets, spin, axis, geocentric, heliocentric Day, Night, Phases of the Moon, star, constellation, waxing, waning, crescent,	• *Pete Edwards - Durham University - will come in to do a FREE discussion / Q and A about Space* • Mobile Planetarium into school - http://immersive-experiences.co.uk/education/planetariums • Dr Research Workshops into School - http://drresearch.co.uk/?page_id=20 - Space Workshop • Life Centre - https://education.life.org.uk/workshop/how-do-we-know-the-earth-is-rotating - CAN COMBINE WITH PLANETARIUM VISIT • Life Centre - https://education.life.org.uk/workshop/forces-and-motion-in-space • Sunderland Astronomical Society - visits-events@sunderlandastro.com • Have parents and children to school to conduct a stargazing event	**English:** • Non-chronological report about the work of scientists such as Ptolemy, Alhazen and Copernicus. • Write a poem about the planets. • Leaflet/poster about a favourite planet. **Maths:** • Record data in tables and line graphs/Measuring and scaling of planet sizing. **ICT/iPads:** Present a stargazing show using iMovie. • 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. • VR in space (google expeditions) • Yakkit kids as a famous scientist • Explain everything video to upload to seesaw	• Curiosity: The Story of a Mars Rover by Markus Motum • Hidden Figures: The True Story of Four Black Women and the Space Race by Lee Shetterly • The Darkest Dark (Chris Hadfield) • Papa please get the moon for me , Eric Carle - inaccurate moon phases to discuss - *To be able to describe the movement of the moon relative to the Earth.* • Boy, Were We wrong About the Solar System by Kathleen V. Kudlinski - *To be able to research how our ideas of the solar system have changed over time* • Planetarium Junior Edition (Welcome To The Museum) by Raman Prinja - *To be able to name and describe the range of celestial bodies in our Solar System, comparing their similarities and differences*

	gibbous, satellite sundials shadow clock eclipse astronomer Astronomical clocks			• Voyage through Space by Katy Flint - *To be able to name and describe the range of celestial bodies in our Solar System, comparing their similarities and differences*

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
- **Post it note planning board in year group folder in Science on the server**
- 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.stem.org.uk/esero/resources - **Good Space Resources**
- 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