Science in Year 6

Working Scientifically

Year 5/6

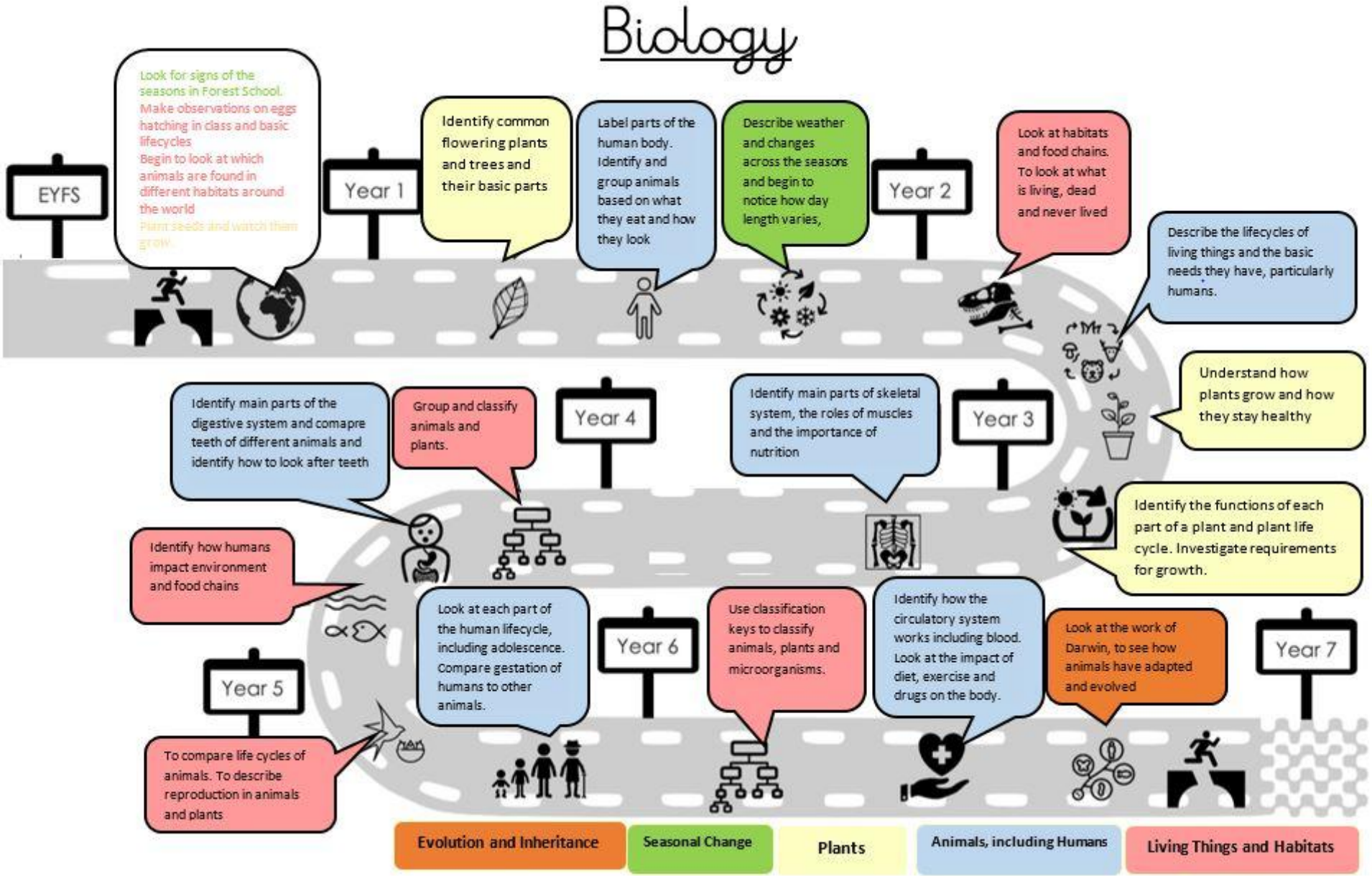
Working Scientifically Skills

Working scientifically

Statutory requirements

During years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programme of study content:

- planning different types of scientific enquiries to answer questions, including recognising and controlling variables where necessary
- taking measurements, using a range of scientific equipment, with increasing accuracy and precision, taking repeat readings when appropriate
- recording data and results of increasing complexity using scientific diagrams and labels, classification keys, tables, scatter graphs, bar and line graphs
- using test results to make predictions to set up further comparative and fair tests
- reporting and presenting findings from enquiries, including conclusions, causal relationships and explanations of and degree of trust in results, in oral and written forms such as displays and other presentations
- identifying scientific evidence that has been used to support or refute ideas or arguments.



Year 6	Area of NC: Living Things and their Habitats - Classification (Biology)

Living things and their habitats

Statutory requirements

Pupils should be taught to:

- describe how living things are classified into broad groups according to common observable characteristics and based on similarities and differences, including micro-organisms, plants and animals
- give reasons for classifying plants and animals based on specific characteristics.

Pupils do not need to be taught the following content, which they will learn in later year groups:

In KS3 children will learn the differences between species



- Odd one out – plastic bottle, fruit salad, pig and flowers (recap of living, non-living, have never lived)
- Odd one out – Moss, fern, acorn, flower
- Is a tree a plant?
- PMI – What if there were no plants in the world?
- What if no-one cleaned their home?
- Odd one out – virus, bacteria, funghi, yeast
- Can microorganisms be good for you?
- Why could the platypus be a bird?
- Picture of two leaves can you identify the similarities and differences.
- PMI: What if we lived in a world with no insects?

SEE ALSO: RETRIEVAL IDEAS



- Use a classification key to identify a variety of living things in the local and wider environment.
- Discuss the lifecycles of mammals, amphibians, insects and birds and how they differ.
- Discuss reproduction in plants and animals.

TIER 3 VOCABULARY:

micro-organism, bacteria, virus, fungi, yeast, arthropod, arachnid, mollusc, crustacean, Linnaean system, phylum, class, order, family, genus, species, thorax, abdomen, antennae.

SEE ALSO: https://www.stem.org.uk/primary/resources

Learning Objective	Objective Broken Down into Differentiation

	Below	*Expected*	*Above*
Sort animals (vertebrates and invertebrates) into groups based on their characteristics	Can give examples of animals in the five vertebrate groups and some of the invertebrate groups	Can give the key characteristics of the five vertebrate groups and some invertebrate groups	Can compare the characteristics of animals in different groups
Use classification systems and keys to identify animals	Can use classification materials to identify common animals	Can use classification materials to identify unknown animals	Can create classification keys for animals
Justify my reasons for classifying animals based on specific characteristics	With support, pupil can give some characteristics that explain why an animal belongs to a particular group	Can give a number of characteristics that explain why an animal belongs to a particular group	Pupil can explain why some animals are harder to classify as they have characteristics of multiple groups eg penguin, platypus etc.
Explain the significance of Carl Linnaeus	Pupil understand that taxonomists help us to identify all living things	Pupil can describe the work of scientists in creating a binomial classification system e.g. Carl Linnaeus	Pupil can describe and name the 7 levels of taxonomic rank used to identify all living things e.g. using a pneumonic to help
Sort plants into groups based on their characteristics, identifying similarities and differences	Pupil understands that there are flowering and non-flowering plants and give examples.	Pupil understands that there are 4 main groups of plants: mosses, ferns, conifers and flowering plants. Pupil can identify similarities and differences between the four main plant groups.	Pupil can justice why plants are placed in the four groups accurately referring to their characteristics.
Use classification systems and keys to identify plants **Forest school**	Can use classification materials to identify plants in the local environment	Can use classification materials to identify unknown plants	Can create classification keys for plants
Identify and classify microorganisms	Pupil understands that microbes can be harmful or helpful	Pupil understands there are more than one type of micro-organism e.g. fungi; bacteria; virus; and name examples Pupil can describe how some micro-organisms are helpful and others harmful, naming examples of both.	Pupil understands micro-organisms can cause harm but can also create medicines, with examples of scientific discoveries

Year 6	**Area of NC: Animals, including Humans – Circulatory System and Health (Biology)**

Animals including humans

Statutory requirements

Pupils should be taught to:

- identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood
- recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function
- describe the ways in which nutrients and water are transported within animals, including humans.

<u>Pupils do not need to be taught the following content, which they will learn in later year groups:</u>

In KS3 children will learn about some more complex consequences of a poor diet like deficiencies and starvation. They will look more into the impact of substance misuse and recreational drugs. They will also look further into the mechanisms of breathing in humans and the impact of exercise, asthma and smoking on the human gas exchange



- Odd one out – intestines, heart, lungs
- Odd one out – stomach, lungs, liver
- Can we live without capillaries?
- PMI – What would a world without exercise be like?
- Odd one out – cheese, salmon, nuts, lettuce
- Similarities and differences - coffee, inhaler calpol, tea, ibuprofen
- PMI - What if our heart was an external organ?
- Are veins and arteries really blue and red?
- What would happen if all our blood was replaced with water?

SEE ALSO: RETRIEVAL IDEAS



- Understand the importance of hygiene, eating the correct amounts and exercise for humans.
- Discuss why balanced diets are important (incl sleep).
- Name the major bones in a human skeleton.
- Discuss the process of digestion.

TIER 3 VOCABULARY:

circulatory system, artery, vein, capillary, aorta, atrium, ventricle, pulse, oxygenated, deoxygenated, haemoglobin, plasma, platelets, respiration, carbon dioxide, blood vessel.

SEE ALSO: https://www.stem.org.uk/primary/resources

Learning Objective	**Objective Broken Down into Differentiation**		
	Below	***Expected***	***Above***
Name and identify the main internal organs and their functions	Pupils with support can name the main internal organs and explain why the skeletal system is important	Pupils can independently name the main parts of the skeletal system and internal organs, explaining we need the skeleton for protection and movement.	Pupils can begin to explain what may happen if one of the organs was not working correctly,

(Skeletal system is recap of Y3)		Pupils can research the functions of the internal organs.	
Identify the main parts of the circulatory system and how it works	Pupil can identify and name the main parts of the circulatory system Pupil can explain how blood circulates around the body.	Pupil can name the main parts of the human circulatory system and describe the function of each part (heart, lungs, blood vessels) Can use role play model to explain the main parts of the circulatory system and their role.	Can independently explain how the circulatory system works using scientific vocabulary accurately. Pupil has opportunity to compare and contrast the circulatory systems of a range of animals compared to man Can compare skeleton, digestive and circulatory system
Identify the main components of human blood and their functions	Pupil can identify the different components that make up blood	Pupil can identify each component of human blood and explain what their function is.	Pupils can explain how the capillaries work and why they are so important.
Describe the ways in which nutrients and water are transported within animals, including humans	Pupil can state how the digestive system breaks down nutrients from what we eat. Pupil recognises that blood carries oxygen and carbon dioxide around the body.	Pupil can state how the digestive system also breaks down the nutrients in the stomach, small intestine and large intestine to be transported around the body. Pupil can explain the composition and function of blood within the body, including how it carries gases, nutrients and water.	Pupil can independently explain, using scientific vocabulary, how the digestive system and circulatory system (blood) transport water and nutrients around the human body and why this is so important.
Recognise the impact of diet and exercise on the way our bodies function	Pupil can name a range of healthy and unhealthy foods giving some reasons for their choice. Pupil can explain why it is important to exercise and eat healthily.	Pupil understands that the human body needs energy to function properly and this comes from our food and this should be from a balanced diet Pupil can explain the impact on the heart and circulatory system of exercise and nutrition	Pupil can suggest specific activities to keep the heart and circulatory system healthy. Pupil can describe what happens to the body if we have too little/too much food to meet its needs.
Recognise the impact of drugs on the way our bodies function	Pupil can name some of the dangers to the body of taking drugs and medicines inappropriately, including smoking and alcohol.	Pupil can identify a range of helpful (medicines) and harmful drugs and explain their effect on the body including the addictive nature of many drugs including smoking and alcohol.	Pupil can identify how some drugs, alcohol and smoking effect certain organs in the human body and how ideas about this have changed over time.

Year 6	**Area of NC: Evolution and Inheritance (Biology)**

Evolution and inheritance

Statutory requirements

Pupils should be taught to:

- recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago
- recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents
- identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.

<u>Pupils do not need to be taught the following content, which they will learn in later year groups:</u>

In KS3 children will learn about DNA and learn more complex information about variation which can cause some organisms to be able to compete more successfully or less successfully either driving natural selection or lead to extinction.



- PMI – Should people be able to design their own babies?
- Will all living things become fossils?
- PMI – What if fossils didn't exist?
- Odd one out.- Beak shape.
- Odd one out – animals that camouflage.
- Odd one out – mixed breeds – inheritance.
- As a child of two Olympic medallists, would you automatically become one yourself?

SEE ALSO: RETRIEVAL IDEAS



- Talk and identify a range of habitats and how an animal or plant might be suited to live there.
- Recall how fossils are made.
- Discuss how habitats can change and human impact can make some habitats dangerous to living things.

TIER 3 VOCABULARY:

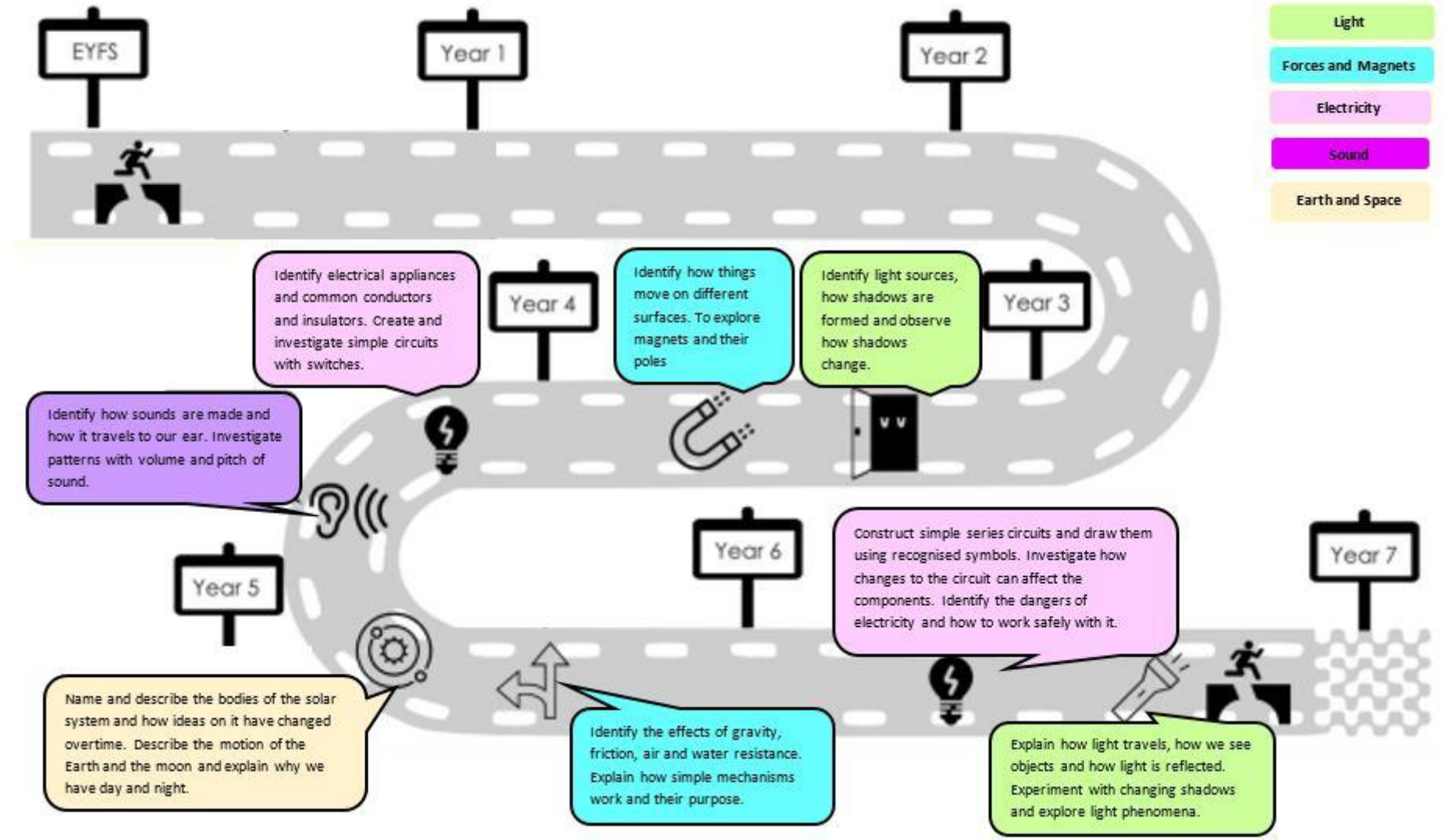
Evolution, natural selection, variation, adaptation, advantageous, inherited, mutation, genetics, selective breeding, survival of the fittest, offspring, species.

SEE ALSO: https://www.stem.org.uk/primary/resources

Learning Objective	**Objective Broken Down into Differentiation**		
	Below	***Expected***	***Above***
Explain what fossils tell us about living things from the past	Can explain that fossils show us something that once was alive and therefore can tell us about the past With support pupils can define the term evolution	Can explain the process of evolution being that living things have changed over time. Can examine fossil evidence/record and explain how it provides information about living things that inhabited the earth millions of years ago. Can examine fossil evidence/record and explain how a living thing has evolved over time	Can give some limitations of fossil evidence Pupil can describe key stages in the Earth's history and offer suggestions as to why different creatures/plants lived then compared to now.

Explore and explain inheritance and variation from parent to offspring.	Pupil can explain that parents give some characteristics to their offspring. Pupil understands that sometimes offspring are not like their parents	Pupil understands that human offspring inherit characteristics from each parent but will not be identical to their parents, although they will have some features in common. Pupil can identify inherited features and those that are learned/environmental. Pupil can use the word variation accurately.	Pupil can explain that some organisms reproduce asexually and the offspring will be almost identical to the parent which is different to human offspring. Pupil may show some awareness of selective breeding creating purposeful variation
Identify how animals and plants are adapted to suit their environment	Can give examples of how plants and animals are suited to an environment. Pupil can explain that some living things are able to survive better than others in different environments, begin to give reasons why.	Can identify characteristics that will make a plant or animal suited or not suited to a particular habitat and understands that adaptation can lead to evolution – through something called natural selection/survival of the fittest Pupil can analyse the advantages and disadvantages of specific adaptations Can give examples of how an animal or plant has evolved and adapted over time e.g. penguin, peppered moth.	Pupil can explain adaptations needed to suit an environment and then explain the impact on the creature or plant if they did not have those characteristics. Pupils can give scientific reasons for adaptations based on what they know about living things and use accurate scientific vocabulary**.**
Research the impact of Charles Darwin ****NON STAT****	Pupil with support, can explain the work of Charles Darwin	Pupils can explain the work of Charles Darwin and the impact and contribution he made.	Can demonstrate understanding of how ideas about evolution developed over time and that Darwin was not the only scientist involved in developing this theory.

Physics



Year 6	Area of NC: Light (Physics)

Light

Statutory requirements

Pupils should be taught to:

- recognise that light appears to travel in straight lines
- use the idea that light travels in straight lines to explain that objects are seen because they give out or reflect light into the eye
- explain that we see things because light travels from light sources to our eyes or from light sources to objects and then to our eyes
- use the idea that light travels in straight lines to explain why shadows have the same shape as the objects that cast them.

<u>Pupils do not need to be taught the following content, which they will learn in later year groups:</u>

In KS3, children will learn about light waves. They will also look at light waves travelling through a vacuum and the speed of light. Children will learn about the human eye and more complex ideas on light rays, transmission of light and colours and different frequencies of light.



- Odd one out – globe lamp, candle, sun, moon (sources of light)
- What happens to the sun at night and the moon during the day?
- Odd one out – glass, oxygen, orange juice, (states, transparency)
- Odd one out – water, translucent cup, hands (transparency)
- What if we didn't see colours?

SEE ALSO: RETRIEVAL IDEAS



- Understand that you need light to see things.
- Explain that 'dark' is the absence of light.
- Explain that light is reflected from surfaces.
- Know that the sun is dangerous and they need to protect their eyes.
- Explain how shadows are formed and can find patterns about shadow size.

TIER 3 VOCABULARY:

angle of incidence, angle of reflection, refraction, spectrum, periscope, prism, light ray, reflection, transparent, opaque. Translucent.

SEE ALSO: https://www.stem.org.uk/primary/resources

Learning Objective	**Objective Broken Down into Differentiation**		
	Below	***Expected***	***Above***
Explain how light appears to travel in straight lines	With support, can demonstrate that light travels in a straight line.	Can demonstrate that light travels in a straight line. Pupil can explain how light travels from a light source in straight lines.	Can describe with diagrams, as appropriate, how light travels in straight lines
Explain how light is reflected to allow humans to see objects	Pupil can identify reflective materials and objects.	Can explain how light is reflected and use words the vocabulary angle of reflection and angle of incidence.	Can predict and explain with diagrams or models, as appropriate, how the path of light rays can be directed by reflection to be seen

Explain how we see objects	Pupil knows that we see because light is reflected from objects and enters our eyes.	Can describe with diagrams, as appropriate, how light travels in straight lines either from sources or reflected from other objects into our eyes.	Pupil can explain that we see images because our brain is sent messages along the optic nerve from the eye. Pupil can describe that we see colour because some colours are absorbed by an object when light is reflected from its surface.
Explain how shadows are created and identify how they can be changed	Pupil can explain that shadows are formed when light is blocked from passing through an object.	Pupil explains that a shadow has the same shape as the object casting it but the size of the shadow is larger when the light source and object move closer to each other as more of the light is blocked. Can predict and explain with diagrams or models, as appropriate, how the shape and size of shadows can be varied	Pupil shows their understanding of shadow formation by creating shadows of different sizes and shape by altering the position and intensity of the light source in relation to the object making the shadow.
Explore and describe a range of phenomena surrounding light. ****NON STAT****	Pupil has observed and can simply describe, with support, some light phenomena including rainbows, colours on soap bubbles, objects looking bent in water, prisms and coloured filters.	Can understand how light is refracted. Can explain what the visible spectrum is .	Can understand the way refraction alters the direction of light. Can describe what Isaac Newton discovered about light

Year 6	**Area of NC: Electricity (Physics)**

Statutory requirements

Pupils should be taught to:

- associate the brightness of a lamp or the volume of a buzzer with the number and voltage of cells used in the circuit
- compare and give reasons for variations in how components function, including the brightness of bulbs, the loudness of buzzers and the on/off position of switches
- use recognised symbols when representing a simple circuit in a diagram.

Pupils do not need to be taught the following content, which they will learn in later year groups:

In KS3 children will look at parallel circuits, they will measure electrical current, learn about static electricity.



- Odd one out – torch, fridge and mobile phone
- Odd one out – silver coin, copper coin, water, rubber tyre
- PMI – What if there was no electricity in the world?
- PMI – What if we could only run off solar energy?
- PMI – It should be the law to own an electric car.

SEE ALSO: RETRIEVAL IDEAS



- Name some appliances that use batteries.
- Name some appliances that use mains electricity.
- Create and/or draw a simple working circuit? (not symbols – this is taught in Y6).
- Explain what a switch does.
- Name some common insulators and conductors?

TIER 3 VOCABULARY:

series circuit, parallel circuit, resistance, voltage, current, fuse, terminal, circuit symbol, electrocution, electric shock, amp, watt, earth wire, live wire, short circuit.

SEE ALSO: https://www.stem.org.uk/primary/resources

Learning Objective	**Objective Broken Down into Differentiation**		
	Below	***Expected***	***Above***

To be able to construct a simple series circuit.	Pupil can create a simple electrical circuit with more than one component – a complete circuit.	Pupil can create a simple series circuit and use accurate scientific vocabulary when explaining why It works	Pupil can create simple series circuits that work, even when given restraints eg only one wire.
To be able to identify and use recognised symbols when representing a simple circuit in a diagram	Pupils can identify and use some electrical symbols in a drawing of an electrical circuit but may not be accurate in drawing a circuit diagram.	Pupil can draw a circuit diagram using recognised symbols.	Pupils can look at circuit diagrams and explain whether the circuit will work or not
To Investigate variations in how components work in a circuit.	With support, pupils can change a component in a circuit so it work differently eg motor spins faster, bulb is dimmer, buzzer is louder Pupil begins to spot a pattern about number of cells in a circuit	Pupil can plan an investigation and choose variables to show how working components can vary in a circuit - including the brightness of bulbs, the loudness of buzzers, the speed of a motor and the on/off position of switches Pupil can explain what will happen to components in a circuit if the number of cells/batteries is increased or reduced. Pupils can use the words voltage accurately.	Pupil can use what they find out in their experiment to predict whether circuits would be bright, loud etc. They can use their knowledge to change cells and component in a circuit to achieve a specific effect. Pupil can use the terms current and voltage accurately.
Identify the dangers electricity presents and understand how to work safely with it	Pupil is aware of the need to be safe around electricity and can describe some precautions.	Pupil can explain the dangers of working with electricity and the safety precautions which must be taken.	Pupil can explain how electrical appliances have safety features in their circuits to prevent electrocution or electric shock.