



# YEAR 5

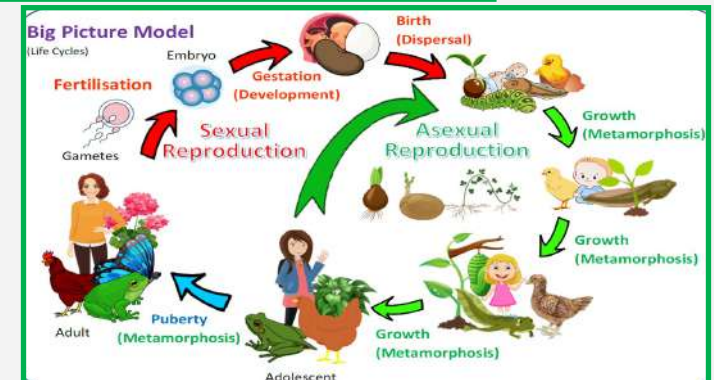
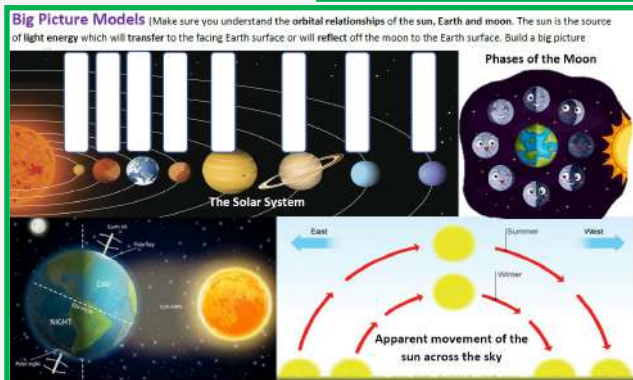
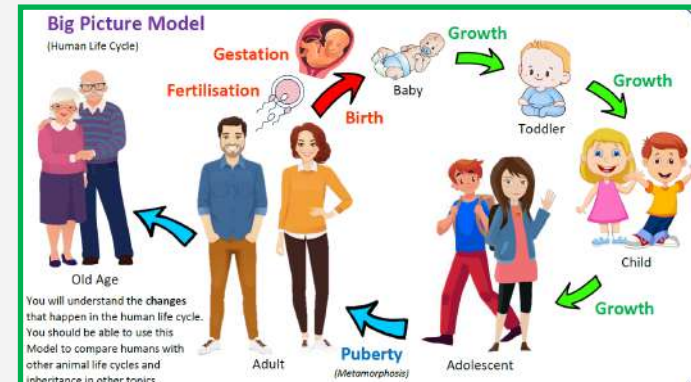
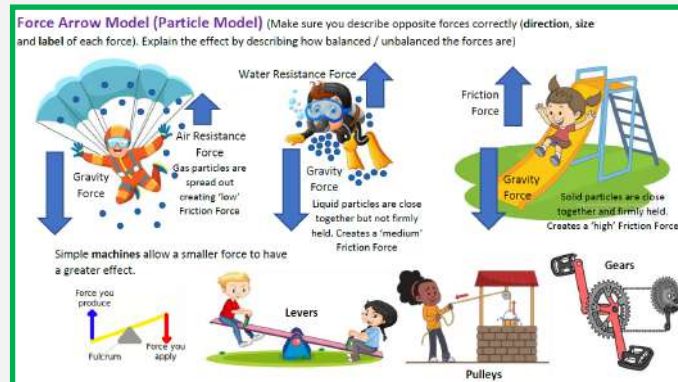
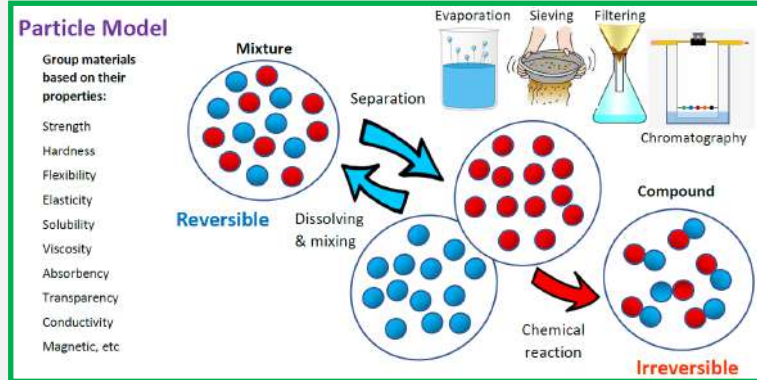
# SCIENCE CURRICULUM



## TOPICS OF STUDY FOR YEAR 5

EARTH AND SPACE: BIG PICTURE ANIMALS INCLUDING HUMANS: KINGDOMS LIVING THINGS AND THEIR HABITATS: KINGDOMS PROPERTIES OF MATERIALS: PARTICLE FORCES: FORCE

## CONCEPTUAL MODELS FOR YEAR 5



## DISCIPLINARY KNOWLEDGE AND SCIENTIFIC ENQUIRY:

# YEAR 5

### How we 'work' and 'think' like a Scientist.

#### EXPLAINING SCIENCE

- I show clear knowledge and understanding of science ideas and concepts.
- I begin to use complex science words correctly.
- I use science models to describe and begin to explain (why, how).
- I begin to draw and annotate my own diagrams.
- I select and prioritise facts to create an argument/answer.

#### CLASSIFICATION

- I construct spider and number keys.
- I group and sub group by easy observation (create criteria).
- I explain how properties suit an application.

#### DESIGNING EXPERIMENTS

- I use knowledge and understanding to explain my prediction (relationship).
- I select equipment with the right scale for the task (supported).
- I begin to plan to minimise risk and work safely (consistently).
- I plan a fair test and ensure controlled variables are kept the same.
- I suggest a data range, interval and sufficient readings.
- I design and write an ordered method (controls variables).

#### DATA, TABLES AND GRAPHS

- I measure divisions on a number line past zero (-ve values).
- I measure/convert values in standard units (inc, area).
- I use a frame to construct a complex table of results.
- I use a frame to construct a graph and can scale axes (supported).
- I join plotted co-ordinates with straight lines.

#### MAKING CONCLUSIONS

- I describe patterns, trends and relationships in data.
- I spot anomalous data that doesn't fit the pattern.
- I use data in my conclusions and use science to explain.
- I identify strengths, weaknesses and improvements.

KEY OBJECTIVES (STATUTORY)		KEY SKILLS OBJECTIVES		VOCABULARY
<ul style="list-style-type: none"><li>Describe the movement of the earth and other planets relative to the sun in the solar system.</li></ul>	<p><u>EXPLAINING SCIENCE</u></p> <p>⇒ Use and apply simple science words correctly.</p> <p>⇒ Use complex science words correctly.</p> <p>⇒ Begin to use knowledge of energy transfer to describe what and where.</p> <p>⇒ Use knowledge of energy transfer to describe and explain why and how.</p> <p>⇒ Annotate diagrams to help describe.</p> <p>⇒ Draw and annotate diagrams.</p>	<p><u>MAKING CONCLUSIONS</u></p> <p>⇒ Describe simple patterns, trends and relationships.</p> <p>⇒ Describe patterns, trends and relationships.</p>	Solar system, sun, star, planet, Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, Pluto, Asteroids, moon, orbit, ellipses, gravity force, temperature, solid, liquid, gas, axis, tilted axis, day, night, month, year, satellite, atmosphere, surface, new moon, full moon, quarter moon, waxing, waning, crescent, gibbous, energy, transfer, Universe, telescope, astronomy, pattern, data, primary data, secondary data, trend, relationship, conclusion, valid (validity).	
<ul style="list-style-type: none"><li>Describe the movement of the moon relative to the earth.</li></ul>				
<ul style="list-style-type: none"><li>Describe the sun, earth and moon as approximately spherical bodies.</li></ul>				
<ul style="list-style-type: none"><li>Use the idea of the earth’s rotation to explain day and night and the apparent movement of the sun across the sky.</li></ul>				
PRIOR LEARNING		KEY CONCEPTUAL KNOWLEDGE AND UNDERSTANDING		
<p><b>Y1: Seasonal Changes:</b> Learn about the changes across the four seasons. Look at how the length of the day varies according to seasons.</p> <p><b>Y3: Light :</b> Learn about different types of artificial and natural light sources. Understand that different sources transfer different quantities of light energy. Explore materials that reflect light and use a sensor to measure reflected light. Know the terms opaque, translucent and transparent and how the transfer of light energy differs when it is transmitted through materials with these different properties. Learn about and investigate shadows. Understand how to protect eyes and skin from light.</p> <p><b>Y5: Forces:</b> Learn that unsupported objects fall towards earth because of gravitational forces acting between earth and the falling object. Air resistance force (gas) water resistance force (liquid) and friction force (solid) act between moving surfaces. When air particles hit a moving object it creates air resistance. The shape of an object affects its air resistance. Levers, pulleys and gears allow a smaller force to have a greater effect.</p>	<p><u>EARTH AND SPACE: ENERGY TRANSFER/FORCES</u></p> <p>⇒ There are four seasons within a year.</p> <p>⇒ During the different seasons, the length of our days and nights gets longer and shorter depending on the time of year. This means long days of sunlight during the summer and shorter, darker days during the winter.</p> <p>⇒ The sun provides heat and light energy.</p> <p>⇒ The sun is a source of heat and light energy which will transfer to the facing Earth’s surface or will reflect off the Moon to the Earth’s surface.</p> <p>⇒ The sun, planets and moon(s) are spherical bodies.</p> <p>⇒ The Earth and other planets orbit the sun in the solar system; day and night are caused by the Earth’s rotation (sun appears to move across the sky).</p> <p>⇒ The Moon is a non-luminous, reflective object.</p> <p>⇒ The Moon orbits the Earth.</p> <p>⇒ There are different phases of the Moon (new moon to full moon).</p> <p>⇒ Forces are the things that allow the movement of all objects around us. Gravity is a force.</p> <p>⇒ The Moon has gravity of its own which pulls the oceans (and us) towards it. Gravity is weaker on the Moon because it’s much smaller in size than Earth.</p>			

### PRIOR LEARNING LINKS

**Y1: Seasonal Changes:** Learn about seasonal changes. Look at how the length of the day varies.

**Y3: Light :** Artificial and natural light sources. Different sources transfer different quantities of light energy. Know the terms opaque, translucent and transparent.

**Y5: Forces:** Unsupported objects fall towards Earth because of gravitational force acting between Earth and the falling object.

## Year 5 Science

### Unit of Learning:

### Earth and Space

### Teaching and Learning Sequence for this Unit.

### FUTURE LEARNING LINKS:

**KS3 Science:** Learn more about the solar system and that the solar system is part of a galaxy which in turn is part of the universe. Learn that the Earth travels through space and through time and that it is part of the solar system with a star called the Sun at the centre.

#### What is the solar system like?

Can we draw, annotate and explain a model of the solar system?

#### Key Skill:

Annotate diagrams to help describe and explain.

#### Why does the sun appear to move across the sky?

Does the amount of energy the sun transfers change during the day?

#### Key Skill:

Describe patterns, trends and relationships.

#### Why do we have day and night?

Can we make models to explain day and night?

#### Key Skill:

Use knowledge of science to describe and explain.

#### What are the phases of the moon?

Can we draw and annotate a diagram to explain the phases of the moon?

#### Key Skill:

Annotate diagrams to help describe and explain.

#### Can we explore the solar system through a research activity?

Moon landings?  
Space stations?  
Rockets?  
Life on Mars?

#### Key Skill:

Use knowledge and understanding to describe/explain.

### Key Learning Objectives:

- Describe the movement of the Earth, and other planets relative to the Sun in the solar system.
- Describe the movement of the Moon relative to the Earth.
- Describe the Sun, Earth and Moon as approximately spherical bodies.
- Use the idea of the Earth's rotation to explain day and night and the apparent movement of the Sun across the sky.

### Key Conceptual Knowledge and Understanding - Energy Transfer/Big Picture/Forces

- The sun is a source of light energy which will transfer to the facing Earth's surface or will reflect off the Moon to the Earth's surface.
- The sun, planets and moon(s) are spherical bodies.
- The Earth and other planets orbit the sun in the solar system; day and night are caused by the Earth's rotation (sun appears to move across the sky).
- The Moon is a non-luminous, reflective object.
- The Moon orbits the Earth.
- There are different phases of the Moon (new moon to full moon);
- **Forces are the things that allow the movement of all objects around us. Gravity is a force**
- The Moon has gravity of its own which pulls the oceans (and us) towards it.
- Gravity is weaker on the Moon because it's much smaller in size than Earth.



KEY OBJECTIVES (STATUTORY)	KEY SKILLS OBJECTIVES		VOCABULARY
<ul style="list-style-type: none"> <li>Describe the changes as humans develop to old age.</li> </ul>	<p><b><u>EXPLAINING SCIENCE</u></b></p> <ul style="list-style-type: none"> <li>⇒ Use and apply simple science words correctly.</li> <li>⇒ Use complex science words correctly.</li> <li>⇒ Begin to use knowledge of science to describe what and where</li> <li>⇒ Use knowledge of science to describe and explain why and how.</li> <li>⇒ Annotate diagrams to help describe.</li> <li>⇒ Draw and annotate diagrams.</li> </ul>	<p><b><u>DATA, TABLES AND GRAPHS</u></b></p> <ul style="list-style-type: none"> <li>⇒ Measure and convert standards units.</li> <li>⇒ Measure and convert standard units.</li> <li>⇒ Construct a simple table to compare cause and effect.</li> <li>⇒ Use a frame to construct a complex table of results.</li> <li>⇒ Construct bar charts correctly.</li> <li>⇒ Construct charts and graphs.</li> </ul>	Baby, toddler, child, adolescent, adult, geriatric, growth, puberty, fertilisation, gestation, birth, egg, sperm, gamete, embryo, foetus, periods, pubic hair, testicle, scrotum, penis, vagina, vulva, cervix, uterus, ovary, erection, intercourse, ejaculation, metamorphosis, table of results, cause, effect, repeats, bar chart, coordinate, graph, data point, scale, plot, mean, trend line.
PRIOR LEARNING	KEY CONCEPTUAL KNOWLEDGE AND UNDERSTANDING		
<p><b>Y2 Animals including Humans:</b> Learn about vertebrates and invertebrates. Describe all the things that animals can do (MRS GREN). Understand that all humans and animals have offspring that grow and change into adults. Learn that food, water and air are essential for survival and that healthy eating, exercise and hygiene are important lifestyle choices.</p> <p><b>Y3 Animals including Humans:</b> Learn about balanced diets and how animals and humans stay healthy. Learn about the function of the skeleton for support and growth and muscles for movement.</p>	<p><b><u>ANIMALS, INCLUDING HUMANS: KINGDOMS</u></b></p> <ul style="list-style-type: none"> <li>⇒ Animals grow and change; some animals look like their parents and others do not.</li> <li>⇒ Animals, including humans have offspring that grow into adults.</li> <li>⇒ Humans also grow and change; there are six stages of human maturation: baby, toddler, child, teenager, adult and older adult.</li> <li>⇒ Gestation is the growth and development of a baby before it is born. It follows the pattern of fertilisation, growth in the womb and birth.</li> <li>⇒ The womb is the organ in a female that the unborn baby grows and develops in.</li> <li>⇒ An embryo is the name for an unborn human in the earliest stages of growth.</li> <li>⇒ A foetus is the name for a baby when it is 8 weeks old in the womb.</li> <li>⇒ The human gestation period lasts about 40 weeks.</li> <li>⇒ Adolescence is when children start changing into an adult; puberty is the start of adolescence.</li> <li>⇒ Girls start to develop earlier than boys at around 11 years old.</li> <li>⇒ Boys start to change around 12-13 years old.</li> <li>⇒ Girls and boys start to develop pubic hair and underarm hair and girls start to develop breasts.</li> <li>⇒ Girls and boys can develop spots as their skins adjusts.</li> <li>⇒ Gestation periods of mammals differ, as do the average number of offspring and the lifespan of the mammal.</li> </ul>		

### PRIOR LEARNING LINKS

#### Y2 Animals including Humans:

Understand that all humans and animals have offspring that grow and change into adults. Learn that food, water and air are essential for survival and that healthy eating, exercise and hygiene are important lifestyle choices.

#### Y3 Animals, including Humans:

Balanced diet and features of healthy lifestyle. Function of the skeleton for support and growth.

## Year 5 Science

### Unit of Learning:

### Animals, including Humans

### Teaching and Learning Sequence for this Unit.

### FUTURE LEARNING LINKS

#### Y6 Animals, including humans:

Identify parts of the human circulatory system. Functions of the heart, blood vessels and blood. Impact of diet, exercise and drugs on our bodies. How nutrients and water are transported within animals, including humans.

#### What is the human timeline?

What are the different stages?

When do they begin and end?

#### Key Skill:

Annotate diagrams to help describe and explain.

#### What happens to our bodies as we get older?

What happens to bone length as we get older?

Do different parts of the body grow at different speeds?

#### Key Skill:

Construct complex tables.

#### How do we change into adults?

What happens during puberty?

#### Key Skill:

Use complex science words.

#### How does human and animal lifespan compare?

Do all animals follow the same pattern of gestation?

#### Key Skill:

Annotate diagrams to help describe and explain.

### Key Learning

#### Objectives:

- Describe the changes as humans develop to old age.

### Key Conceptual Knowledge and Understanding-Human Life Cycle

- ⇒ Animals grow and change; some animals look like their parents and others do not.
- ⇒ Animals, including humans have offspring that grow into adults.
- ⇒ Humans also grow and change; there are six stages of human maturation: baby, toddler, child, teenager, adult and older adult.
- ⇒ Gestation is the growth and development of a baby before it is born. It follows the pattern of fertilisation, growth in the womb and birth.
- ⇒ The womb is the organ in a female that the unborn baby grows and develops in.
- ⇒ An embryo is the name for an unborn human in the earliest stages of growth.
- ⇒ A foetus is the name for a baby when it is 8 weeks old in the womb.
- ⇒ The human gestation period lasts about 40 weeks.
- ⇒ Adolescence is when children start changing into an adult; puberty is the start of adolescence.
- ⇒ Girls start to develop earlier than boys at around 11 years old.
- ⇒ Boys start to change around 12-13 years old.
- ⇒ Girls and boys start to develop pubic hair and underarm hair and girls start to develop breasts.
- ⇒ Girls and boys can develop spots as their skins adjust.
- ⇒ Gestation periods of mammals differ, as do the average number of offspring and the lifespan of the mammal.

## KEY OBJECTIVES (STATUTORY)

- Describe the differences in the lifecycles of a mammal, an amphibian, an insect and a bird.
- Describe the process of reproduction in some plants and animals.

EXPLAINING SCIENCE

- ⇒ Use and apply simple science words correctly.
- ⇒ Use complex science words correctly.
- ⇒ Use knowledge of living things to describe what and where.
- ⇒ Use knowledge of living things to describe and explain why and how.
- ⇒ Annotate diagrams to help describe.
- ⇒ Draw and annotate diagrams.

CLASSIFICATION

- ⇒ Create appropriate groups for sorting (create criteria).
- ⇒ Group and sub-group by easy observation (create criteria).

## KEY SKILLS OBJECTIVES

DESIGNING EXPERIMENTS

- ⇒ Predict a trend (relationship prediction).
- ⇒ Use knowledge and understanding to explain a prediction (relationship prediction).
- ⇒ Plan a fair test by selecting a variable to change and measure.
- ⇒ Plan a fair test and ensure controlled variables are kept the same.
- ⇒ Design and write a simple ordered method (from plan).
- ⇒ Design and write an ordered method (controls variables).

## VOCABULARY

Sexual, asexual, growth, metamorphosis, puberty, reproduction, fertilisation (internal / external), gamete, egg, sperm, embryo, foetus, larva, pupa (chrysalis), testes, uterus, gestation, birth, petals, sepals, carpel, stigma, ovary, anther, stamen, pollen, pollination, dispersal, vegetative, bulb, runner, tuber, rhizome, corm, stem, root, variation, clone, independent variable, dependent variable, controlled variable, data range, data interval, repetition, reliability, risk, relationship prediction, hypothesis, method, scale.

## PRIOR LEARNING

**Y2 Living Things and Habitats:** Learn about the characteristics of living things and things that are living, dead and not living. Learn why specific plants and animals may live in particular habitats. Learn about food chains and the impact of a part being taken away.

**Y3 Plants:** Learn that the different parts of a plant have a particular function. Learn that flowers support reproduction through pollination, seed formation and seed dispersal.

**Y4 Living Things and Habitats:** Learn about finer classification-vertebrates and invertebrates, non-flowering and flowering plants and trees and use them to classify. Learn about different kinds of plant reproduction— seed and spores. Learn about local habitats and what makes a healthy ecosystem. Links in with Y4 Geography through looking at negative human-environment interactions that impact habitats.

## KEY CONCEPTUAL KNOWLEDGE AND UNDERSTANDING

- ⇒ Mammals are warm-blooded, have skin, hair or fur, give birth to live young and breathe air; humans are mammals.
- ⇒ Birds are warm-blooded, have skin, feathers, beaks and wings, lay eggs and breathe air.
- ⇒ Amphibians are cold-blooded, have slimy skin, lay soft eggs and most can breathe underwater and on land.
- ⇒ Reptiles are cold-blooded, have scaly skin, lay harder eggs and breathe air.
- ⇒ Fish are cold-blooded, have fins and scales, lay soft eggs in water and breathe underwater.
- ⇒ Living things can be divided or sorted into different groups using a classification key.
- ⇒ A classification key is a series of questions to identify a living thing and can unlock the identity of it.
- ⇒ Animals can be divided into vertebrates and invertebrates and plants can be divided into flowering or non-flowering, in order to classify them.
- ⇒ Flowering plants reproduce using flowers to make seeds; non-flowering plants reproduce using spores and seed cones.
- ⇒ Spores are minute organisms that do not need fertilisation to grow into a new individual.
- ⇒ A community of **animals, plants and microorganisms**, together with their **habitat** is called an **ecosystem**.
- ⇒ A lifecycle is the different stages of life for all living things, including humans.
- ⇒ There are normally four major events in the lifecycle of animals: birth-growth-reproduction and death.
- ⇒ There are similarities and differences between the lifecycles of mammals, amphibians, birds and insects.
- ⇒ Insects and amphibians go through a transformational change called metamorphosis.
- ⇒ Reproduction in living things is varied. Some reproduce asexually, whilst others reproduce sexually. Some plants and a few animals can reproduce asexually and sexually.
- ⇒ Sexual reproduction produces variation within a species, due to the combination of male and female cells, whereas asexual reproduction makes an identical copy of the animal or plant.
- ⇒ Only very few animals reproduce sexually and asexually. Many plants use asexual reproduction as an efficient and fast way to populate.



### PRIOR LEARNING LINKS

**Y3 Plants:** The different parts of a plant have a particular function. Flowers support reproduction through pollination, seed formation and seed dispersal  
**Y4 Living Things and Habitats:** Learn about finer classification-vertebrates and invertebrates, non-flowering and flowering plants and trees and used them to classify. Learn about different types of plant reproduction-seed and spores.

## Year 5 Science

### Unit of Learning:

## Living Things & Their Habitats

### FUTURE LEARNING LINKS:

#### Y6 Living Things and their Habitats:

Learn about micro-organisms. Learn how living things are classified based on similarities and differences, including micro-organisms, plants and animals.

### Teaching and Learning Sequence for this Unit.

#### What is the difference between a mammal and an amphibian?

Can we list and match what is similar?

Can we notice and deduce what is different?

#### Key Skill:

Group & sub-group by fine observations.

#### What is the difference between an insect and a bird?

Can we list and match what is similar?

Can we notice and deduce what is different?

#### Key Skill:

Group & sub-group by fine observations.

#### What is similar/different between the lifecycles of a mammal, an insect, an amphibian and a bird?

#### Key Skill

Categorise, compare, contrast and deduce to draw conclusions.

#### How do living things reproduce?

What are the differences between asexual and sexual reproduction?

#### Key Skill

Use knowledge of science to describe/explain.

#### Can we investigate reproduction in plants?

Does wind speed affect how far pollen is blown?

#### Key Skill

Plan a fair test  
Write an ordered

### Key Learning Objectives:

- Describe the differences in the lifecycles of a mammal, an amphibian, an insect and a bird.
- Describe the process of reproduction in some plants and animals.

### Key Conceptual Knowledge and Understanding

#### REFER TO 'TEACH IT' FOR PRIOR KNOWLEDGE

- ⇒ A lifecycle is the different stages of life for all living things, including humans.
- ⇒ There are normally four major events in the lifecycle of animals: birth-growth-reproduction and death.
- ⇒ There are similarities and differences between the lifecycles of mammals, amphibians, birds and insects.
- ⇒ Insects and amphibians go through a transformational change called metamorphosis.
- ⇒ Reproduction in living things is varied. Some reproduce asexually, whilst others reproduce sexually. Some plants and a few animals can reproduce asexually and sexually.
- ⇒ Sexual reproduction produces variation within a species, due to the combination of male and female cells, whereas asexual reproduction makes an identical copy of the animal or plant.
- ⇒ Only very few animals reproduce sexually and asexually. Many plants use asexual reproduction as an efficient and fast way to populate.

KEY OBJECTIVES (STATUTORY)	KEY SKILLS OBJECTIVES		VOCABULARY
<ul style="list-style-type: none"> <li>Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets.</li> <li>Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution.</li> <li>Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating.</li> <li>Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic.</li> <li>Demonstrate that dissolving, mixing and changes of state are reversible changes.</li> <li>Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate of soda.</li> </ul>	<p><b><u>EXPLAINING SCIENCE</u></b></p> <ul style="list-style-type: none"> <li>⇒ Use and apply simple science words correctly.</li> <li>⇒ Use complex science words correctly.</li> <li>⇒ Use knowledge of particles to describe what and where.</li> <li>⇒ Use knowledge of particles to describe and explain why and how.</li> <li>⇒ Annotate diagrams to help describe.</li> <li>⇒ Draw and annotate diagrams.</li> </ul> <p><b><u>CLASSIFICATION</u></b></p> <ul style="list-style-type: none"> <li>⇒ Describe combined properties required for an application.</li> <li>⇒ Explain how properties suit an application.</li> </ul>	<p><b><u>DESIGNING EXPERIMENTS</u></b></p> <ul style="list-style-type: none"> <li>⇒ Select and use suitable equipment;</li> <li>⇒ Select suitable equipment with the most appropriate scale for the task.</li> <li>⇒ Plan a fair test by selecting variables to change and measure.</li> <li>⇒ Plan a fair test and ensure that controlled variables are kept the same.</li> <li>⇒ Collect sufficient repeat readings.</li> </ul>	<p>Material, particle, substance, mixture, compound, state, solid, liquid, gas, melting, boiling, evaporation, condensation, freezing, energy, attraction, dissolve (dissolving), solute, solvent, soluble (solubility), insoluble, opaque, translucent, transparent (transparency), conductive (conductivity), insulating (insulation), heat, temperature, thermal, flexible (flexibility), rigid (rigidity), elastic (elasticity), absorbent (absorbency), magnetic, filtration, sieving, permeable (permeability), chromatography, chemical, physical, reaction, bond (bonded), combined, reversible, irreversible, variable, cause, effect, independent variable, dependent variable, controlled variable, data range, data interval, repetition, reliability, risk, relationship prediction, hypothesis, method.</p>
PRIOR LEARNING	KEY CONCEPTUAL KNOWLEDGE AND UNDERSTANDING		
<p><b>Y2 Uses of Everyday Materials:</b> Recap common everyday materials and their basic properties. Compare the suitability of different materials for particular purposes. Investigate how the shape of solid objects can be changed by twisting, bending etc.</p> <p><b>Y3 Rocks:</b> Compare and group together different kinds of rocks; understand rock and fossil formation. Learn about soil.</p> <p><b>Y4 States of Matter:</b> Learn about other states of matter, as well as solids e.g. liquids and gases. Learn about the particles within them and their energy levels. Know about the effects of heating and cooling on particles and how changes of state can occur. Learn about evaporation, condensation and the Water cycle</p>	<ul style="list-style-type: none"> <li>⇒ Particles are in constant motion.</li> <li>⇒ They move because they have energy.</li> <li>⇒ The more energy they have, the more movement and the less energy they have, the less movement.</li> <li>⇒ The particles in a solid have much less energy and can only vibrate, which holds their fixed position.</li> <li>⇒ The particles in a liquid have more energy than a solid, they move more quickly but still pack closely together and flow over each other.</li> <li>⇒ The particles in a gas have the most energy and therefore move very quickly so they collide and spread out.</li> <li>⇒ Heating particles results in more energy and more movement and leads to a change of state.</li> <li>⇒ Cooling particles results in less energy and less movement and also leads to a change of state.</li> <li>⇒ A mixture is a combination of two types of particle. The particles show little attraction for each other and therefore can be separated by filtering or sieving-a reversible change.</li> <li>⇒ A solution occurs when the particles in a substance get pulled apart by the water particles because there is more attraction (dissolving). Because of this they can only be separated by evaporation and chromatography (KS3)-also a reversible change.</li> </ul>		

### PRIOR LEARNING LINKS

**Y2 Uses of Everyday Materials:** Recap on common everyday materials and their basic properties. Compare the suitability of different materials for particular purposes based on their properties. Investigate how the shape of solid objects can be changed by twisting, bending etc.

**Y4 States of Matter:** Learn about other states of matter, as well as solids e.g. liquids and gases. Learn about the particles within them and their energy levels. Know about the effects of heating and cooling on particles and how changes of can occur. Learn about evaporation, condensation and the water cycle.

## Year 5 Science

### Unit of Learning:

### Properties & Changes of Materials

### FUTURE LEARNING LINKS

**KS3 Science:** Learn about the properties and uses of composites, polymers and ceramics. Learn about the properties of different metals.

### Teaching and Learning Sequence for this Unit.

#### How does a material's property suit its role?

Are some materials more transparent than others?  
Which material absorbs the most heat?

##### Key Skill:

Plan a fair test.  
Explain how properties suit and application.

#### What does soluble mean?

How can we find out which materials form solutions and which form mixtures?  
What is the difference?

##### Key Skill:

Use knowledge of particles to describe and explain.

#### How can mixtures be separated?

What do we know about the particles in a mixture?  
What techniques are there for separating mixtures?

##### Key Skill:

Use knowledge of particles to describe and explain.

#### How can solutions be separated?

What do we know about the particles in a solution?  
What techniques are there for separating solutions?

##### Key Skill:

Use knowledge of particles to describe and explain.

#### Which changes cannot be reversed and why?

What happens when:  
An egg is heated?  
Bicarbonate of soda and vinegar are mixed?

##### Key Skill:

Select appropriate equipment with the right scale.

### Key Learning Objectives:

- Compare and group together everyday materials on the basis of their properties, including their hardness, solubility, transparency, conductivity (electrical and thermal), and response to magnets.
- Know that some materials will dissolve in liquid to form a solution, and describe how to recover a substance from a solution.
- Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating.
- Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic.
- Demonstrate that dissolving, mixing and changes of state are reversible changes.
- Explain that some changes result in the formation of new materials, and that this kind of change is not usually reversible, including changes associated with burning and the action of acid on bicarbonate soda.

### Key Conceptual Knowledge and Understanding

- Particles are in constant motion; they move because they have energy.
- The more energy they have, the more movement and the less energy they have, the less movement.
- Particles have attraction to each other.
- The particles in a solid have much less energy than in a liquid or gas. They are held strongly by the attraction. The particles only vibrate, which holds their fixed position.
- The particles in a liquid have less energy than a gas; they can feel the attraction and pack closely together but they move more quickly and therefore flow over each other.
- The particles in a gas have a lot of energy so are travelling too fast to 'feel' the attraction, because of this they move very quickly so collide and spread out.
- Heating particles results in more energy and more movement and leads to a change of state.
- Cooling particles results in less energy and less movement and also leads to a change of state.
- A mixture is a combination of two types of particle. The particles show little attraction for each other and therefore can be separated by filtering or sieving-a reversible change.
- A solution occurs when the particles in a substance get pulled apart by the water particles because there is more attraction (dissolving). Because of this they can only be separated by evaporation and chromatography (KS3)-also a reversible **change**.

## KEY OBJECTIVES (STATUTORY)

- Explain that unsupported objects fall towards the Earth because of the force of gravity acting between the Earth and the falling object.
- Identify the effects of air resistance, water resistance and friction, that act between moving surfaces.
- Recognise that some mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.

## KEY SKILLS OBJECTIVES

EXPLAINING SCIENCE

- ⇒ Use and apply simple science words correctly.
- ⇒ Use complex science words correctly.
- ⇒ Use knowledge of forces to describe what and where.
- ⇒ Use knowledge of forces to describe and explain why and how.
- ⇒ Annotate diagrams to help describe.
- ⇒ Draw and annotate diagrams.

DATA, TABLES AND GRAPHS

- ⇒ Construct a simple table of results.
- ⇒ Use a frame to construct a complex table of results.
- ⇒ Construct a bar chart correctly.
- ⇒ Use a frame to construct a graph and scale axes.
- ⇒ Plot co-ordinates on a graph.
- ⇒ Join plotted co-ordinates with straight lines.

## VOCABULARY

Force, force arrow, contact force, non-contact force, push force, pull force, twist force, friction force, up thrust force, reaction force, gravity force, air resistance force, water resistance force, particle, solid, liquid, gas, balanced, unbalanced, resultant force, force meter, Newton (N), mass, weight, machine, lever (type 1,2 & 3), pivot, fulcrum, effort, load, pulley, mechanical advantage, force multiplier, gear, cog, turning force, speed, acceleration, table of results, cause, effect, repeats, bar chart, bar, coordinate, graph, data point, extrapolate, scale, plot, mean, trend line.

## PRIOR LEARNING

**EYFS Foundations for Science:** Explore and talk about simple forces that they can feel. Recognise a push or a pull as a force needed to move an object. Investigate simple forces, exploring how to push objects further /push or pull heavier objects, with more force. Explore magnets through continuous provision.

**Y2: Uses of Everyday Materials:** Investigate how the shape of solid objects can be changed by twisting, bending etc.

**Y3: Forces and Magnets:** Learn about contact and non-contact forces. Introduce the use of labels and arrows to identify the type of force and its size and direction. Use a Newton meter to measure the size of a force. Learnt about the concept of gravity and carry out investigations. Learn about magnetic forces- attract /repel and the two poles on magnets and how these coincide with the Earth's poles. Explore magnetic and non-magnetic materials.

## KEY CONCEPTUAL KNOWLEDGE AND UNDERSTANDING

FORCES

- ⇒ There are different types of forces: a push force, a pull force, a gravitational force (an air resistance force, water resistance force and friction force-Y5).
- ⇒ Some forces need contact (contact forces) between two objects and some forces act at a distance (non-contact forces).
- ⇒ The type of force should be identified using a label; the size and direction of a force can be shown using an arrow. The length of the arrow determines the size of the force; if arrows are of equal length then the forces will be equal in size. The direction of an arrow determines in which direction the force is acting.
- ⇒ When forces are balanced, they cancel each other out, resulting in no change in motion for the object they are acting on. Unbalanced forces do not cancel each other out, and result in a change in motion for the object they are acting on.
- ⇒ Magnets attract and repel each other. Magnets have two poles which coincide with the Earth's poles.
- ⇒ Materials can be grouped together based upon whether they are attracted to a magnet (magnetic) or not.
- ⇒ Opposing forces can be in balance or unbalanced.
- ⇒ Unsupported objects fall towards Earth because of gravitational force acting between earth and the falling object.
- ⇒ Air resistance force (gas) water resistance force (liquid) and friction force (solid) act between moving surfaces.

### PRIOR LEARNING LINKS

#### Y2: Uses of Everyday Materials:

Investigate how the shape of solid objects can be changed by twisting, bending etc.

**Y3: Forces and Magnets:** Learnt about contact and non-contact forces. Introduced to the use of labels and arrows to identify the type of force and its size and direction. Used a Newton meter to measure the size of a force. Learnt about the concept of gravity and carried out investigations. Learnt about magnetic forces-attract /repel and the two poles on magnets. Explored magnetic and non-magnetic materials.

### FUTURE LEARNING LINKS

**KS3 Science:** Learn more about the different types of forces and learn about Scalars and vectors.

## Year 5 Science

### Unit of Learning:

## Forces

### Teaching and Learning Sequence for this Unit.

#### What do we already know about contact forces?

Can we explore push/pulls of different weights using a force meter?

#### Key Skill:

Construct a complex table.

#### What is the effect of friction?

How can we move a box more easily? What can we use (wheels, rollers, lubricants)? Can we describe the effect of friction?

#### Key Skill:

Use knowledge of forces to describe and explain.

#### What is the effect of air resistance?

How do air particles make it difficult for objects to move through air? How does the size and shape of the object affect this?

#### Key Skill:

Use knowledge of forces to describe and explain.

#### What do already know about non-contact forces?

How can we stop an egg hitting the ground when we drop it from a height? (Use of elasticated material) How could we describe the forces at work?

#### Key Skill:

Construct a graph.

#### What is up-thrust?

What happens when you try to push a balloon underwater?

What shape of boat is the most buoyant?

#### Key Skill:

Construct a graph.

#### What is a machine?

What is a lever and what does it do?

How does the length of the lever affect the force needed to lift a load?

#### Key Skill:

Construct a graph.

### Key Learning Objectives:

- Explain that unsupported objects fall towards the earth because of the force of gravity acting between the earth and the falling object.
- Identify the effects of air resistance, water resistance and friction that act between moving surfaces.
- Recognise that some mechanism including, levers, pulleys and gears, allow a smaller force to have a greater effect.

### Key Conceptual Knowledge and Understanding-Energy Transfer/Big Picture/Forces

- There are different types of forces: a push force, a pull force, a gravity force (an air resistance force, water resistance force and friction force-Y5).
- Some forces need contact (contact forces) between two objects and some forces act at a distance (non-contact forces)
- The type of force should be identified using a label; the size and direction of a force can be shown using an arrow. The length of the arrow determines the size of the force; if arrows are of equal length then the forces will be equal in size. The direction of an arrow determines in which direction the force is acting.
- Magnets attract and repel each other. Magnets have two poles.
- Materials can be grouped together based upon whether they are attracted to a magnet (magnetic) or not.
- When forces are balanced, they cancel each other out, resulting in no change in motion for the object they are acting on. Unbalanced forces do not cancel each other out, and result in a change in motion for the object they are acting on.
- Unsupported objects fall towards earth because of gravity force acting between earth and the falling object.
- Air resistance force (gas) water resistance force (liquid) and friction force (solid) act between moving surfaces.
- When air particles hit a moving object it creates air resistance. The shape of an object affects its air resistance.
- Levers, pulleys and gears allow a smaller force to have a greater effect.



CHILDREN SHOULD BE SUPPORTED TO DEVELOP THEIR UNDERSTANDING OF SCIENTIFIC IDEAS BY USING DIFFERENT TYPES OF SCIENTIFIC ENQUIRY THROUGHOUT ALL TEACHING.

## WORKING SCIENTIFICALLY

During Years 5 and 6, pupils should be taught to use the following practical scientific methods, processes and skills through the teaching of the programmes 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.

## POSSIBLE SCIENTIFIC INVESTIGATIONS:

### Living Things and Their Habitats:

- How can we grow new plants from different parts of the parent plant, for example, seeds, stem and root cuttings, tubers, bulbs?
- What changes occur in animals over a period of time (for example, by hatching and rearing chicks)?
- Do all animals reproduce and grow in the same way?
- What is the same and what is different about the life cycles of plants and animals in their local environment and how does this compare with other plants and animals around the world (in the rainforest, in the oceans, in desert areas and in prehistoric times)?

### Properties and Changes of Materials:

- Does it take more time for an ice cube to melt or for water to freeze and make an ice cube? (same size and shape).
- How could we separate different size materials (sieving, filtering, evaporation)?
- Which materials would be the most effective for different purposes e.g. for making a warm jacket, for wrapping ice cream to stop it melting, or for making blackout curtains?
- What are the best materials to make a switch in a circuit.
- What changes take place when a material is exposed to heat (burning different materials or baking bread or cakes)?

### Earth and Space:

- Does the moon change shape?
- Does the sun move across the sky?
- What is it like at the same time of the day at different places on the Earth? (internet links and direct communication)
- How have structures such as Stonehenge been used as astronomical clocks?

### Forces:

- What can change the effect of friction?
- What does air resistance feel like?
- How does increasing the speed affect air resistance?
- What happens if you reduce the surface area?
- What causes resistance in water? (testing boats of different shapes).

### Animals, including Humans:

- How do the gestation periods of other animals compare to humans?