Year 5 Science Curriculum

Autumn Term

Earth and Space

National Curriculum Objectives

Describe the movement of the Earth, and the other planets, relative to the Sun in the solar system. (1)
Describe the movement of the Moon relative to the Earth. (2)
Describe the Sun, Earth and Moon as approximately spherical bodies. (3)
Use the idea of the Earth's rotation to explain day and night and the apparent movement of the sun across the sky. (4)
Providing further depth and breadth of understanding (5)

Direct Knowledge

All knowledge linked to prior learning
that the Sun, Earth and Moon are approximately spherical bodies. **(3)**
that the Sun and Moon appear similar in size in the sky due to the distance from Earth that each of them is (perspective). **(3)**
that the moon is approximately one quarter of the size of Earth. **(3)**
that the sun is approximately 110 times bigger than the Earth. **(3)**
that the Earth takes approximately 1 year to orbit the sun, rotating as it goes. **(1)**
that the Sun is at the centre of our solar system. **(1)**
that the moon takes approximately 28 days to orbit the Earth. **(2)**
that the different appearances of the moon over 28 days provide evidence of a 28-day cycle. **(2)**
that the Moon has different phases depending on where it is in its orbit. **(2)**
that each lunar month, the moon is unilluminated, this is called the new moon. **(2)**
that as the lunar month continues, more of the moon is illuminated by the sun until it becomes a full moon. **(2)**
that waxing occurs after a new moon and before a full moon, as more of the moon is illuminated. **(2)**
that waning occurs after a full moon and before a new moon, as less of the moon is illuminated. **(2)**
that the sun appears to move across the sky during the day, but in fact the Sun does not move. **(4)**
that it is the Earth that moves and not the sun. **(4)**
that as the Earth rotates, shadows that are formed change in size and orientation. **(4)**
that day and night is caused by the rotation of the Earth on its axis once every 24 hours. **(4)**
that different parts of the Earth experience daylight at different times. **(4)**
that it is daytime in the part of the Earth facing the sun. **(4)**
that it is night-time in the part of the Earth facing away from the sun. **(4)**
that the sun rises in the general direction of the east. **(4)**

that the sun sets in the general direction of the west. **(4)**
the solar system is made up of the sun and everything that orbits around it, including planets, moons, asteroids, comets and meteoroids. **(5)**
That there are 8 planets within our solar system, they are: Mercury, Venus, Earth, Mars, Jupiter, Saturn Uranus and Neptune. **(5)**
that our solar system is a small part of a galaxy called The Milky Way. **(5)**
that our solar system and galaxy are small parts of the entire universe, including the whole of space (all stars, planets, matter and energy). **(5)**
that the time at which the sun rises and sets changes depending on the time at which it is in the year. **(5)**
that because of the Earth's tilt, the poles experience 24 hours of sunlight in the summer, and very few hours of sunlight in the winter. **(5)**
that Earth's tilted axis causes the seasons. **(5)**
that when the North Pole tilts towards the Sun, it's summer in the Northern Hemisphere and winter in the Southern Hemisphere. **(5)**
that when the South Pole tilts towards the Sun, it's summer in the Southern Hemisphere and winter in the Northern Hemisphere. **(5)**

Common misconceptions

Some children may think:

• the Earth is flat

• the Sun is a planet

• the Sun rotates around the Earth

• the Sun moves across the sky during the day

• the Sun rises in the morning and sets in the evening

• the Moon appears only at night

• night is caused by the Moon getting in the way of the Sun or the Sun moving further away from the Earth.

Forces

National Curriculum 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 mechanisms, including levers, pulleys and gears, allow a smaller force to have a greater effect.
Providing further depth and breadth of understanding

Direct Knowledge

All knowledge linked to prior learning
that mass is how much matter is inside an object and it is measured in kilograms (kg). **(4)**

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that weight is how strongly gravity is pulling an object down. It is measured in newtons (N). **(4)**
that forces are always a 'push' or a 'pull'. **(4)**
that forces can make an object... **(4)** - start to move; stop moving; change direction; move faster; change shape; move more slowly
that the force of gravity pulls unsupported objects towards to centre of the Earth. **(1)**
that several forces may act on one object. **(1)**
that the direction of forces is represented by arrows. **(1)**
that air resistance may reduce the speed at which objects travel through the air. **(2)**
that air resistance acts in the opposite direction to the travelling object. **(2)**
that air resistance is reduced when a moving object is streamlined (and vice versa). **(2)**
that water resistance may reduce the speed at which objects travel through water. **(2)**
that water resistance acts in the opposite direction to the travelling object. **(2)**
that water resistance is reduced when a moving object is streamlined (and vice versa). **(2)**
that an object is buoyant (floats) because the weight of the object is equal to the upthrust. **(4)**
that friction may reduce the speed at which an object moves across a surface. **(2)**
that friction is reduced when surfaces moving across each other are smoother. **(2)**
that friction acts in the opposite direction to the motion of an object across the surface. **(2)**
that friction can be a useful force (i.e. car tyres). **(4)**
that pulleys can be used to make a small force lift a heavier load. **(3)**
that the more wheels in a pulley, the less force is needed to lift a weight. **(3)**
that gears or cogs can be used to change the speed, force or direction of a motion. **(3)**
that when two gears are connected, they always turn in the opposite direction to each other. **(3)**
that levers can be used to make a small force lift a heavier load. **(3)**
that a lever always rests on a pivot. **(3)**
that a spring can be used to return an object to its original position. **(3)**
that a spring can be stretched by pulling it or squashing by pushing it. **(3)**
that the greater the force pulling/pushing a spring, the greater the force the spring uses to return to its original shape. **(3)**

Common misconceptions

Some children may think:

• the heavier the object the faster it falls, because it has more gravity acting on it

• forces always act in pairs which are equal and opposite

• smooth surfaces have no friction

• objects always travel better on smooth surfaces

• a moving object has a force which is pushing it forwards and it stops when the pushing force wears out

• a non-moving object has no forces acting on it

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• heavy objects sink and light objects float.

Spring Term

Properties of Materials

National Curriculum 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. (1)
Know that some materials will dissolve in liquid to form a solution. (2)
Use knowledge of solids, liquids and gases to decide how mixtures might be separated, including through filtering, sieving and evaporating. (3)
Give reasons, based on evidence from comparative and fair tests, for the particular uses of everyday materials, including metals, wood and plastic. (4)
Demonstrate that dissolving, mixing and changes of state are reversible changes. (5)
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. (6)
Providing further depth and breadth of understanding

Direct Knowledge

All knowledge linked to prior learning
that materials have a range of physical properties. **(1)**
that hardness is the resistance of a material to deformation. **(1)**
that absorption is the process in which a material 'takes in' another substance. **(1)**
that transparency is the property of allowing light to pass through something (and therefore a person's ability to see through it). **(1)**
that an opaque material does not let light pass through it (and therefore a person cannot see through it). **(1)**
that a transparent material lets lots of light pass though it (and therefore a person can see though it easily). **(1)**
that a translucent material lets some light pass through it (and therefore a person can somewhat see through it). **(1)**
that a conductor is a material that heat or electricity can easily travel through. **(1)**
that an insulator is a material that does not let heat or electricity travel through it. **(1)**
that a good thermal insulator will not allow heat to pass through it easily, and vice versa **(1)**
that a good thermal conductor will allow heat to pass through it easily, and vice versa **(1)**
that metals are not good thermal insulators but wood and plastics are. **(1)**
that a good electrical insulator will not allow electivity to pass through it easily, and vice versa. **(1)**
that a good electrical conductor will allow electivity to pass through it easily, and vice versa **(1)**

that most metals are not good electrical insulators but wood and plastics are. **(1)**
that materials such as metals, which are good electrical conductors, are usually good thermal conductors. **(1)**
that magnetism is the force exerted by magnets when they attract or repel each other. **(1)**
that solubility is the ability of a substance (referred to as the solute) to dissolve in a solvent (usually a liquid) and form a clear solution (which may be coloured). **(2)**
that solids can be mixed with solids, and it is sometimes possible to separate them by sieving. **(3)**
that solids can be mixed with solids, and it is sometimes not possible to separate them by sieving. **(3)**
that solids can be mixed with liquids, and it is sometimes possible to separate them by filtration, which is similar to sieving. **(3)**
that solids can be mixed with liquids, and it is sometimes not possible to separate them by filtration. **(3)**
that when it is not possible to separate a solid and a liquid by filtration, this is because the solid is dissolved into the liquid to form a solution. **(3)**
that when solids will not dissolve into a liquid, this is **often** because the solid is insoluble or the liquid is saturated. **(7)**
that solutions can be separated using evaporation and condensation. **(3)**
that when a liquid evaporates from a solution, a solid is left behind. **(3)**
that mixing and dissolving are reversible changes, but some changes that occur when two substances are mixed cannot easily be reversed. **(5)**
that when acid is added to bicarbonate of soda, new substances are formed. **(6)**
that the changes that occur when acid is added to bicarbonate of soda are not reversible. **(6)**
that some changes result in the formation of new materials and this is not usually reversible. **(6)**
that when a material burns, new materials are formed. **(6)**
that the changes that occur when materials burn are not reversible. **(6)**
that burning is a hazardous process and the risks of doing so must be assessed and managed. **(7)**
that something hot will cool down and something cool will warm up until it is at the same temperature as its surroundings. **(7)**
that heating some materials can cause them to change. **(6)**
that cooling some materials can cause them to change. **(6)**
that materials changing state (as a result of heating / cooling) is a reversible change. **(5)**
that the sense of touch is not an accurate method of judging temperature. **(7)**
that a thermometer can be used to take accurate measurements of temperature. **(7)**

Common misconceptions

Lots of misconceptions exist around reversible and irreversible changes, including around the permanence or impermanence of the change. There is confusion between physical/chemical changes and reversible and irreversible changes. They do not correlate simply. Chemical changes result in a new material being formed. These are mostly irreversible. Physical changes are often reversible but may be permanent. These do not result in new materials e.g. cutting a loaf of bread. It is still bread, but it is no longer a loaf. The shape, but not the material, has been changed.

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Some children may think:

- thermal insulators keep cold in or out
- thermal insulators warm things up
- solids dissolved in liquids have vanished and so you cannot get them back
- lit candles only melt, which is a reversible change.

Living Things and Their Habitats

National Curriculum Objectives

Describe the differences in the life cycles of a mammal, an amphibian, an insect and a bird.
Describe the life process of reproduction in some plants and animals.
Providing further depth and breadth of understanding

Direct Knowledge

All knowledge linked to prior learning
that living organisms can reproduce sexually or asexually. (2)
that David Attenborough has contributed enormously to our knowledge of science by informing people of newly discovered species and animal behaviour. (2)
that most mammals give birth to their young, which are generally fully formed and resemble the adults. (1)
that the placenta, an organ attached to the mother's womb, allows the baby to stay inside the mother for much longer than in most animals. It carries out functions that the unborn baby cannot perform for itself. (1)
that mammals are unique amongst animals in producing milk, a mix of fat, protein and sugars. (1)
that a small group of mammals known as marsupials, which includes kangaroos and koalas, give birth to very undeveloped young. (1)
that reptile's young look like a small version of the adult and develop inside the egg, which has a hard, thin shell to protect them and stop them from drying out. (1)
that most reptile mothers leave the nest and the hatchlings must find their own food and shelter. (1)
that amphibian's young are born looking very different from the parents. (1)
that some amphibian and insect's young experience further changes before becoming adults e.g. caterpillars to butterflies. This is called a metamorphosis. (1)
that insects have a hard exoskeleton on the outside but begin life in a very different form. Most go through complete metamorphosis. (1)
that these morphological changes will equip the insect for its new lifestyle or habitat. (1)
that birds lay eggs with hard, waterproof shells, which they will incubate until hatched. (1)
that many plants can reproduce both sexually and asexually, but in animals, sexual reproduction is much more common than asexual. (2)
that in sexual reproduction, the genetic information from two parents mixes and the offspring are similar but not identical to the parents. (2)
that in asexual reproduction, only one parent is needed therefore there is no mixing of genetic information. (2)
that the offspring of an asexual plant is genetically identical to the parent and each other. (2)

that asexual reproduction may be an advantage to the organism under harsh environmental conditions when the lengthier and more complex process of sexual reproduction may fail. (3)
that asexual reproduction is used by farmers to create many crops with identical characteristics (such as planting potato tubers) (3)
that asexual reproduction does not always equip organisms well if conditions change significantly – all the offspring could die. (3)
that, unlike animals, pieces broken off from plants can grow into another individual organism. (2)
that gardeners may force plants to reproduce asexually by taking cuttings.
that flowers have the structure of a petal, anther, sepal, carpel, stigma, style, ovary, pollen grain, pollen tube and ovule. (2)
that plants can be either female or male. (2)
that male structure produce pollen from the stamen and female structures have one or more ovaries which are part of the carpel. (2)
that pollen can be transferred from the stamen to a stigma to be fertilised. (2)
that seeds disperse and grow away from their parent plant. (2)
that some plants die after a single life cycle, but others have multiple cycles. (2)
that animals reproduce sexually and each individual has a male and a female parent from which they inherit various traits. (2)

Common misconceptions

Some children may think:

- all plants start out as seeds
- all plants have flowers
- plants that grow from bulbs do not have seeds
- only birds lay eggs.

Animals Inc Humans

National Curriculum Objectives

Describe the changes as humans develop to old age.

Direct Knowledge

that humans can produce offspring which grow into adults.
that male and female sex cells fuse together in a process called fertilisation.
that fused cells develop and grow into a foetus inside a mother's uterus.
that the stage of development between fertilisation and birth is called 'prenatal'.
that the human gestation period is around nine months.
that the gestation period of humans is different to that of some other animals.
that a foetus is an unborn animal or human being in the very early stages of development .
that after nine months of gestation, a baby is born.
that in the first few years of human life, growth and development is rapid.

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that a newborn is a baby that has just been born. infancy - this is a period of rapid change. Many toddlers learn to walk and talk at this stage.
that children learn to walk and talk during infancy.
that throughout childhood, children learn new skills and become more independent.
that the stage of development between childhood and adulthood is called adolescence.
that adolescence is when the body starts to change and prepare itself for adulthood. Hormonal changes take place over a few years. This is also known as puberty.
that human adolescence usually takes places between 10 and 19 years after birth.
that the human body starts to change during adolescence to enable reproduction to occur during adulthood.
that humans develop even greater independence during adolescence.
that during adolescence, boys and girls experience a physical stage of development called 'puberty'.
that puberty is the change that happens in late childhood and adolescence where the body starts to change because of hormones.
During puberty, the following changes usually occur for females: ● Menstruation begins ● Breasts start to grow ● Shoulders begin to broaden
During puberty, the following changes usually occur for males: ● Hair begins to grow on the chest ● Scrotum, testes and penis develop
During puberty, the following changes usually occur for both males and females: ● The larynx (voice box) grows ● Hair begins to grow on arms and legs, as well as under the armpits ● Pubic hair starts to grow ● Continue to grow taller ● All other parts of the body continue to grow ● Sweat glands produce more sweat ● Skin becomes oilier
that in early adulthood, the human body is at peak fitness and strength.
that humans' ability to reproduce decreases as they move through middle adulthood.
that during middle adulthood, humans may begin to lose their hair.
that during middle adulthood, humans' hair may begin to turn grey.
that in middle adulthood - changes such as hair loss may happen. There are also some hormonal changes again and the ability to reproduce decreases.
that into late adulthood, the human body begins to decline in fitness and strength.

Common misconceptions

Some children may think:

• a baby grows in a mother's tummy.