KS3 SCIENCE

TEACHING OVERVIW AND TIMELINE

Year 7

Route for class with two teachers (following two routes):

Autumn	Half Term 1							Half Term 2						
Week:	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Route A	Ecosystems												Matter	
Route B	Earth								Organisms					

Autumn	Half Term 3						Half Term 4					
Week:	1	2	3	4	5	6	1	2	3	4	5	6
Route A	Matter						Waves					
Route B			Forces					Reactions				

Autumn	Half Term 5						Half Term 6						
Week:	1	2	3	4	5	6	1	2	3	4	5	6	7
Route A			Genes							Energy			
Route B				Electromagnets						Energy			

Route for class with two teachers (following two routes):

Autumn	Half Term 1							Half Term 2						
Week:	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Route C	Earth													
Route D	Organisms													
Route E	Ecosystems												Matter	

Autumn	Half Term 3						Half Term 4					
Week:	1	2	3	4	5	6	1	2	3	4	5	6
Route C			Forces									
Route D				Reactions								
Route E	Matter						Waves					

Autumn	Half Term 5						Half Term 6						
Week:	1	2	3	4	5	6	1	2	3	4	5	6	7
Route C	Electromagnets									Energy			
Route D	Reactions									Review			
Route E			Genes							Energy			

KS3 SCIENCE

CONTENT PROGRESSION MAP

AQA Realising potential

BIG IDEAS	KS3 Part 1 (Year 7)		KS3 Part 2 (Year 8)	
Earth	Universe	Earth Structure	Climate	Earth resources
Ecosystem	Interdependence	Plant reproduction	Respiration	Photosynthesis
Organisms	Movement	Cells	Breathing	Digestion
Matter	Particle model	Separating mixtures	Periodic Table	Elements
Forces	Speed	Gravity	Contact Forces	Pressure
Waves	Sound	Light	Wave effects	Wave properties
Reactions	Acids and alkalis	Metals and non-metals	Types of reaction	Chemical energy
Genes	Variation	Human reproduction	Evolution	Inheritance
Electromagnets	Potential difference and resistance	Current	Magnetism	Electromagnets
Energy	Energy costs	Energy transfer	Work	Heating and cooling

A spiral design for understanding

It's easier for students to develop an understanding of a big idea by having multiple interactions with the concepts within the idea. By connecting smaller ideas to more abstract ideas, students will be better prepared to apply these concepts when approaching an unfamiliar topic. Using a logical order of objectives, our curriculum uses the big ideas principle alongside 'mastery goals' to equip students for success at GCSE. Mastery means gaining a secure understanding of the big ideas. Understanding means both 'knowing' – having an accurate mental structure of the concepts and skills – and 'applying' – being able to use the knowledge flexibly across different situations. So mastery goals are very clear statements of what it means for students to know and apply for each topic and big idea.

Each big idea topic contains four smaller topics that build in complexity. For example 'Waves', topics are ordered from simpler, more concrete topics 'Light' and 'Sound', to more abstract ones 'Wave properties' and 'Wave effects'. These have been created to avoid repetition, draw on various scientific skills and use different contexts.

	Part 1		Part 2	
Waves	Sound	Light	Wave effects	Wave properties

Complexity of topics increases

KS3 SCIENCE

SKILLS PROGRESSION MAP

Enquiry processes: working scientifically

Analyse
- Analyse patterns
- Discuss limitations
- Draw conclusions
- Present data

Communicate
- Communicate ideas
- Construct explanations
- Critique claims
- Justify opinions

Enquire
- Collect data
- Devise questions
- Plan variables
- Test hypotheses

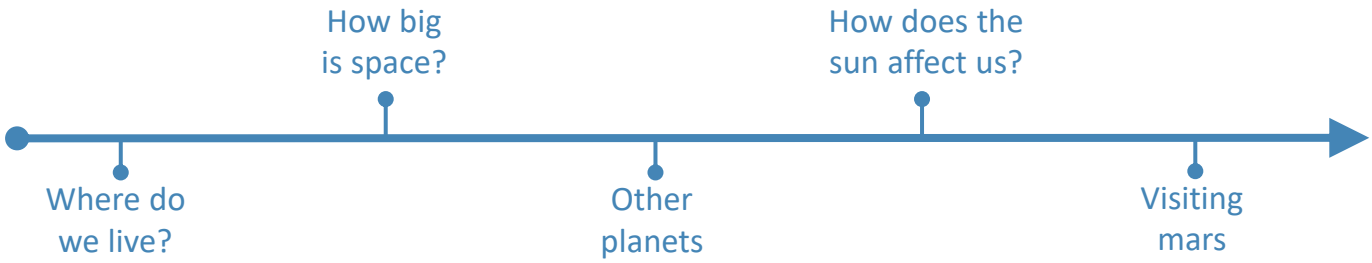
Solve
- Estimate risks
- Examine consequences
- Interrogate sources
- Review theories

Scientific enquiry is at the heart of our science curriculum at ICC because working scientifically gets students working in similar ways to scientists! Enquiry is divided into four areas across our KS3 curriculum and learning activities have been structured in order to support effective delivery of these requirements via our enquiry activities. These are presented in the unit overview sections above the know, apply, extend objectives and are intended to ensure our students develop subject content knowledge and enquiry skills to gain mastery of both.

Year 7 Enquiry activities		Speed	Gravity	Potential difference	Current	Energy costs	Energy transfers	Sound	Light	Particle Model	Separating Mixtures	Acids and alkalis	Metals & non-metals	Earth Structure	Universe	Movement	Cells	Interdependence	Plant reproduction	Variation	Human reproduction
Analyse	Analyse patterns	●	●			●		●		●		●	●	●	●	●				●	
	Discuss limitations	●				●				●		●	●	●		●			●	●	
	Draw conclusions	●	●	●	●	●	●	●		●		●	●	●	●	●		●		●	
	Present data	●	●	●	●					●		●	●		●	●			●	●	
Communicate	Communicate ideas	●	●	●	●	●	●	●	●	●		●	●	●	●	●	●		●		●
	Explanations	●	●	●	●	●	●	●	●	●		●	●	●	●		●	●	●		●
	Critique claims					●							●			●			●	●	●
	Justify opinions					●									●	●		●	●	●	●
Enquire	Collect data	●									●		●						●		
	Devise questions	●		●	●				●		●		●			●			●		
	Plan variables	●		●	●								●			●			●		
	Test hypotheses	●		●	●			●			●	●	●			●			●		
Solve	Estimate risks									●	●	●	●								
	Consequences					●						●								●	●
	Review theories									●				●	●					●	●
	Interrogate sources					●														●	●

EARTH

THE UNIVERSE



TAKE IT FURTHER

Resources:

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Big idea:

EARTH

TIMELINE

Relate observations of changing day length to an appropriate model of the solar system.

1 Know

Ideas

K1 The solar system can be modelled as planets rotating on tilted axes while orbiting the Sun, moons orbiting planets, and sunlight spreading out and being reflected. This explains day and year length, seasons and the visibility of objects from Earth.

K2 Our solar system is a tiny part of a galaxy, one of many billions in the Universe. Light takes minutes to reach Earth from the Sun, four years from our nearest star and billions of years from other galaxies.

Key words

K3 **Galaxy:** Collection of stars held together by gravity. Our galaxy is called the Milky Way.

K4 **Light year:** Distance light travels in a year (over 9 million, million kilometres).

K5 **Stars:** Bodies which give out light, and which may have a solar system of planets.

K6 **Orbit:** Path taken by a satellite, planet or star moving around a larger body. Earth completes one orbit of the Sun every year.

K7 **Exoplanet:** Planet that orbits a star outside our solar system.

2 Apply

A1 Describe the appearance of planets or moons from diagrams showing their position in relation to the Earth and Sun.

A2 Explain why places on the Earth experience different daylight hours and amounts of sunlight during the year.

A3 Describe how space exploration and observations of stars are affected by the scale of the universe.

A4 Explain the choice of particular units for measuring distance.

3 Extend

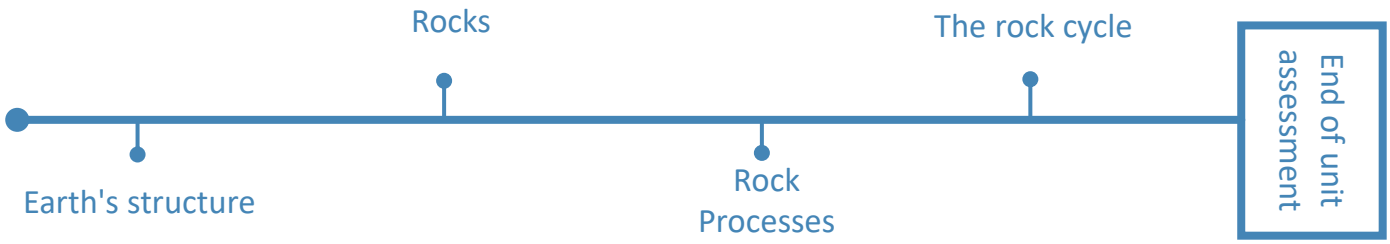
E1 Predict patterns in day length, the Sun's intensity or an object's shadow at different latitudes.

E2 Make deductions from observation data of planets, stars and galaxies.

E3 Compare explanations from different periods in history about the motion of objects and structure of the Universe.

EARTH

EARTH STRUCTURE



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Big idea:

EARTH

TIMELINE

Model the processes that are responsible for rock formation and link these to the rock features.

1 Know

Ideas

K1 Sedimentary, igneous and metamorphic rocks can be interconverted over millions of years through weathering and erosion, heat and pressure, and melting and cooling.

Facts

K2 The three rock layers inside Earth are the crust, the mantle, and the core.

2 Apply

A1 Explain why a rock has a particular property based on how it was formed.

A2 Identify the causes of weathering and erosion and describe how they occur.

A3 Construct a labelled diagram to identify the processes of the rock cycle.

Key words

K3 **Rock cycle:** Sequence of processes where rocks change from one type to another.

K4 **Weathering:** The wearing down of rock by physical, chemical or biological processes.

K5 **Erosion:** Weathering of rock and its movement by water, ice or wind (transportation).

K6 **Minerals:** Chemicals that rocks are made from.

K7 **Sedimentary rocks:** Formed from layers of sediment, and which can contain fossils. Examples are limestone, chalk and sandstone.

K8 **Igneous rocks:** Formed from cooled magma, with minerals arranged in crystals. Examples are granite, basalt and obsidian.

K9 **Metamorphic rocks:** Formed from existing rocks exposed to heat and pressure over a long time. Examples are marble, slate and schist.

K10 **Strata:** Layers of sedimentary rock.

3 Extend

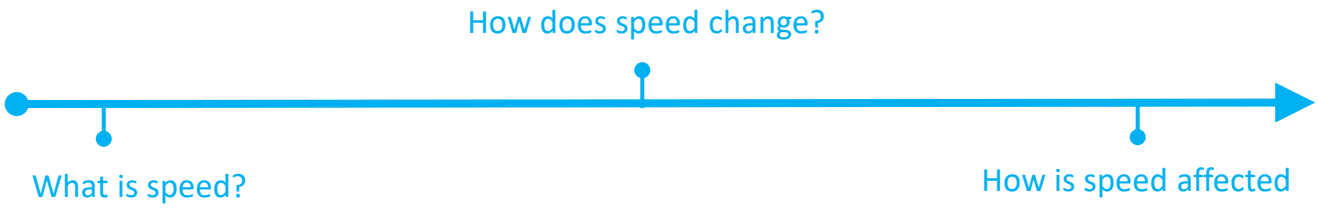
E1 Identify circumstances that indicate fast processes of change on Earth and those that indicate slower processes.

E2 Predict planetary conditions from descriptions of rocks on other planets.

E3 Describe similarities and differences between the rock cycle and everyday physical and chemical processes.

FORCES

SPEED



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Big idea:

FORCES

TIMELINE

Investigate variables that affect the speed of a toy car rolling down a slope.

1 Know

Ideas

K1 If the overall, resultant force on an object is unbalanced, its motion changes and it slows down, speeds up or changes direction.

Skill

K2 Use the formula:
speed = distance (m) / time (s)
or distance-time graphs, to calculate speed.

Facts

K3 A straight line on a distance-time graph shows constant speed, a curving line shows acceleration.

K4 The higher the speed of an object, the shorter the time taken for a journey.

Key words

K5 **Speed:** How much distance is covered in how much time.

K6 **Average speed:** The overall distance travelled divided by overall time for a journey.

K7 **Relative motion:** Different observers judge speeds differently if they are in motion too, so an object's speed is relative to the observer's speed.

K8 **Acceleration:** How quickly speed increases or decreases.

2 Apply

A1 Illustrate a journey with changing speed on a distance-time graph, and label changes in motion.

A2 Describe how the speed of an object varies when measured by observers who are not moving, or moving relative to the object.

3 Extend

E1 Suggest how the motion of two objects moving at different speeds in the same direction would appear to the other.

E2 Predict changes in an object's speed when the forces on it change.

FORCES

GRAVITY

How is gravity changed?

What is weight?

How is weight affected?

End of unit assessment

TAKE IT FURTHER

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Big idea:

FORCES

TIMELINE

Explain the way in which an astronaut's weight varies on a journey to the moon.

1 Know

Ideas

K1 Mass and weight are different but related. Mass is a property of the object; weight depends upon mass but also on gravitational field strength.

K2 Every object exerts a gravitational force on every other object. The force increases with mass and decreases with distance. Gravity holds planets and moons in orbit around larger bodies.

Skill

K3 Use the formula: weight (N) = mass (kg) x gravitational field strength (N/kg).

Facts

K4 g on Earth = 10 N/kg. On the Moon it is 1.6 N/kg.

Key words

K5 **Weight:** The force of gravity on an object (N).

K6 **Non-contact force:** One that acts without direct contact.

K7 **Mass:** The amount of stuff in an object (kg).

K8 **Gravitational field strength, g:** The force from gravity on 1 kg (N/kg).

K9 **Field:** The area where other objects feel a gravitational force.

2 Apply

A1 Explain unfamiliar observations where weight changes.

A2 Draw a force diagram for a problem involving gravity.

A3 Deduce how gravity varies for different masses and distances.

A4 Compare your weight on Earth with your weight on different planets using the formula.

3 Extend

E1 Compare and contrast gravity with other forces.

E2 Draw conclusions from data about orbits, based on how gravity varies with mass and distance.

E3 Suggest implications of how gravity varies for a space mission.

ELECTROMAGNETS

POTENTIAL DIFFERENCE AND RESISTANCE

How does potential difference change in different circuits?

What is potential difference and resistance?

TAKE IT FURTHER

Resources:

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Big idea:

ELECTROMAGNETS

TIMELINE

Compare the voltage drop across resistors connected in series in a circuit.

1 Know

Ideas

K1 We can model voltage as an electrical push from the battery, or the amount of energy per unit of charge transferred through the electrical pathway. In a series circuit, voltage is shared between each component. In a parallel circuit, voltage is the same across each loop.

K2 Components with resistance reduce the current flowing and shift energy to the surroundings.

Skill

K3 Calculate resistance using the formula: Resistance (Ω) = potential difference (V) ÷ current (A).

Key words

K4 **Potential difference (voltage):** The amount of energy shifted from the battery to the moving charge, or from the charge to circuit components, in volts (V).

K5 **Resistance:** A property of a component, making it difficult for charge to pass through, in ohms (Ω).

K6 **Electrical conductor:** A material that allows current to flow through it easily, and has a low resistance.

K7 **Electrical insulator:** A material that does not allow current to flow easily, and has a high resistance.

2 Apply

A1 Draw a circuit diagram to show how voltage can be measured in a simple circuit.

A2 Use the idea of energy to explain how voltage and resistance affect the way components work.

A3 Given a table of voltage against current. Use the ratio of voltage to current to determine the resistance.

A4 Use an analogy like water in pipes to explain why part of a circuit has higher resistance.

3 Extend

E1 Predict the effect of changing the rating of a battery or a bulb on other components in a series or parallel circuit.

E2 Justify the sizes of voltages in a circuit, using arguments based on energy.

E3 Draw conclusions about safety risks, from data on voltage, resistance and current.

ELECTROMAGNETS

CURRENT

What is charge?

How does current change in different circuits?

End of unit assessment

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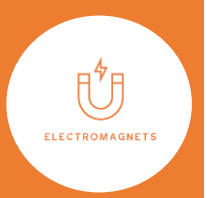
Big idea:



TIMELINE

Compare and explain current flow in different parts of a parallel circuit.

1 Know

Ideas

K1 Current is a movement of electrons and is the same everywhere in a series circuit. Current divides between loops in a parallel circuit, combines when loops meet, lights up bulbs and makes components work.

K2 Around a charged object, the electric field affects other charged objects, causing them to be attracted or repelled. The field strength decreases with distance.

Facts

K3 Two similarly charged objects repel, two differently charged objects attract.

2 Apply

A1 Describe how current changes in series and parallel circuits when components are changed.

A2 Turn circuit diagrams into real series and parallel circuits, and vice versa.

A3 Describe what happens when charged objects are placed near to each other or touching.

A4 Use a sketch to describe how an object charged positively or negatively became charged up.

Key words

K4 **Negatively charged:** An object that has gained electrons as a result of the charging process.

K5 **Positively charged:** An object that has lost electrons as a result of the charging process.

K6 **Electrons:** Tiny particles which are part of atoms and carry a negative charge.

K7 **Charged up:** When materials are rubbed together, electrons move from one surface to the other.

K8 **Electrostatic force:** Non-contact force between two charged objects.

K9 **Current:** Flow of electric charge, in amperes (A).

K10 **In series:** If components in a circuit are on the same loop.

K11 **In parallel:** If some components are on separate loops.

K12 **Field:** The area where other objects feel an electrostatic force.

3 Extend

E1 Compare the advantages of series and parallel circuits for particular uses.

E2 Evaluate a model of current as electrons moving from the negative to the positive terminal of a battery, through the circuit.

E3 Suggest ways to reduce the risk of getting electrostatic shocks.

ENERGY

ENERGY COSTS

What are energy resources?

What are energy costs?

TAKE IT FURTHER

Resources:

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Big idea:

ENERGY

TIMELINE

Compare the running costs of fluorescent and filament light bulbs.

1 Know

Ideas

K1 We pay for our domestic electricity usage based on the amount of energy transferred.

K2 Electricity is generated by a combination of resources which each have advantages and disadvantages.

Skill

K3 Calculate the cost of home energy usage, using the formula:
cost = power (kW) x time (hours) x price (per kWh).

Facts

K4 Food labels list the energy content of food in kilojoules (kJ).

2 Apply

A1 Compare the amounts of energy transferred by different foods and activities.

A2 Compare the energy usage and cost of running different home devices.

A3 Explain the advantages and disadvantages of different energy resources.

A4 Represent the energy transfers from a renewable or non-renewable resource to an electrical device in the home.

Key words

K5 **Power:** How quickly energy is transferred by a device (watts).

K6 **Energy resource:** Something with stored energy that can be released in a useful way.

K7 **Non-renewable:** An energy resource that cannot be replaced and will be used up.

K8 **Renewable:** An energy resource that can be replaced and will not run out. Examples are solar, wind, waves, geothermal and biomass.

K9 **Fossil fuels:** Non-renewable energy resources formed from the remains of ancient plants or animals. Examples are coal, crude oil and natural gas.

3 Extend

E1 Evaluate the social, economic and environmental consequences of using a resource to generate electricity, from data.

E2 Suggest actions a government or communities could take in response to rising energy demand.

E3 Suggest ways to reduce costs, by examining data on a home energy bill.

ENERGY

What are the energy stores that are transferred?

What happens when energy stores are transferred?

End of unit assessment

TAKE IT FURTHER

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Big idea:

ENERGY

TIMELINE

Explain the energy transfers in a hand-crank torch

1 Know

Ideas

K1 We can describe how jobs get done using an energy model where energy is transferred from one store at the start to another at the end.

K2 When energy is transferred, the total is conserved, but some energy is dissipated, reducing the useful energy.

Key words

K3 **Thermal energy store:** Filled when an object is warmed up.

K4 **Chemical energy store:** Emptied during chemical reactions when energy is transferred to surroundings.

K5 **Kinetic energy store:** Filled when an object speeds up.

K6 **Gravitational potential energy store:** Filled when an object is raised.

K7 **Elastic energy store:** Filled when a material is stretched or compressed.

K8 **Dissipated:** Become spread out wastefully.

2 Apply

A1 Describe how the energy of an object depends on its speed, temperature, height or whether it is stretched or compressed.

A2 Show how energy is transferred between energy stores in a range of real-life examples.

A3 Calculate the useful energy and the amount dissipated, given values of input and output energy.

A4 Explain how energy is dissipated in a range of situations.

3 Extend

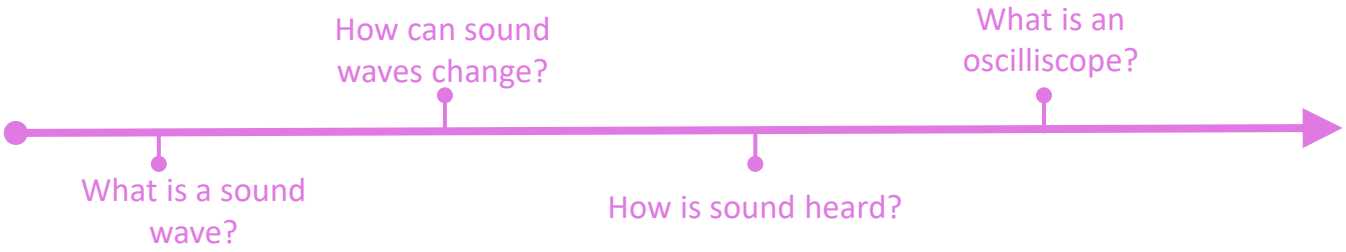
E1 Compare the percentages of energy wasted by renewable energy sources.

E2 Explain why processes such as swinging pendulums or bouncing balls cannot go on forever, in terms of energy.

E3 Evaluate analogies and explanations for the transfer of energy.

WAVES

SOUND



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Big idea:

WAVES

TIMELINE

Relate changes in the shape of an oscilloscope trace to changes in pitch and volume.

1 Know

Ideas

- K1 Sound consists of vibrations which travel as a longitudinal wave through substances. The denser the medium, the faster sound travels.
- K2 The greater the amplitude of the waveform, the louder the sound. The greater the frequency (and therefore the shorter the wavelength), the higher the pitch.

Facts

- K3 Sound does not travel through a vacuum.
- K4 The speed of sound in air is 330 m/s, a million times slower than light.

Key words

- K5 **Vibration:** A back and forth motion that repeats.
- K6 **Longitudinal wave:** Where the direction of vibration is the same as that of the wave.
- K7 **Volume:** How loud or quiet a sound is, in decibels (dB).
- K8 **Pitch:** How low or high a sound is. A low (high) pitch sound has a low (high) frequency.
- K9 **Amplitude:** The maximum amount of vibration, measured from the middle position of the wave, in metres.
- K10 **Wavelength:** Distance between two corresponding points on a wave, in metres.
- K11 **Frequency:** The number of waves produced in one second, in hertz.
- K12 **Oscilloscope:** Device able to view patterns of sound waves that have been turned into electrical signals.
- K13 **Vacuum:** A space with no particles of matter in it.
- K14 **Absorption:** When energy is transferred from sound to a material.
- K15 **Auditory range:** The lowest and highest frequencies that a type of animal can hear.
- K16 **Echo:** Reflection of sound waves from a surface back to the listener.

2 Apply

- A1 Explain observations where sound is reflected, transmitted or absorbed by different media.
- A2 Explain observations of how sound travels using the idea of a longitudinal wave.
- A3 Describe the amplitude and frequency of a wave from a diagram or oscilloscope picture.
- A4 Use drawings of waves to describe how sound waves change with volume or pitch.

3 Extend

- E1 Suggest the effects of particular ear problems on a person's hearing.
- E2 Evaluate the data behind a claim for a sound creation or blocking device, using the properties of sound waves.
- E3 Use diagrams to compare the waveforms a musical instrument makes when playing different pitches or volumes.

WAVES

LIGHT

What is light?

How does reflection happen?

How does refraction happen?

How can light waves be seen?

End of unit assessment

TAKE IT FURTHER

Resources:

Knowledge Organisers

Word Mats

Seneca homework

BBC Bitesize Revision

Big idea:

WAVES

TIMELINE

Use ray diagrams to model how light passes through lenses and transparent materials.

1 Know

Ideas

K1 When a light ray meets a different medium, some of it is absorbed and some reflected. For a mirror, the angle of incidence equals the angle of reflection. The ray model can describe the formation of an image in a mirror and how objects appear different colours.

K2 When light enters a denser medium it bends towards the normal; when it enters a less dense medium it bends away from the normal. Refraction through lenses and prisms can be described using a ray diagram as a model.

Skill

K3 Construct ray diagrams to show how light reflects off mirrors, forms images, and refracts.

2 Apply

A1 Use ray diagrams of eclipses to describe what is seen by observers in different places.

A2 Explain observations where coloured lights are mixed or objects are viewed in different lights.

A3 Use ray diagrams to describe how light passes through lenses and transparent materials.

A4 Describe how lenses may be used to correct vision.

Facts

K4 Light travels at 300 million metres per second in a vacuum.

K5 Different colours of light have different frequencies.

Key words

K7 **Incident ray:** The incoming ray.

K8 **Reflected ray:** The outgoing ray.

K9 **Normal line:** From which angles are measured, at right angles to the surface.

K10 **Angle of reflection:** Between the normal and reflected ray.

K11 **Angle of incidence:** Between the normal and incident ray.

K12 **Refraction:** Change in the direction of light going from one material into another.

K13 **Absorption:** When energy is transferred from light to a material.

K14 **Scattering:** When light bounces off an object in all directions.

K15 **Transparent:** A material that allows all light to pass through it.

K16 **Translucent:** A material that allows some light to pass through it.

K17 **Opaque:** A material that allows no light to pass through it.

K18 **Convex lens:** A lens that is thicker in the middle which bends light rays towards each other.

K19 **Concave lens**: A lens that is thinner in the middle which spreads out light rays.

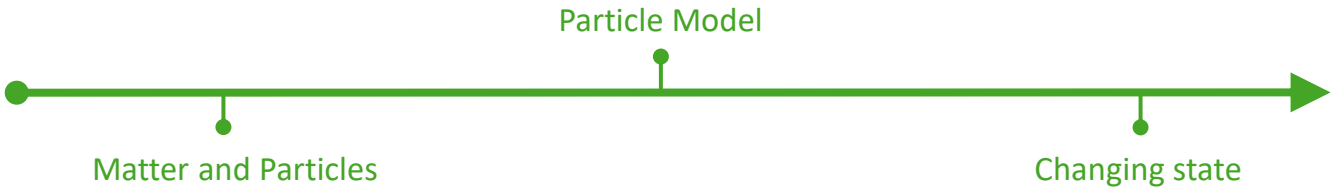
K20 **Retina:** Layer at the back of the eye with light detecting cells and where image is formed.

3 Extend

E1 Use a ray diagram to predict how an image will change in different

MATTER

PARTICLE MODEL



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Big idea:

MATTER

TIMELINE

Relate the features of the particle model to the properties of materials in different states.

1 Know

Ideas

K1 Properties of solids, liquids and gases can be described in terms of particles in motion but with differences in the arrangement and movement of these same particles: closely spaced and vibrating (solid), in random motion but in contact (liquid), or in random motion and widely spaced (gas).

K2 Observations where substances change temperature or state can be described in terms of particles gaining or losing energy.

Facts

K3 A substance is a solid below its melting point, a liquid above it, and a gas above its boiling point.

Key words

K4 **Particle:** A very tiny object such as an atom or molecule, too small to be seen with a microscope.

K5 **Particle Model:** A way to think about how substances behave in terms of small, moving particles.

K6 **Diffusion:** the process by which particles in liquids or gases spread out through random movement from a region where there are many particles to one where there are fewer.

K7 **Gas pressure:** Caused by collisions of particles with the walls of a container.

K8 **Density:** How much matter there is in a particular volume, or how close the particles are.

2 Apply

A1 Explain unfamiliar observations about gas pressure in terms of particles.

A2 Explain the properties of solids, liquids and gases based on the arrangement and movement of their particles.

A3 Explain changes in states in terms of changes to the energy of particles.

A4 Draw before and after diagrams of particles to explain observations about changes of state, gas pressure and diffusion.

K9 **Evaporate:** Change from liquid to gas at the surface of a liquid, at any temperature.

K10 **Boil:** Change from liquid to a gas of all the liquid when the temperature reaches boiling point.

K11 **Condense:** Change of state from gas to liquid when the temperature drops to the boiling point.

K12 **Melt:** Change from solid to liquid when the temperature rises to the melting point.

K13 **Freeze:** Change from liquid to a solid when the temperature drops to the melting point.

K14 **Sublime:** Change from a solid directly into a gas.

3 Extend

E1 Argue for how to classify substances which behave unusually, as solids, liquids, or gases.

E2 Evaluate observations that provide evidence for the existence of particles.

E3 Make predictions about what will happen during unfamiliar physical processes, in terms of particles and their energy.

MATTER

SEPERATING MIXTURES

Mixtures and purity

Solutes and solvents (water)

Separating techniques

Separating mixtures

End of unit assessment

TAKE IT FURTHER

Resources:

Knowledge Organisers

Word Mats

Seneca homework

BBC Bitesize Revision

Big idea:

MATTER

TIMELINE

Devise ways to separate mixtures, based on their properties.

1 Know

Ideas

K1 A pure substance consists of only one type of element or compound, and has a fixed melting and boiling point. Mixtures may be separated due to differences in their physical properties.

K2 The method chosen to separate a mixture depends on which physical properties of the individual substances are different.

Skill

K3 Use techniques to separate mixtures.

Facts

K4 Air, fruit juice, sea water and milk are mixtures.

K5 Liquids have different boiling points.

2 Apply

A1 Explain how substances dissolve using the particle model.

A2 Use the solubility curve of a solute to explain observations about solutions.

A3 Use evidence from chromatography to identify unknown substances in mixtures.

A4 Choose the most suitable technique to separate out a mixture of substances.

A5 Explain how substances dissolve using the particle model.

A6 Use the solubility curve of a solute to explain observations about solutions.

A7 Use evidence from chromatography to identify unknown substances in mixtures.

A8 Choose the most suitable technique to separate out a mixture of substances.

Key words

K6 **Solvent:** A substance, normally a liquid, that dissolves another substance.

K7 **Solubility:** Maximum mass of solute that dissolves in a certain volume of solvent.

K8 **Soluble:** (insoluble) Property of a substance that will (will not) dissolve in a liquid.

K9 **Solution:** Mixture formed when a solvent dissolves a solute.

K10 **Dissolve:** When a solute mixes completely with a solvent.

K11 **Solute:** A substance that can dissolve in a liquid.

K12 **Pure substance:** Single type of material with nothing mixed in.

K13 **Mixture:** Two or more pure substances mixed together, whose properties are different to the individual substances.

K14 **Filtration:** Separating substances using a filter to produce a filtrate (solution) and residue.

K15 **Distillation:** Separating substances by boiling and condensing liquids.

K16 **Evaporation:** A way to separate a solid dissolved in a liquid by the liquid turning into a gas.

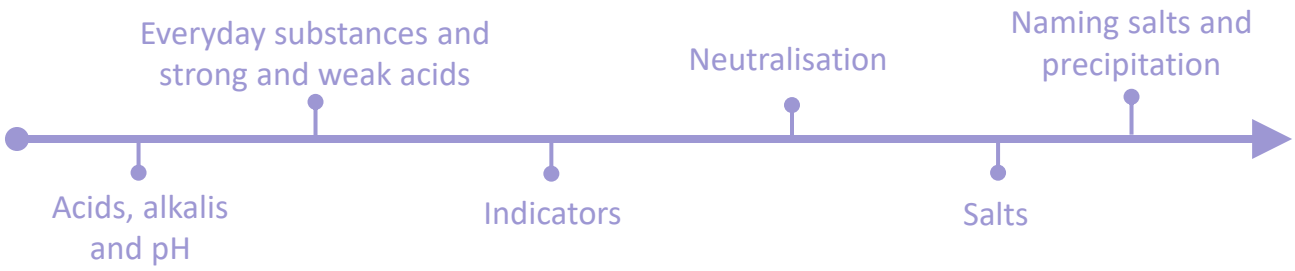
K17 **Chromatography:** Used to separate different coloured substances.

3 Extend

E1 Analyse and interpret solubility curves.

REACTIONS

ACID AND ALKALIS



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Resources:

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Big idea:

REACTIONS

TIMELINE

Devise an enquiry to compare how well indigestion remedies work.

1 Know

Ideas

K1 The pH of a solution depends on the strength of the acid: strong acids have lower pH values than weak acids.

K2 Mixing an acid and alkali produces a chemical reaction, neutralisation, forming a chemical called a salt and water.

Facts

K3 Acids have a pH below 7, neutral solutions have a pH of 7, alkalis have a pH above 7.

K4 Acids and alkalis can be corrosive or irritant and require safe handling.

K5 Hydrochloric, sulfuric and nitric acid are strong acids.

K6 Acetic and citric acid are weak acids.

Key words

K7 **pH:** Scale of acidity and alkalinity from 0 to 14.

K8 **Indicators:** Substances used to identify whether unknown solutions are acidic or alkaline.

K9 **Base:** A substance that neutralises an acid - those that dissolve in water are called alkalis.

K10 **Concentration:** A measure of the number of particles in a given volume.

2 Apply

A1 Identify the best indicator to distinguish between solutions of different pH, using data provided.

A2 Use data and observations to determine the pH of a solution and explain what this shows.

A3 Explain how neutralisation reactions are used in a range of situations.

A4 Describe a method for how to make a neutral solution from an acid and alkali.

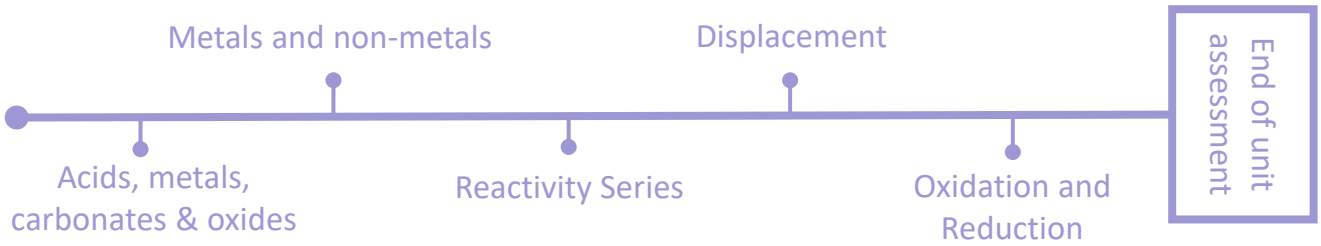
3 Extend

E1 Given the names of an acid and an alkali, work out the name of the salt produced when they react.

E2 Deduce the hazards of different alkalis and acids using data about their

REACTIONS

METALS AND NON-METALS



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Big idea:

REACTIONS

TIMELINE

Use experimental results to suggest an order of reactivity of various metals

1 Know

Ideas

- K1 Metals and non-metals react with oxygen to form oxides which are either bases or acids.
- K2 Metals can be arranged as a reactivity series in order of how readily they react with other substances.
- K3 Some metals react with acids to produce salts and hydrogen.

Facts

- K4 Iron, nickel and cobalt are magnetic elements.
- K5 Mercury is a metal that is liquid at room temperature.
- K6 Bromine is a non-metal that is liquid at room temperature.

Key words

- K7 **Metals:** Shiny, good conductors of electricity and heat, malleable and ductile, and usually solid at room temperature.
- K8 **Non-metals:** Dull, poor conductors of electricity and heat, brittle and usually solid or gaseous at room temperature.
- K9 **Displacement:** Reaction where a more reactive metal takes the place of a less reactive metal in a compound.
- K10 **Oxidation:** Reaction in which a substance combines with oxygen.
- K11 **Reactivity:** The tendency of a substance to undergo a chemical reaction.

2 Apply

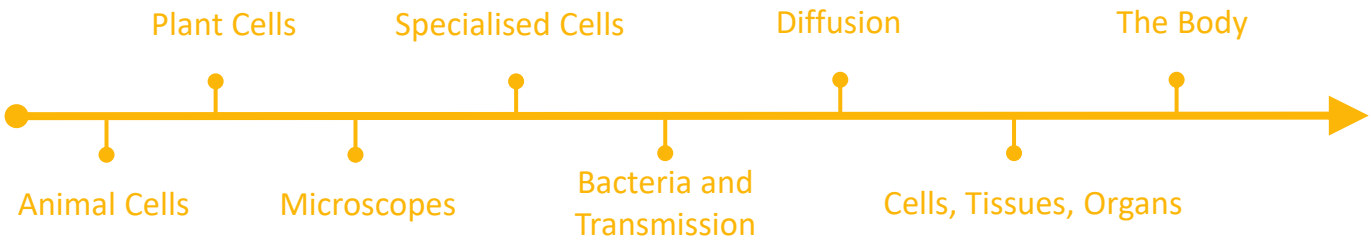
- A1 Describe an oxidation, displacement, or metal-acid reaction with a word equation.
- A2 Use particle diagrams to represent oxidation, displacement and metal-acid reactions.
- A3 Identify an unknown element from its physical and chemical properties.
- A4 Place an unfamiliar metal into the reactivity series based on information about its reactions.

3 Extend

- E1 Deduce the physical or chemical changes a metal has undergone from its appearance.
- E2 Justify the use of specific metals and non-metals for different applications, using data provided.
- E3 Deduce a rule from data about which reactions will occur or not, based on the reactivity series.

ORGANISMS

CELLS



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Big idea:

ORGANISMS

TIMELINE

Identify the principal features of a cheek cell and describe their functions.

1 Know

Ideas

K1 Multicellular organisms are composed of cells which are organised into tissues, organs and systems to carry out life processes.

K2 There are many types of cell. Each has a different structure or feature so it can do a specific job.

Skill

K3 Use a light microscope to observe and draw cells.

Key words

K6 **Cell:** The unit of a living organism, contains parts to carry out life processes.

K7 **Uni-cellular:** Living things made up of one cell.

K8 **Multi-cellular:** Living things made up of many types of cell.

K9 **Tissue:** Group of cells of one type.

K10 **Organ:** Group of different tissues working together to carry out a job.

K11 **Diffusion:** One way for substances to move into and out of cells.

K12 **Circulatory system:** Transports substances around the body.

K13 **Immune system:** Protects the body against infections.

K14 **Reproductive system:** Produces sperm and eggs, and is where the foetus develops.

K15 **Digestive system:** Breaks down and then absorbs food molecules.

K16 **Chloroplast:** Absorbs light energy so the plant can make food.

2 Apply

A1 Explain why multi-cellular organisms need organ systems to keep their cells alive.

A2 Suggest what kind of tissue or organism a cell is part of, based on its features.

A3 Explain how to use a microscope to identify and compare different types of cells.

A4 Explain how uni-cellular organisms are adapted to carry out functions that in multicellular organisms are done by different types of cell.

Facts

K4 Both plant and animal cells have a cell membrane, nucleus, cytoplasm and mitochondria.

K5 Plant cells also have a cell wall, chloroplasts and usually a permanent vacuole.

K18 **Mitochondria:** Part of the cell where energy is released from food molecules.

K19 **Cytoplasm:** Jelly-like substance where most chemical processes happen.

K20 **Cell membrane:** Surrounds the cell and controls movement of substances in and out.

K21 **Nucleus:** Contains genetic material (DNA) which controls the cell's activities.

K22 **Structural adaptations:** Special features to help a cell carry out its functions.

K23 **Respiratory system:** Replaces oxygen and removes carbon dioxide from blood.

K24 **Muscular skeletal system:** Muscles and bones working together to cause movement and support the body.

K25 **Vacuole:** Area in a cell that contains liquid, and can be used by plants to keep the cell rigid and store substances.

3 Extend

E1 Make deductions about how medical treatments work based on cells, tissues, organs and systems.

E2 Suggest how damage to, or failure of, an organ would affect other body systems.

E3 Deduce general patterns about how the structure of different cells is related to their function.

ORGANISMS

MOVEMENT

Muscles and Joints

Skeletal system

Musculoskeletal system

End of unit assessment

TAKE IT FURTHER

Resources:

Knowledge Organisers

Word Mats

Seneca homework

BBC Bitesize Revision

Big idea:

ORGANISMS

TIMELINE

Explore how the skeletal system and muscular system in a chicken wing work together to cause movement.

1 Know

Ideas

K1 The parts of the human skeleton work as a system for support, protection, movement and the production of new blood cells.

K2 Antagonistic pairs of muscles create movement when one contracts and the other relaxes.

Key words

K3 **Joints:** Places where bones meet.

K4 **Bone marrow:** Tissue found inside some bones where new blood cells are made.

K5 **Ligaments:** Connect bones in joints.

K6 **Tendons:** Connect muscles to bones.

K7 **Cartilage:** Smooth tissue found at the end of bones, which reduces friction between them.

K8 **Antagonistic muscle pair:** Muscles working in unison to create movement.

2 Apply

A1 Explain how a physical property of part of the skeleton relates to its function.

A2 Explain why some organs contain muscle tissue.

A3 Explain how antagonistic muscles produce movement around a joint.

A4 Use a diagram to predict the result of a muscle contraction or relaxation.

3 Extend

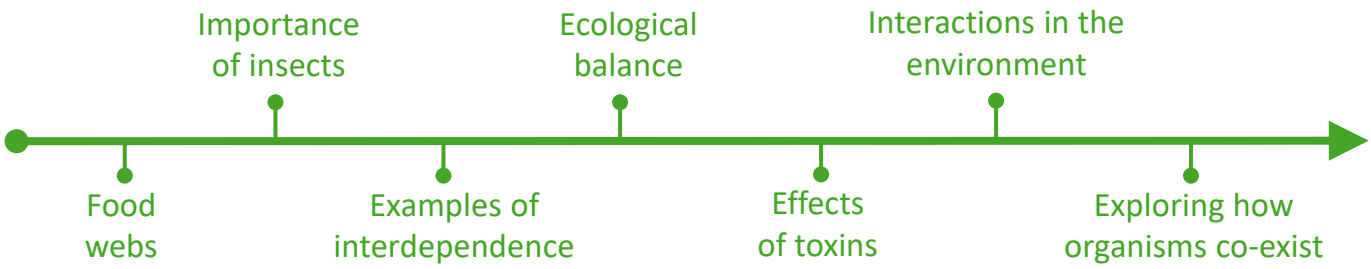
E1 Predict the consequences of damage to a joint, bone or muscle.

E2 Suggest factors that affect the force exerted by different muscles.

E3 Consider the benefits and risks of a technology for improving human movement.

ECOSYSTEM

INTERDEPENDENCE



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Big idea:

ECOSYSTEM

TIMELINE

Use a model to investigate the impact of changes in a population of one organism on others in the ecosystem

1 Know

Ideas

K1 Organisms in a food web (decomposers, producers and consumers) depend on each other for nutrients. So, a change in one population leads to changes in others.

K2 The population of a species is affected by the number of its predators and prey, disease, pollution and competition between individuals for limited resources such as water and nutrients.

Facts

K3 Insects are needed to pollinate food crops.

2 Apply

A1 Describe how a species' population changes as its predator or prey population changes.

A2 Explain effects of environmental changes and toxic materials on a species' population.

A3 Combine food chains to form a food web.

A4 Explain issues with human food supplies in terms of insect pollinators.

Key words

K4 **Food web:** Shows how food chains in an ecosystem are linked.

K5 **Food chain:** Part of a food web, starting with a producer, ending with a top predator.

K6 **Ecosystem:** The living things in a given area, and their non-living environment.

K7 **Environment:** The surrounding air, water, and soil where an organism lives.

K8 **Population:** Group of the same species living in an area.

K9 **Producer:** Green plant or algae that makes its own food using sunlight.

K10 **Consumer:** Animal that eats other animals or plants.

K11 **Decomposer:** Organism that breaks down dead plant and animal material so nutrients can be recycled back to the soil or water.

3 Extend

E1 Suggest what might happen when an unfamiliar species is introduced into a food web.

E2 Develop an argument about how toxic substances can accumulate in human food.

E3 Make a deduction based on data about what caused a change in the population of a species.

ECOSYSTEM

PLANT REPRODUCTION

Flowering plants → Germination → Seed dispersal → Crop production → End of unit assessment

TAKE IT FURTHER

Resources:

Knowledge Organisers

Word Mats

Mastery Booklet

BBC Bitesize Revision

Big idea:

ECOSYSTEM

TIMELINE

Use models to evaluate the features of various types of seed dispersal.

1 Know

Ideas

K1 Plants have adaptations to disperse seeds using wind, water or animals.

K2 Plants reproduce sexually to produce seeds, which are formed following fertilisation in the ovary.

Facts

K3 Flowers contain the plant's reproductive organs.

K4 Pollen can be carried by the wind, pollinating insects or other animals.

Key words

K5 **Pollen:** Contains the plant male sex cells found on the stamens.

K6 **Ovules:** Female sex cells in plants found in the ovary.

K7 **Pollination:** Transfer of pollen from the male part of the flower to the female part of the flower on the same or another plant.

2 Apply

A1 Describe the main steps that take place when a plant reproduces successfully.

A2 Identify parts of the flower and link their structure to their function.

A3 Suggest how a plant carried out seed dispersal based on the features of its fruit or seed.

A4 Explain why seed dispersal is important to survival of the parent plant and its offspring.

K8 **Fertilisation:** Joining of a nucleus from a male and female sex cell.

K9 **Seed:** Structure that contains the embryo of a new plant.

K10 **Fruit:** Structure that the ovary becomes after fertilisation, which contains seeds.

Carpel: The female part of the flower, made up of the stigma where the Pollen lands, style and ovary.

3 Extend

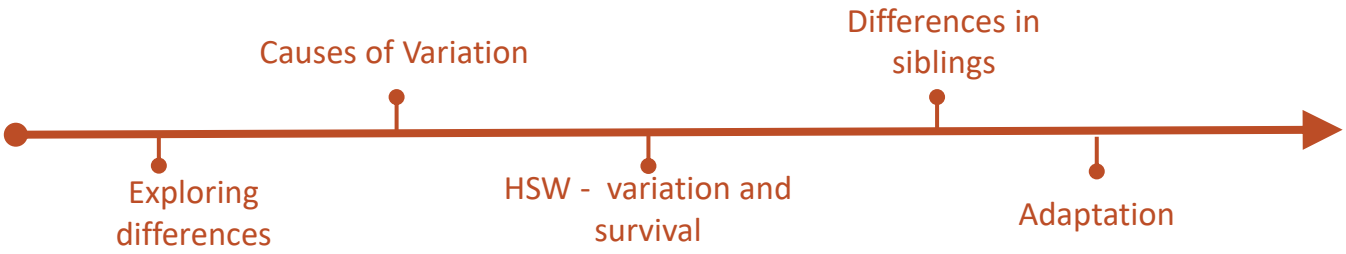
E1 Describe similarities and differences between the structures of wind pollinated and insect pollinated plants.

E2 Suggest how plant breeders use knowledge of pollination to carry out selective breeding.

E3 Develop an argument why a particular plant structure increases the likelihood of successful production of offspring.

GENES

VARIATION



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Resources:

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Word Mats

Seneca homework

BBC Bitesize Revision

Big idea:

GENES

TIMELINE

Graph data relating to variation and explain how it may lead to the survival of a species

1 Know

Ideas

K1 There is variation between individuals of the same species. Some variation is inherited, some is caused by the environment, and some is a combination.

K2 Variation between individuals is important for the survival of a species, helping it to avoid extinction in an always changing environment.

Key words

K3 **Species:** A group of living things that have more in common with each other than with other groups.

K4 **Variation:** The differences within and between species.

K5 **Continuous variation:** Where differences between living things can have any numerical value.

K6 **Discontinuous variation:** Where differences between living things can only be grouped into categories.

2 Apply

A1 Explain whether characteristics are inherited, environmental or both.

A2 Plot bar charts or line graphs to show discontinuous or continuous variation data.

A3 Explain how variation helps a particular species in a changing environment.

A4 Explain how characteristics of a species are adapted to particular environmental conditions.

3 Extend

E1 Predict implications of a change in the environment on a population.

E2 Use the ideas of variation to explain why one species may adapt better than another to an environmental change.

E3 Critique a claim that a particular characteristic is inherited or environmental.

GENES

HUMAN REPRODUCTION

Male reproductive system

Female reproductive system

Menstruation

Foetus development

End of unit assessment

TAKE IT FURTHER

Resources:

Knowledge Organisers

Word Mats

Seneca homework

BBC Bitesize Revision

Big idea:

GENES

TIMELINE

Relate advice to pregnant women to ideas about transfer of substances to the embryo.

1 Know

Ideas

K1 The menstrual cycle prepares the female for pregnancy and stops if the egg is fertilised by a sperm.

K2 The developing foetus relies on the mother to provide it with oxygen and nutrients; to remove waste and protect it against harmful substances.

Facts

K3 The menstrual cycle lasts approximately 28 days.

K4 If an egg is fertilised it settles into the uterus lining.

2 Apply

A1 Explain whether substances are passed from the mother to the foetus or not.

A2 Use a diagram to show stages in development of a foetus from the production of sex cells to birth.

A3 Describe causes of low fertility in male and female reproductive systems.

A4 Identify key events on a diagram of the menstrual cycle.

Key words

K5 **Gamete:** The male gamete (sex cell) in animals is a sperm, the female an egg.

K6 **Fertilisation:** Joining of a nucleus from a male and female sex cell.

K7 **Ovary:** Organ which contains eggs.

K8 **Testicle:** Organ where sperm are produced.

K9 **Oviduct, or fallopian tube:** Carries an egg from the ovary to the uterus and is where fertilisation occurs.

K10 **Uterus, or womb:** Where a baby develops in a pregnant woman.

K11 **Ovulation:** Release of an egg cell during the menstrual cycle, which may be met by a sperm.

K12 **Menstruation:** Loss of the lining of the uterus during the menstrual cycle

K13 **Reproductive system:** All the male and female organs involved in reproduction.

K14 **Penis:** Organ which carries sperm out of the male's body.

K15 **Vagina:** Where the penis enters the female's body and sperm is received.

K16 **Foetus:** The developing baby during pregnancy.

K17 **Gestation:** Process where the baby develops during pregnancy.

K18 **Placenta:** Organ that provides the foetus with oxygen and nutrients and removes waste substances.

K19 **Amniotic fluid:** Liquid that surrounds and protects the foetus.

K20 **Umbilical cord:** Connects the foetus to the placenta.

3 Extend

E1 Explain why pregnancy is more or less likely at certain stages of the menstrual cycle.

E2 Make deductions about how contraception and fertility treatments work.

E3 Predict the effect of a mother taking cigarettes, alcohol or drugs on the developing foetus.