KS3 SCIENCE

TEACHING OVERVIW AND TIMELINE

Year 8

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	Earth							Matter						
Route B	Ecosystems							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					Genes				
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			Electromagnets				How Science Works					
Route B	Reactions		Energy					How Science Works					

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

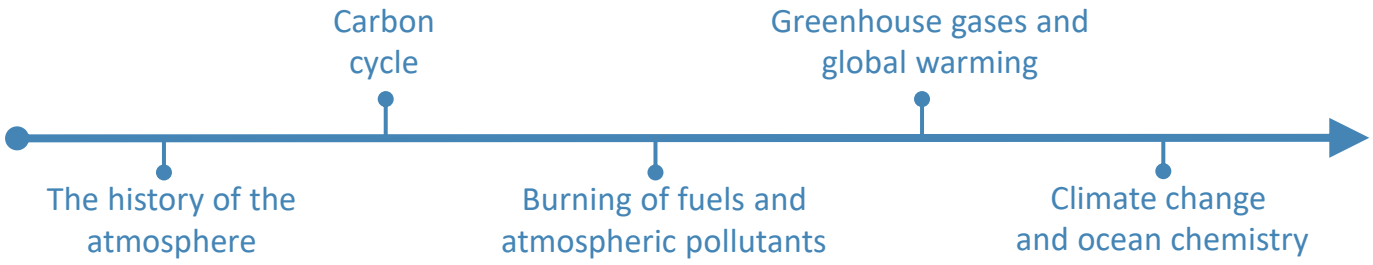
Solve
- Estimate risks
- Examine consequences
- Interrogate sources
- Review theories

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 8 Enquiry activities		Contact forces	Pressure	Electromagnets	Magnatism	Work	Heating and cooling	Wave effects	Wave properties	Periodic table	Elements	Chemical energy	Types of reaction	Climate	Earth resources	Breathing	Digestion	Respiration	Photosynthesis	Evolution	inheritance
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

CLIMATE



TAKE IT FURTHER

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Big idea:

EARTH

TIMELINE

Investigate the contribution that natural and human chemical processes make to our carbon dioxide emissions.

1 Know

Ideas

K1 Carbon is recycled through natural processes in the atmosphere, ecosystems, oceans and the Earth's crust (such as photosynthesis and respiration) as well as human activities (burning fuels).

K2 Greenhouse gases reduce the amount of energy lost from the Earth through radiation and therefore the temperature has been rising as the concentration of those gases has risen.

K3 Scientists have evidence that global warming caused by human activity is causing changes in climate.

Facts

K4 Methane and carbon dioxide are greenhouse gases.

K5 Earth's atmosphere contains around 78% nitrogen, 21% oxygen, <1% carbon dioxide, plus small amounts of other gases.

Key words

K6 **Global warming:** The gradual increase in surface temperature of the Earth.

K7 **Fossil fuels:** Remains of dead organisms that are burned as fuels, releasing carbon dioxide.

K8 **Carbon sink:** Areas of vegetation, the ocean or the soil, which absorb and store carbon.

Greenhouse effect: When energy from the sun is transferred to the thermal energy store of gases in Earth's atmosphere.

2 Apply

A1 Use a diagram to show how carbon is recycled in the environment and through living things.

A2 Describe how human activities affect the carbon cycle.

A3 Describe how global warming can impact on climate and local weather patterns.

3 Extend

E1 Evaluate the implications of a proposal to reduce carbon emissions.

E2 Evaluate claims that human activity is causing global warming or climate change.

E3 Compare the relative effects of human-produced and natural global warming.

EARTH

EARTH RESOURCES

TAKE IT FURTHER

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Big idea:

EARTH

TIMELINE

Predict the method used for extracting metal based on its position in the reactivity series.

1 Know

Ideas

K1 There is only a certain quantity of any resource on Earth, so the faster it is extracted, the sooner it will run out. Recycling reduces the need to extract resources.

K2 Most metals are found combined with other elements, as a compound, in ores. The more reactive a metal, the more difficult it is to separate it from its compound. Carbon displaces less reactive metals, while electrolysis is needed for more reactive metals.

Key words

K3 **Natural resources:** Materials from the Earth which act as raw materials for making a variety of products.

K4 **Mineral:** Naturally occurring metal or metal compound.

K5 **Ore:** Naturally occurring rock containing sufficient minerals for extraction.

K6 **Extraction:** Separation of a metal from a metal compound.

K7 **Recycling:** Processing a material so that it can be used again.

K8 **Electrolysis:** Using electricity to split up a compound into its elements.

2 Apply

A1 Explain why recycling of some materials is particularly important.

A2 Describe how Earth's resources are turned into useful materials or recycled.

A3 Justify the choice of extraction method for a metal, given data about reactivity.

A4 Suggest factors to take into account when deciding whether extraction of a metal is practical.

3 Extend

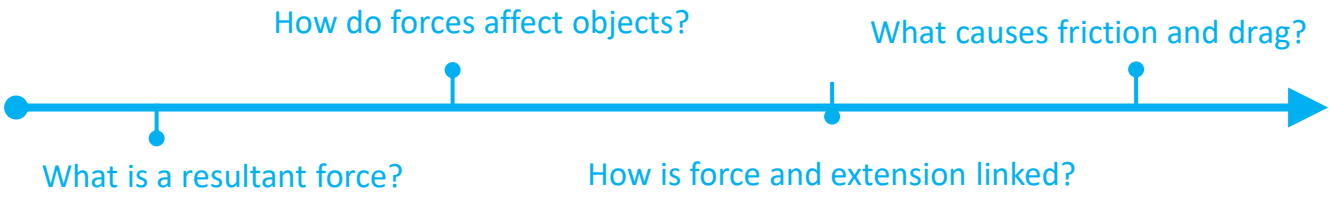
E1 Suggest ways in which changes in behaviour and the use of alternative materials may limit the consumption of natural resources.

E2 Suggest ways in which waste products from industrial processes could be reduced.

E3 Use data to evaluate proposals for recycling materials.

FORCES

CONTACT FORCES



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Big idea:

FORCES

TIMELINE

Investigate factors that affect the size of frictional or drag forces.

1 Know

Ideas

K1 When the resultant force on an object is zero, it is in equilibrium and does not move, or remains at constant speed in a straight line.

K2 One effect of a force is to change an object's form, causing it to be stretched or compressed. In some materials, the change is proportional to the force applied

Skill

K3 Sketch the forces acting on an object, and label their size and direction.

Key words

K4 **Equilibrium:** State of an object when opposing forces are balanced.

K5 **Deformation:** Changing shape due to a force.

K6 **Linear relationship:** When two variables are graphed and show a straight line which goes through the origin, and they can be called proportional.

K7 **Newton:** Unit for measuring forces (N).

K8 **Resultant force:** Single force which can replace all the forces acting on an object and have the same effect.

K9 **Friction:** Force opposing motion which is caused by the interaction of surfaces moving over one another. It is called 'drag' if one is a fluid.

K10 **Tension:** Force extending or pulling apart.

K11 **Compression:** Force squashing or pushing together.

K12 **Contact force:** One that acts by direct contact.

2 Apply

A1 Explain whether an object in an unfamiliar situation is in equilibrium.

A2 Describe factors which affect the size of frictional and drag forces.

A3 Describe how materials behave as they are stretched or squashed.

A4 Describe what happens to the length of a spring when the force on it changes.

3 Extend

E1 Evaluate how well sports or vehicle technology reduces frictional or drag forces.

E2 Describe the effects of drag and other forces on falling or accelerating objects as they move.

E3 Using force and extension data, compare the behaviour of different materials in deformation using the idea of proportionality.

FORCES

PRESSURE

How do you calculate pressure?

What is pressure?

How do change the amount of pressure applied?

End of unit assessment

TAKE IT FURTHER

Investigate how pressure from your foot onto the ground varies with different footwear.

1 Know

Ideas

K1 Pressure acts in a fluid in all directions. It increases with depth due to the increased weight of fluid, and results in an upthrust. Objects sink or float depending on whether the weight of the object is bigger or smaller than the upthrust.

K2 Different stresses on a solid object can be used to explain observations where objects scratch, sink into or break surfaces.

Skill

K3 Use the formula: fluid pressure, or stress on a surface = force (N) / area (m^2).

Key words

K4 **Fluid:** A substance with no fixed shape, a gas or a liquid.

K5 **Pressure:** The ratio of force to surface area, in N/m2, and it causes stresses in solids.

K6 **Upthrust:** The upward force that a liquid or gas exerts on a body floating in it.

K7 **Atmospheric pressure:** The pressure caused by the weight of the air above a surface.

2 Apply

A1 Use diagrams to explain observations of fluids in terms of unequal pressure.

A2 Explain why objects either sink or float depending upon their weight and the upthrust acting on them.

A3 Explain observations where the effects of forces are different because of differences in the area over which they apply.

A4 Given unfamiliar situations, use the formula to calculate fluid pressure or stress on a surface.

3 Extend

E1 Use the idea of pressure changing with depth to explain underwater effects.

E2 Carry out calculations involving pressure, force and area in hydraulics, where the effects of applied forces are increased.

E3 Use the idea of stress to deduce potential damage to one solid object by another.

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Big idea:

FORCES

TIMELINE

ELECTROMAGNETS

MAGNETISM

What is Magnetism?

How is the Magnetic Field Affected?

What is a Magnetic Field?

TAKE IT FURTHER

Resources:

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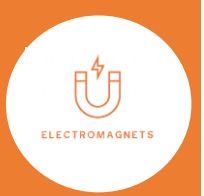
Big idea:



TIMELINE

Explore the magnetic field pattern around different types or combinations of magnets.

1 Know

Ideas

K1 Magnetic materials, electromagnets and the Earth create magnetic fields which can be described by drawing field lines to show the strength and direction. The stronger the magnet, and the smaller the distance from it, the greater the force a magnetic object in the field experiences.

Facts

K2 Two 'like' magnetic poles repel and two 'unlike' magnetic poles attract.

K3 Field lines flow from the north-seeking pole to the south-seeking pole.

Key words

K4 **Magnetic force:** Non-contact force from a magnet on a magnetic material.

K5 **Permanent magnet:** An object that is magnetic all of the time.

K6 **Magnetic poles:** The ends of a magnetic field, called north-seeking (N) and south-seeking poles (S).

2 Apply

A1 Use the idea of field lines to show how the direction or strength of the field around a magnet varies.

A2 Explain observations about navigation using Earth's magnetic field.

3 Extend

E1 Predict the pattern of field lines and the force around two magnets placed near each other.

E2 Predict how an object made of a magnetic material will behave if placed in or rolled through a magnetic field.

ELECTROMAGNETS

ELECTROMAGNETS

What are electromagnets?

How are electromagnets used?

How is the strength of an electromagnet affected?

End of unit assessment

TAKE IT FURTHER

Investigate ways of varying the strength of an electromagnet.

1 Know

Ideas

K1 An electromagnet uses the principle that a current through a wire causes a magnetic field. Its strength depends on the current, the core and the number of coils in the solenoid.

Facts

K2 The magnetic force of an electromagnet decreases with distance.

Key words

K3 **Electromagnet:** A non-permanent magnet turned on and off by controlling the current through it.

K4 **Solenoid:** Wire wound into a tight coil, part of an electromagnet.

K5 **Core:** Soft iron metal which the solenoid is wrapped around.

2 Apply

A1 Use a diagram to explain how an electromagnet can be made and how to change its strength.

A2 Explain the choice of electromagnets or permanent magnets for a device in terms of their properties.

3 Extend

E1 Critique the design of a device using an electromagnet and suggest improvements.

E2 Suggest how bells, circuit breakers and loudspeakers work, from diagrams.

Resources:

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Big idea:

ELECTROMAGNETS

TIMELINE

ENERGY

WORK

TAKE IT FURTHER

Explain how an electric motor raising a weight is doing work.

1 Know

Ideas

K1 Work is done and energy transferred when a force moves an object. The bigger the force or distance, the greater the work. Machines make work easier by reducing the force needed. Levers and pulleys do this by increasing the distance moved, and wheels reduce friction.

Key words

K2 **Work:** The transfer of energy when a force moves an object, in joules.

K3 **Lever:** A type of machine which is a rigid bar that pivots about a point.

K4 **Input force:** The force you apply to a machine.

K5 **Output force:** The force that is applied to the object moved by the machine.

K6 **Displacement:** The distance an object moves from its original position.

K7 **Deformation:** When an elastic object is stretched or squashed, which requires work.

2 Apply

A1 Draw a diagram to explain how a lever makes a job easier.

A2 Compare the work needed to move objects different distances.

3 Extend

E1 Use the formula: work done (J) = force (N) x distance moved (m) to compare energy transferred for objects moving horizontally.

E2 Compare and contrast the advantages of different levers in terms of the forces needed and distance moved.

Resources:

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Big idea:

ENERGY

TIMELINE

ENERGY

HEATING & COOLING

What is thermal energy?

How is thermal energy transferred?

How can the amount of thermal energy transferred be reduced?

End of unit assessment

TAKE IT FURTHER

Investigate how to prevent heat loss by conduction, convection and radiation.

1 Know

Ideas

K1 The thermal energy of an object depends upon its mass and temperature and what it's made of. When there is a temperature difference, energy transfers from the hotter to the cooler object.

K2 Thermal energy is transferred through different pathways, by particles in conduction and convection, and by radiation.

Key words

K3 **Thermal conductor:** Material that allows heat to move quickly through it.

K4 **Thermal insulator:** Material that only allows heat to travel slowly through it.

K5 **Temperature:** A measure of the motion and energy of the particles.

K6 **Thermal energy:** The quantity of energy stored in a substance due to the vibration of its particles.

K7 **Conduction:** Transfer of thermal energy by the vibration of particles.

K8 **Convection:** Transfer of thermal energy when particles in a heated fluid rise.

K9 **Radiation:** Transfer of thermal energy as a wave.

2 Apply

A1 Explain observations about changing temperature in terms of energy transfer.

A2 Describe how an object's temperature changes over time when heated or cooled.

A3 Explain how a method of thermal insulation works in terms of conduction, convection and radiation.

A4 Sketch diagrams to show convection currents in unfamiliar situations.

3 Extend

E1 Sketch a graph to show the pattern of temperature change against time.

E2 Evaluate a claim about insulation in the home or for clothing technology.

E3 Compare and contrast the three ways that energy can be moved from one place to another by heating.

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Big idea:

ENERGY

TIMELINE

WAVES

WAVE EFFECTS

How are sound waves produced and detected?

What do waves do?

Are waves dangerous?

TAKE IT FURTHER

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Big idea:

WAVES

TIMELINE

Relate the impact of different types of waves on living cells to their frequency and the energy carried by the wave.

1 Know

Ideas

K1 When a wave travels through a substance, particles move to and fro. Energy is transferred in the direction of movement of the wave. Waves of higher amplitude or higher frequency transfer more energy.

Key words

K2 **Ultrasound:** Sound waves with frequencies higher than the human auditory range.

K3 **Ultraviolet (UV):** Waves with frequencies higher than light, which human eyes cannot detect.

K4 **Microphone:** Turns the pressure wave of sound hitting it into an electrical signal.

K5 **Loudspeaker:** Turns an electrical signal into a pressure wave of sound.

K6 **Pressure wave:** An example is sound, which has repeating patterns of high-pressure and low-pressure regions.

2 Apply

A1 Explain differences in the damage done to living cells by light and other waves, in terms of their frequency.

A2 Explain how audio equipment converts sound into a changing pattern of electric current.

3 Extend

E1 Suggest reasons why sound waves can agitate a liquid for cleaning objects, or massage muscles for physiotherapy.

E2 Evaluate electricity production by wave energy using data for different locations and weather conditions.

WAVES

WAVE PROPERTIES

What are the properties of waves?

What is the wave model?

How are wave properties affected?

End of unit assessment

TAKE IT FURTHER

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Big idea:

WAVES

TIMELINE

Use the wave model to explain observations of the reflection, absorption and transmission of waves.

1 Know

Ideas

K1 A physical model of a transverse wave demonstrates it moves from place to place, while the material it travels through does not, and describes the properties of speed, wavelength and reflection.

Key words

K2 **Waves:** Vibrations that transport energy from place to place without transporting matter.

K3 **Transverse wave:** Where the direction of vibration is perpendicular to that of the wave.

K4 **Transmission:** Where waves travel through a medium rather than being absorbed or reflected.

2 Apply

A1 Describe the properties of different longitudinal and transverse waves.

A2 Use the wave model to explain observations of the reflection, absorption and transmission of a wave.

3 Extend

E1 Compare and contrast the properties of sound and light waves.

E2 Suggest what happens when two waves combine.

MATTER

ELEMENTS

Atoms, elements & compounds

Atoms, elements & compounds part 2

Polymers, ceramics and composites

TAKE IT FURTHER

Resources:

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Big idea:

MATTER

TIMELINE

Compare the properties of elements with the properties of a compound formed from them.

1 Know

Ideas

K1 Most substances are not pure elements, but compounds or mixtures containing atoms of different elements. They have different properties to the elements they contain.

Skills

K2 Use particle diagrams to classify a substance as an element, mixture or compound, and as molecules or atoms.

K3 Name simple compounds using rules: change non-metal to –ide; mono, di, tri prefixes; and symbols of hydroxide, nitrate, sulfate and carbonate.

Facts

K4 The symbols of hydrogen, oxygen, nitrogen, carbon, iron, zinc, copper, sulfur, aluminium, iodine, bromine, chlorine, sodium, potassium, magnesium.

Key words

K5 **Elements:** what all substances are made up of, and which contain only one type of atom.

K6 **Atom:** The smallest particle of an element that can exist.

K7 **Molecules:** Two to thousands of atoms joined together. Most non-metals exist either as small or giant molecules.

K8 **Compound:** Pure substances made up of two or more elements strongly joined together.

K9 **Chemical formula:** Shows the elements present in a compound and their relative proportions.

K10 **Polymer:** A molecule made of thousands of smaller molecules in a repeating pattern. Plastics are man-made polymers, starch is a natural polymer.

2 Apply

A1 Name compounds using their chemical formulae.

A2 Given chemical formulae, name the elements present and their relative proportions.

A3 Represent atoms, molecules and elements, mixtures and compounds using particle diagrams.

A4 Use observations from chemical reactions to decide if an unknown substance is an element or a compound.

3 Extend

E1 Use particle diagrams to predict physical properties of elements and compounds.

E2 Deduce a pattern in the formula of similar compounds and use it to suggest formulae for unfamiliar ones.

E3 Compare and contrast the properties of elements and compounds and give a reason for differences.

MATTER

THE PERIODIC TABLE

Groups and periods

Chemical symbols and formulae

Group 1

Group 7

End of unit assessment

TAKE IT FURTHER

Resources:

Knowledge Organisers

Word Mats

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Big idea:

MATTER

TIMELINE

Sort elements using chemical data and relate this to their position in the periodic table.

1 Know

Ideas

- K1 The elements in a group all react in a similar way and sometimes show a pattern in reactivity.
- K2 As you go down a group and across a period the elements show patterns in physical properties.

Facts

- K3 Metals are generally found on the left side of the table, non-metals on the right.
- K4 Group 1 contains reactive metals called alkali metals.
- K5 Group 7 contains non-metals called halogens.
- K6 Group 0 contains unreactive gases called noble gases.

Key words

- K7 **Periodic table:** Shows all the elements arranged in rows and columns.
- K8 **Physical properties:** Features of a substance that can be observed without changing the substance itself.
- K9 **Chemical properties:** Features of the way a substance reacts with other substances.
- K10 **Groups:** Columns of the Periodic table.
- K11 **Periods:** Rows of the Periodic table.

2 Apply

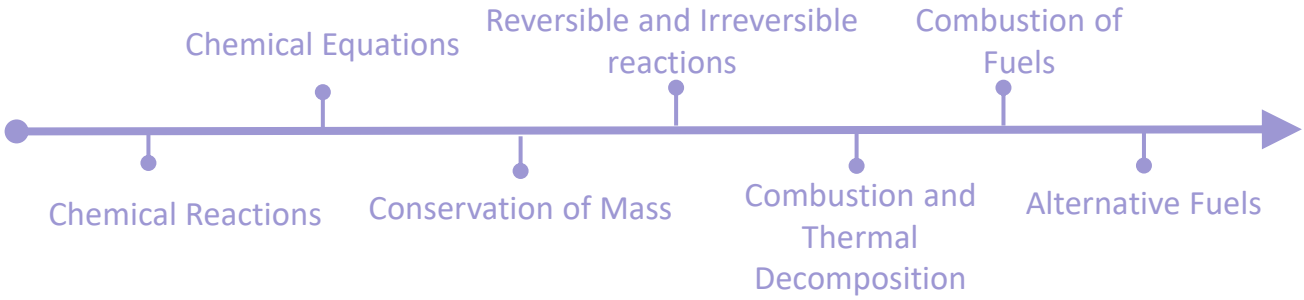
- A1 Use data to describe a trend in physical properties.
- A2 Describe the reaction of an unfamiliar Group 1 or 7 element.
- A3 Use data showing a pattern in physical properties to estimate a missing value for an element.
- A4 Use observations of a pattern in chemical reactions to predict the behaviour of an element in a group.

3 Extend

- E1 Predict the position of an element in the Periodic table based on information about its physical and chemical properties.
- E2 Choose elements for different uses from their position in the Periodic table.
- E3 Use data about the properties of elements to find similarities, patterns and anomalies.

REACTIONS

TYPES OF REACTION



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Big idea:

REACTIONS

TIMELINE

Investigate changes in mass for chemical and physical processes.

1 Know

Ideas

- K1 Combustion is a reaction with oxygen in which energy is transferred to the surroundings as heat and light.
- K2 Thermal decomposition is a reaction where a single reactant is broken down into simpler products by heating.
- K3 Chemical changes can be described by a model where atoms and molecules in reactants rearrange to make the products and the total number of atoms is conserved.

Skills

- K4 Write word equations from information about chemical reactions.

Key words

- K5 **Fuel:** Stores energy in a chemical store which it can release as heat.
- K6 **Chemical reaction:** A change in which a new substance is formed.
- K7 **Physical change:** One that changes the physical properties of a substance, but no new substance is formed.
- K8 **Reactants:** Substances that react together, shown before the arrow in an equation.
- K9 **Products:** Substances formed in a chemical reaction, shown after the reaction arrow in an equation.
- K10 **Conserved:** When the quantity of something does not change after a process takes place.

2 Apply

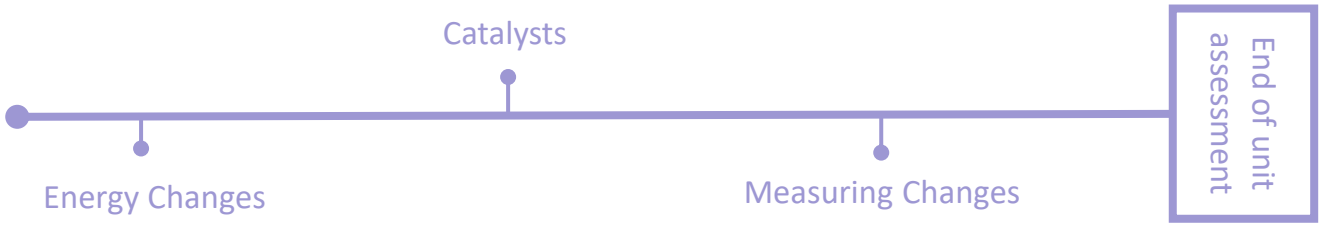
- A1 Explain why a reaction is an example of combustion or thermal decomposition.
- A2 Predict the products of the combustion or thermal decomposition of a given reactant and show the reaction as a word equation.
- A3 Explain observations about mass in a chemical or physical change.
- A4 Use particle diagrams to show what happens in a reaction.

3 Extend

- E1 Compare the pros and cons of fuels in terms of their products of combustion.
- E2 Use known masses of reactants or products to calculate unknown masses of the remaining reactant or product.
- E3 Devise a general rule for how a set of compounds reacts with oxygen or thermally decomposes.
- E4 Balance a symbol equation.
- E5 Use mass of reactant in equation to determine mass of product e.g., magnesium and oxygen.

REACTIONS

CHEMICAL ENERGY



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Big idea:

REACTIONS

TIMELINE

Investigate a phenomenon that relies on an exothermic or endothermic reaction.

1 Know

Ideas

K1 During a chemical reaction bonds are broken (requiring energy) and new bonds formed (releasing energy). If the energy released is greater than the energy required, the reaction is exothermic. If the reverse, it is endothermic.

Key words

K2 **Catalysts:** Substances that speed up chemical reactions but are unchanged at the end.

K3 **Exothermic reaction:** One in which energy is given out, usually as heat or light.

K4 **Endothermic reaction:** One in which energy is taken in, usually as heat.

K5 **Chemical bond:** Force that holds atoms together in molecules.

2 Apply

A1 Use experimental observations to distinguish exothermic and endothermic reactions.

A2 Use a diagram of relative energy levels of particles to explain energy changes observed during a change of state.

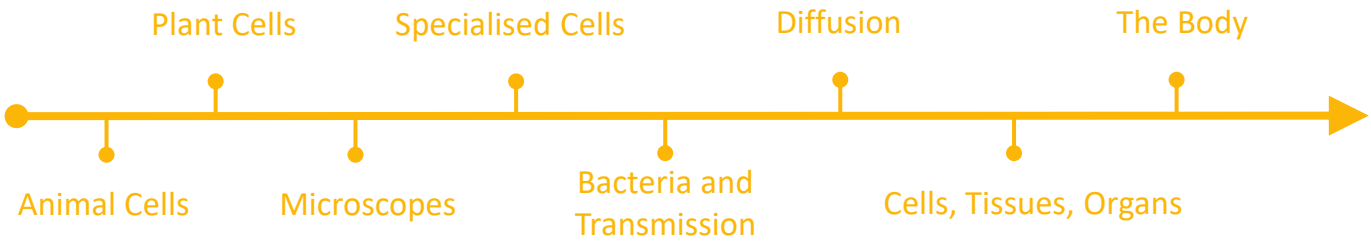
3 Extend

E1 Predict whether a chemical reaction will be exothermic or endothermic given data on bond strengths.

E2 Use energy data to select a reaction for a chemical hand warmer or cool pack.

ORGANISMS

BREATHING



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Resources:

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Big idea:

ORGANISMS

TIMELINE

Investigate a claim linking height to lung volume.

1 Know

Ideas

K1 In gas exchange, oxygen and carbon dioxide move between alveoli and the blood. Oxygen is transported to cells for aerobic respiration and carbon dioxide, a waste product of respiration, is removed from the body.

K2 Breathing occurs through the action of muscles in the ribcage and diaphragm. The amount of oxygen required by body cells determines the rate of breathing.

Key words

K3 **Breathing:** The movement of air in and out of the lungs.

K4 **Trachea (windpipe):** Carries air from the mouth and nose to the lungs.

K5 **Bronchi:** Two tubes which carry air to the lungs.

K6 **Bronchioles:** Small tubes in the lung.

K7 **Alveoli:** Small air sacs found at the end of each bronchiole.

K8 **Ribs:** Bones which surround the lungs to form the ribcage.

K9 **Diaphragm:** A sheet of muscle found underneath the lungs.

K10 **Lung volume:** Measure of the amount of air breathed in or out.

2 Apply

A1 Explain how exercise, smoking and asthma affect the gas exchange system.

A2 Explain how the parts of the gas exchange system are adapted to their function.

A3 Explain observations about changes to breathing rate and volume.

A4 Explain how changes in volume and pressure inside the chest move gases in and out of the lungs.

3 Extend

E1 Evaluate a possible treatment for a lung disease.

E2 Predict how a change in the gas exchange system could affect other processes in the body.

E3 Evaluate a model for showing the mechanism of breathing.

E4 Find out how recreation drugs might affect different body systems.

ORGANISMS

DIGESTION

Muscles and Joints

Skeletal system

Musculoskeletal system

End of unit assessment

TAKE IT FURTHER

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Big idea:

ORGANISMS

TIMELINE

Evaluate how well a model represents key features of the digestive system.

1 Know

Ideas

K1 The body needs a balanced diet with lipids, proteins, vitamins, minerals, dietary fibre and water, for its cells' energy, growth and maintenance.

K2 Organs of the digestive system are adapted to break large food molecules into small ones which can travel in the blood to cells and are used for life processes.

Facts

K3 Iron is a mineral important for red blood cells.

K4 Calcium is a mineral needed for strong teeth and bones.

K5 Vitamins and minerals are needed in small amounts to keep the body healthy.

Key words

K6 **Enzymes:** Substances that speed up the chemical reactions of digestion.

K7 **Dietary fibre:** Parts of plants that cannot be digested, which helps the body eliminate waste.

K8 **Carbohydrates:** The body's main source of energy. There are two types: simple (sugars) and complex (starch).

K9 **Lipids:** (fats and oils) A source of energy. Found in butter, milk, eggs, nuts.

K10 **Protein:** Nutrient your body uses to build new tissue for growth and repair. Sources are meat, fish, eggs, dairy products, beans, nuts and seeds.

K11 **Stomach:** A sac where food is mixed with acidic juices to start the digestion of protein and kill microorganisms.

K12 **Small intestine:** Upper part of the intestine where digestion is completed and nutrients are absorbed by the blood.

K13 **Large intestine:** Lower part of the intestine from which water is absorbed and where faeces are formed.

K14 **Gut bacteria:** Microorganisms that naturally live in the intestine and help food break down.

2 Apply

A1 Describe possible health effects of unbalanced diets from data provided.

A2 Calculate food requirements for a healthy diet, using information provided.

A3 Describe how organs and tissues involved in digestion are adapted for their role.

A4 Describe the events that take place in order to turn a meal into simple food molecules inside a cell.

3 Extend

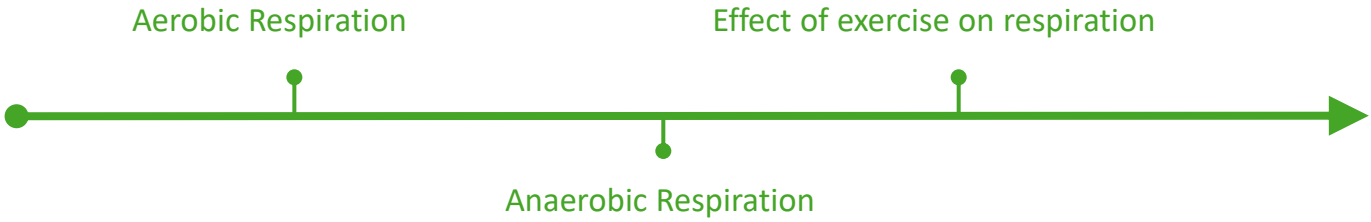
E1 Design a diet for a person with specific dietary needs.

E2 Critique claims for a food product or diet by analysing nutritional information.

E3 Make deductions from medical symptoms showing problems with the digestive system.

ECOSYSTEM

RESPIRATION



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Big idea:

ECOSYSTEM

TIMELINE

Use data from investigating fermentation with yeast to explore respiration.

1 Know

Ideas

K1 Respiration is a series of chemical reactions, in cells, that breaks down glucose to provide energy and form new molecules. Most living things use aerobic respiration but switch to anaerobic respiration, which provides less energy, when oxygen is unavailable.

Facts

K3 Yeast fermentation is used in brewing and bread-making.

Key words

K4 **Aerobic respiration:** Breaking down glucose with oxygen to release energy and producing carbon dioxide and water.

K5 **Anaerobic respiration (fermentation):** Releasing energy from the breakdown of glucose without oxygen, producing lactic acid (in animals) and ethanol and carbon dioxide (in plants and microorganisms).

2 Apply

A1 Use word equations to describe aerobic and anaerobic respiration.

A2 Explain how specific activities involve aerobic or anaerobic respiration.

3 Extend

E1 Suggest how organisms living in different conditions use respiration to get their energy.

E2 Describe similarities and differences between aerobic and anaerobic respiration.

ECOSYSTEM

PHOTOSYNTHESIS

Looking at leaves

The importance of plants

Exploring the role of stomata

Investigating photosynthesis

Movement of water and minerals in plants

End of unit assessment

TAKE IT FURTHER

Use lab tests on variegated leaves to show that chlorophyll is essential for photosynthesis.

1 Know

Ideas

K1 Plants and algae do not eat, but use energy from light, together with carbon dioxide and water to make glucose (food) through photosynthesis. They either use the glucose as an energy source, to build new tissue, or store it for later use.

K2 Plants have specially-adapted organs that allow them to obtain resources needed for photosynthesis.

Facts

K3 Iodine is used to test for the presence of starch.

Key words

K4 **Fertilisers:** Chemicals containing minerals that plants need to build new tissues.

K6 **Photosynthesis:** A process where plants and algae turn carbon dioxide and water into glucose and release oxygen.

K7 **Chlorophyll:** Green pigment in plants and algae which absorbs light energy.

K8 **Stomata** Pores in the bottom of a leaf which open and close to let gases in and out.

2 Apply

A1 Describe ways in which plants obtain resources for photosynthesis.

A2 Explain why other organisms are dependent on photosynthesis.

A3 Sketch a line graph to show how the rate of photosynthesis is affected by changing conditions.

A4 Use a word equation to describe photosynthesis in plants and algae.

3 Extend

E1 Suggest how particular conditions could affect plant growth.

E2 Suggest reasons for particular adaptations of leaves, roots and stems.

E3 Compare the movement of carbon dioxide and oxygen through stomata at different times of day.

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Big idea:

ECOSYSTEM

TIMELINE

GENES

EVOLUTION

How Organisms Survive

Preserving Plants and Animals

Explaining Extinction

TAKE IT FURTHER

Resources:

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BBC Bitesize Revision

Big idea:

GENES

TIMELINE

Review the evidence for theories about how a particular species went extinct.

1 Know

Ideas

K1 Natural selection is a theory that explains how species evolve and why extinction occurs.

K2 Biodiversity is vital to maintaining populations. Within a species variation helps against environment changes, avoiding extinction. Within an ecosystem, having many different species ensures resources are available for other populations, like humans.

Key words

K3 **Population:** Group of organisms of the same kind living in the same place.

K4 **Natural selection:** Process by which species change over time in response to environmental changes and competition for resources.

K5 **Extinct:** When no more individuals of a species remain.

K6 **Biodiversity:** The variety of living things. It is measured as the differences between individuals of the same species, or the number of different species in an ecosystem.

K7 **Competition:** When two or more living things struggle against each other to get the same resource.

K8 **Evolution:** Theory that the animal and plant species living today descended from species that existed in the past.

2 Apply

A1 Use evidence to explain why a species has become extinct or adapted to changing conditions.

A2 Evaluate whether evidence for a species changing over time supports natural selection.

A3 Explain how a lack of biodiversity can affect an ecosystem.

A4 Describe how preserving biodiversity can provide useful products and services for humans.

3 Extend

E1 Predict and explain the changes in a population over time due to natural selection.

E2 Suggest an explanation, based on data, for how a particular evolutionary change occurred.

E3 Evaluate ways of preserving plant or animal material for future generations.

GENES

INHERITANCE

The Cell's Nucleus and The Genome

Inherited Characteristics

Selective Breeding

Genetic Modification

End of unit assessment

TAKE IT FURTHER

Resources:

Knowledge Organisers

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Big idea:

GENES

TIMELINE

Model the inheritance of a specific trait and explore the variation in the offspring produced.

1 Know

Ideas

K1 Inherited characteristics are the result of genetic information, in the form of sections of DNA called genes, being transferred from parents to offspring during reproduction.

K2 Chromosomes are long pieces of DNA which contain many genes. Gametes, carrying half the total number of chromosomes of each parent, combine during fertilisation.

Facts

K3 The DNA of every individual is different, except for identical twins.

K4 There is more than one version of each gene e.g. different blood groups.

Key words

K5 **Inherited characteristics:** Features that are passed from parents to their offspring.

K6 **DNA:** A molecule found in the nucleus of cells that contains genetic information.

K7 **Chromosomes:** Thread-like structures containing tightly coiled DNA.

K8 **Gene:** A section of DNA that determines an inherited characteristic.

2 Apply

A1 Use a diagram to show the relationship between DNA, chromosomes and genes.

A2 Use a diagram to show how genes are inherited.

A3 Explain how a change in the DNA (mutation) may affect an organism and its future offspring.

A4 Explain why offspring from the same parents look similar but are not usually identical.

3 Extend

E1 Suggest arguments for and against genetic modification.

E2 Suggest benefits from scientists knowing all the genes in the human genome.

E3 Determine how the number of chromosomes changes during cell division, production of sex cells and fertilisation.

E4 Find out why scientist Watson, Crick and Franklin were so important.