

	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer 1	Summer 2	Cross curricular links. Personal development links Careers related
Year 7 (3LBH/3JG)	<p>Muscles and bones 7C.</p> <p>Fitness Muscles and breathing Muscles and blood The skeleton</p>	<p>Muscles and bones 7C.</p> <p>Muscles and moving Drugs Drugs and sport Current and electricity 7J.</p> <p>Discovering electricity Switches and current Models for circuits Series and parallel circuits Changing the current Using electricity A world without electricity</p>	<p>Energy 7I.</p> <p>Energy and changes Energy from food Energy transfers/stores Fuels Other energy resources Using resources Making changes</p>	<p>Cells, tissues, organs and systems 7A.</p> <p>Doctors, past and present Life processes Organs Tissues Microscopes Cells Organ systems Transplants</p>	<p>Current and electricity 7J.</p> <p>Discovering electricity Switches and current Models for circuits Series and parallel circuits Changing the current Using electricity A world without electricity</p>	<p>Acids and alkalis 7F.</p> <p>Chemistry in the home Hazards Indicators Acidity and alkalinity Neutralisation Neutralisation in daily life Danger at home</p>	<p>Art. Vitruvian man (measurements). Autumn pictures (photosynthesis).</p> <p>English. A world without electricity. PSHE. Healthy organs.</p> <p>Understanding how our bodies work.</p>
Year 8 (3GR/3DRB)	<p>Light 8J</p> <p>Seeing things. Light on the move. Reflection. Refraction. Cameras and eyes. Colour. Invisibility cloaks.</p>	<p>Combustion 8E.</p> <p>Engines. Burning fuels. Oxidation. Fire safety. Air pollution. Global warming. Reducing pollution.</p>	<p>Food and Nutrition 8A.</p> <p>Food and advertising. Nutrients. Uses of nutrients. Balanced diets. Digestion. Absorption. Packaging and the law.</p>	<p>Breathing and respiration 8C.</p> <p>Water sports and breathing. Aerobic respiration. Gas exchange system. Getting oxygen. Comparing gas exchange.</p>	<p>Earth and Space 8L.</p> <p>Changing ideas. Gathering evidence. Seasons. Magnetic earth. Gravity in space. Beyond the solar system. Studying space.</p>	<p>Rocks 8H.</p> <p>Disaster. Rocks and their uses. Igneous and metamorphic. Weathering and erosion. Sedimentary rocks. Materials in the earth. Living in danger.</p>	<p>Cooking. Eatwell guide, balanced diet, nutrients, food labels.</p> <p>English. Watersports and breathing. Aerobic/anaerobic respiration.</p> <p>RE. pH levels.</p>

				Anaerobic respiration. Fitness training.			
Year 9 (3NA)	<p>ELC – Component 1 – Biology (The human body).</p> <p>And/or</p> <p>Food and nutrition 8A. Food and advertising. Nutrients. Uses of nutrients. Balanced diets. Digestion. Absorption. Packaging and the law.</p>	<p>ELC – Component 2 – Biology (Enironment, evolution and inheritance).</p> <p>And/or</p> <p>Force fields and electromagnets 9J. Mission to Mars. Force fields. Static electricity. Current electricity. Resistance. Electromagnets. Humans in Space.</p>	<p>ELC – Component 3 – Chemistry Elements,mixtures and compounds).</p> <p>And/or</p> <p>Light 8J. Seeing things. Light on the move. Reflection. Refraction. Cameras and eyes. Colour. Invisibility cloaks.</p>	<p>ELC – Component 3 – Chemistry (Chemistry in our world).</p> <p>And/or</p> <p>Breathing and respiration 8C. Water sports and breathing. Aerobic respiration. Gas exchange system. Getting oxygen. Comparing gas exchange. Anaerobic respiration. Fitness training.</p>	<p>ELC – Component 5 – Physics (Energy, forces and matter).</p> <p>And/or</p> <p>Earth and Space 8L. Changing ideas. Gathering evidence. Seasons. Magnetic earth. Gravity in space. Beyond the solar system. Studying space.</p>	<p>ELC – Component 6 – Physics (Electricity, magnetism and waves).</p> <p>And/or</p> <p>Rocks 8H. Disaster. Rocks and their uses. Igneous and metamorphic. Weathering and erosion. Sedimentary rocks. Materials in the earth. Living in danger.</p>	<p>Cooking. Eatwell guide, balanced diet, nutrients, food labels.</p> <p>PE. Fitness, respiration.</p> <p>Art. Colours.</p> <p>Maths. Place value, decimals, rounding, using equations, rearranging equations, charts/graphs.</p>
Year							

KS4 (4PR/4NT/4CM)	ELC – Component 1 – Biology (The human body). And/or iGCSE - Autumn term	ELC – Component 2 – Biology (Environment, evolution and inheritance).	ELC – Component 3 – Chemistry (Elements, mixtures and compounds). And/or iGCSE – Spring term	ELC – Component 4 – Chemistry (Chemistry in our world). 3 Physical chemistry 4 Organic chemistry	ELC – Component 5 – Physics (Energy, forces and matter). And/or iGCSE – Summer term Physics content 1 Forces and motion 2 Electricity 3 Waves 4 Energy resources and energy transfers	ELC – Component 6 – Physics (Electricity, magnetism and waves). 5 Solids, liquids and gases 6 Magnetism and electromagnetism 7 Radioactivity and particles 8 Astrophysics	Maths. Place value, decimals, rounding, using equations, rearranging equations, charts/graphs.
	Biology content 1 The nature and variety of living organisms 2 Structure and functions in living organisms	3 Reproduction and inheritance 4 Ecology and the environment 5 Use of biological resources	Chemistry content 1 Principles of chemistry 2 Inorganic chemistry				

YEAR 7 — MEDIUM-TERM OVERVIEW

Half term	Topics discussed	Pupil outcomes	Resources and support information	Cross curricular links.
<p>Autumn 1</p> <p>Muscles and bones</p>	<p>Fitness</p> <p>Muscles and breathing</p> <p>Muscles and blood</p> <p>The skeleton</p>	<ul style="list-style-type: none"> I can name the four S-factors. I can identify organs in the human body. I can place individual organs in organ systems. I can understand what the term organisation means in terms of cells, tissues etc. <ul style="list-style-type: none"> I can describe how muscles in the gas exchange system allow ventilation. I can describe what happens during gas exchange in the lungs. I can describe the role of muscles in the heart. I can describe the role of different parts of the blood and where the different parts are made. I can describe the functions of different bones in the skeleton. I can describe some different types of joint. 	<p>Exploring Science. TES</p>	<p>English.</p> <p>Written evaluation. Extended literacy tasks</p> <p>PE. Skeleton, muscles, fitness factors.</p> <p>Art. Vitruvian man (measurements).</p> <p>Maths. Units/measurements.</p> <p>PSHE. Healthy lifestyle.</p> <p>Understanding how our bodies work.</p> <p>NHS careers – Nursing etc.</p> <p>Fitness industry.</p>
<p>Autumn 2</p> <p>Muscles and bones</p>	<p>Muscles and moving</p> <p>Drugs</p> <p>Drugs and sport</p>	<ul style="list-style-type: none"> I can explain how antagonistic pairs of muscles operate and are controlled to allow movement. I can recall how different drugs affect the body. I can explain why athletes use drugs to help them enhance their performance. 	<p>Exploring Science. TES.</p>	<p>English.</p> <p>Written evaluation. Extended literacy tasks</p> <p>PE. Skeleton, muscles, fitness factors, PEDs.</p> <p>Maths. Units/measurements.</p> <p>PSHE. Healthy lifestyles.</p> <p>How our bodies work.</p> <p>NHS careers – Nursing etc.</p> <p>Fitness industry.</p>

Spring 1

Energy

Energy and changes

Energy from food

Energy transfers/stores

Fuels

Other energy resources

Using resources

Making changes

- I can recall that our bodies need energy, which we get from food.
- I can explain why different people need different amounts of energy.
- I can recall the units for measuring energy are joules (J) or kilojoules (kJ). 1kJ=1000J.
- I can describe different ways in which energy is transferred.
- I can describe different ways in which energy is stored.
- I can recall the law of conservation of energy.
- I can describe what fossil fuels are and how they were made.
- I can explain why fossil fuels are described as non-renewable.
- I can name some renewable fuels.
- I can give some examples of renewable energy resources.
- I can explain how the Sun is the original source of energy for most of our energy resources.
- I can recall which energy resources do not depend on the sun.
- I can describe advantages and disadvantages of different energy resources.
- I can describe some ways of using less fossil fuels.
- I can explain what efficiency means.

Exploring Science.
TES.

English.

Written evaluation. Extended literacy tasks

Maths. Units/measurements.

Cooking. Energy content in food.

Citizenship – Energy resources.

Pollution

Our role in reducing Green House gases.

Energy industry jobs.

<p>Spring 2</p> <p>Cells, tissues, organs and systems</p>	<p>Doctors, past and present</p> <p>Life processes</p> <p>Organs</p> <p>Tissues</p> <p>Microscopes</p> <p>Cells</p> <p>Organ systems</p> <p>Transplants</p>	<ul style="list-style-type: none"> • I can recall and describe the life processes. • I can explain the differences between organisms and non-living things. • I can identify and locate important plant and animal organs. • I can describe the functions of important plant and animal organs. • I can describe what happens in photosynthesis. • I can identify and recall named tissues in human and plant organs. • I can describe the functions of different tissues in an organ. • I can describe how to prepare a microscope slide. • I can describe how to use a light microscope to examine a specimen. • I can identify the main parts of animal cells and describe their function. • I can identify and recall the main organs in the plant water transport system. • I can identify and recall the main organs in the human locomotor, digestive, circulatory, breathing, urinary and nervous system. 	<p>Exploring Science.</p> <p>TES.</p>	<p>English.</p> <p>Written evaluation. Extended literacy tasks Art. Autumn pictures- photosynthesis</p> <p>Maths. Units/measurements..</p> <p>PE. Respiration/exercise.</p> <p>PSHE. Healthy living.</p> <p>Food. Balanced diet.</p> <p>Our bodies and our health.</p> <p>NHS careers. Nurse etc.</p>
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				Cross curricular links.
Summer 1 Current and electricity	Discovering electricity Switches and current Models for circuits Series and parallel circuits Changing the current Using electricity A world without electricity	<ul style="list-style-type: none"> I can use standard circuit symbols to draw a circuit diagram. I can explain how switches work. I can describe what happens when the number of bulbs in a circuit is changed. I can describe what a current is and how it is measured. I can explain why models are used. I can identify what the parts of a physical model represent. I can use a physical model to help explain electric circuits. I can evaluate a physical model. I can state what is meant by current. I can state what is meant by series and parallel circuits. I can explain how switches can control different types of circuits. I can explain how changing the number or type of components in a circuit affects the current. I can describe the differences in how current behaves in series and parallel circuits. I can describe how a voltmeter is used. I can explain why current increases when the voltage of the supply is increased. I can describe the relationship between resistance and current. I can explain some safety precautions to be followed when using electricity. I can describe the job that fuses and circuit breakers do. I can explain how a fuse works. I can recall how the different wires are connected in plug. 	Exploring Science. TES.	English. Written evaluation. Extended literacy tasks – a world without electricity. Maths – Units and calculations. Tech-Using meters. Building electrical circuits. Using appliances. Electrical contractor etc.
Summer 2 Acids and alkalis	Chemistry in the home Hazards Indicators Acidity and alkalinity Neutralisation	<ul style="list-style-type: none"> I understand that many many chemical substances found in our homes are dangerous. I can recognise some common hazard symbols. I can explain why hazard symbols are necessary. I can recognise some common acids. I can plan and explain safety precautions. I can recognise hazards and explain how the risks can be controlled. 	Exploring Science. TES.	English. Written evaluation. Extended literacy tasks PSHE. pH levels in energy drinks. Cooking. Cleaning products. Maths. Units/measurements. Chemical hazards. Cleaning contractors.

Neutralisation in daily life

Danger at home

- I can name examples of indicators made from plants.
- I can describe how indicators can be used to test for acidic, alkaline or neutral solutions.
- I can name some common examples of acids and alkalis.
- I can describe the pH scale and how it is used.
- I can describe how pH can be measured.
- I can describe what happens during neutralisation.
- I can write word equations for neutralisation reactions.
- I can explain the pH changes taking place during neutralisation.
- I can describe some examples of everyday acids and bases.
- I can describe and explain some everyday neutralisation reactions.

YEAR 8 — MEDIUM-TERM OVERVIEW

Half term	Topics discussed	In this unit of work, students learn...	Resources and support information	Cross curricular links.
<p>Autumn 1 Food and nutrition.</p>	<p>Food and advertising. Nutrients. Uses of nutrients. Balanced diets. Digestion. Absorption. Packaging and the law.</p>	<ul style="list-style-type: none"> I can recall the nutrients we need in our diets. I can interpret nutrition information labels. I can recall the tests used to detect some nutrients. <ul style="list-style-type: none"> I can recall good sources of different nutrients. I can describe how factors change the amount of energy we need. I can describe what each nutrient does in the body. heart. I can describe the benefits of a balanced diet. I can explain how different types of malnutrition are caused and their effects. I can recall the parts of the digestive system and their functions. I can explain why enzymes and bacteria are useful for digestion. I can explain how diffusion enable absorption by the small intestine. I can explain how the small intestine is adapted to its function. 	<p>Exploring Science. TES.</p>	<p>English. Written evaluation. Extended literacy tasks Cooking. Eatwell guide. Nutrients etc.</p> <p>PE. Healthy diet and exercise. Maths. Units/measurements.</p> <p>PSHE. Healthy lifestyle.</p> <p>Healthy living.</p> <p>Nutritionist.</p>
<p>Autumn 2 Combustion.</p>	<p>Engines. Burning fuels. Oxidation. Fire safety. Air pollution.</p>	<ul style="list-style-type: none"> I can describe the reactions of hydrogen and hydrocarbons with oxygen. I can use word equations to model combustion reactions. I can describe oxidation reactions of metals and non-metals. I can explain changes of mass seen in oxidation reactions. I can compare how phlogiston and oxygen explain combustion. I can use the fire triangle to explain how to control a fire. I can identify hazard symbols for substances likely to 	<p>Exploring Science. TES.</p>	<p>English. Written evaluation. Extended literacy tasks Cooking. Hazards in the kitchen.</p> <p>Outdoor learning – combustion.</p> <p>RI visit. Maths. Units/measurements.</p>

	<p>Global warming.</p> <p>Reducing pollution.</p>	<p>cause fires.</p> <ul style="list-style-type: none"> • I can identify pollutants that are formed by burning fuels. • I can explain how these pollutants cause problems and how their effects can be reduced. • I can describe the greenhouse effect and how it is caused. • I can explain how human activity may be causing global warming. 		<p>Fire Safety.</p> <p>Fire service/Fire prevention jobs.</p>
<p>Spring 1</p> <p>Light.</p>	<p>Seeing things.</p> <p>Light on the move.</p> <p>Reflection.</p> <p>Refraction.</p> <p>Cameras and eyes.</p> <p>Colour.</p> <p>Invisibility cloaks.</p>	<ul style="list-style-type: none"> • I can compare light and sound waves. • I can describe what happens to light when it hits different surfaces. • I can describe how to demonstrate that light travels in straight lines. • I can describe how mirrors and rough surfaces reflect light. • I can describe how an image is formed in a mirror using a ray diagram. • I can recall some uses of lenses. • I can describe how light changes direction at the interface of two different substances. • I can use a model to explain how lenses work. • I can recall the parts of cameras and eyes and state their functions. • I can describe some ways in which the energy transferred by light leads to chemical or electrical effects. • I can describe how to make a spectrum. • I can explain why coloured objects appeared coloured. 	<p>Exploring Science. TES.</p>	<p>English</p> <p>Written evaluation. Extended literacy tasks</p> <p>Maths. Units/measurements.</p> <p>Eyeware</p>

<p>Spring 2 Breathing and respiration.</p>	<p>Water sports and breathing. Aerobic respiration. Gas exchange system. Getting oxygen. Comparing gas exchange. Anaerobic respiration. Fitness training.</p>	<ul style="list-style-type: none"> • I can recall what happens in aerobic respiration. • I can recall the functions of the organs in the gas exchange system. • I can explain how the structure of the lungs allows efficient gas exchange. • I can describe the effects of exercise on breathing and heartbeat rates. • I can describe how substances reach respiring cells from the blood and how waste products are returned to the blood. • I can identify the causes, and explain the effects of, reduced oxygen supply to the body. • I can recall how to detect aerobic respiration. • I can describe how gas exchange happens in different organisms. • I can recall what happens in anaerobic respiration. • I can describe the effects of anaerobic respiration during and after hard exercise. 	<p>Exploring Science. TES.</p>	<p>English. Written evaluation. Extended literacy tasks PE. Respiration, breathing, fitness. Maths. Units/measurements. Personal trainer.</p>
<p>Summer 1 Earth and space.</p>	<p>Changing ideas. Gathering evidence. Seasons. Magnetic earth. Gravity in space. Beyond the solar system. Studying space.</p>	<ul style="list-style-type: none"> • I can describe some ways of investigating the planets. • I can compare different models of the Solar System. • I can use the tilt of the Earth's axis to explain the changes in the seasons. • I can use a model to explain the pattern of light and dark in the Earth's poles. • I can explain how to arrange magnets so that they attract or repel each other. • I can describe the Earth's magnetic field and how it affects compasses. • I can describe how to find the shape of a magnetic field. • I can calculate weight. • I can recall the factors that effect the strength of gravity. • I can describe how gravity affects objects in space. • I can describe stars, galaxies and constellations. • I can describe the Milky Way. • I can explain what a light year is. 	<p>Exploring Science. TES.</p>	<p>English. Written evaluation. Extended literacy tasks Maths. Units/measurements.</p>

<p>Summer 2</p> <p>Rocks.</p>	<p>Disaster.</p> <p>Rocks and their uses.</p> <p>Igneous and metamorphic.</p> <p>Weathering and erosion.</p> <p>Sedimentary rocks.</p> <p>Materials in the earth.</p> <p>Living in danger.</p>	<ul style="list-style-type: none"> • I can describe the textures of some different rocks. • I can describe how some of the properties of rocks are related to their texture. • I can recall some uses of rocks. • I can describe the structure of the Earth. • I can describe how igneous and metamorphic rocks are formed. • I can explain how the grain size is evidence for the speed of cooling. • I can describe how weathering can break up rocks. • I can describe how weathered rocks are eroded. • I can describe how sedimentary rocks are formed. • I can describe the texture of sedimentary rocks. • I can use the rock cycle model to link the three types of rock. • I can describe how materials are obtained. • I can describe some advantages of recycling metals. 	<p>Exploring Science.</p> <p>TES.</p>	<p>English.</p> <p>Written evaluation. Extended literacy tasks</p> <p>Maths. Units/measurements.</p>
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Half term / Key question:	Topics discussed	In this unit of work, students learn...	Resources and support information	Cross curricular links.
<p>Autumn 1</p> <p>ELC</p> <p>And /or</p> <p>Food and nutrition.</p>	<p>ELC – Component 1 – Biology (The human body).</p> <p>And/or</p> <p>Food and advertising. Nutrients. Uses of nutrients. Balanced diets. Digestion. Absorption. Packaging and the law.</p>	<ul style="list-style-type: none"> • <u><i>ELC Comp 1 (see ELC scheme) and/or</i></u> <p><u><i>Food and nutrition</i></u></p> <ul style="list-style-type: none"> • I can recall the nutrients we need in our diets. • I can interpret nutrition information labels. • I can recall the tests used to detect some nutrients. <ul style="list-style-type: none"> • I can recall good sources of different nutrients. • I can describe how factors change the amount of energy we need. • I can describe what each nutrient does in the body. heart. • I can describe the benefits of a balanced diet. • I can explain how different types of malnutrition are caused and their effects. • I can recall the parts of the digestive system and their functions. • I can explain why enzymes and bacteria are useful for digestion. • I can explain how diffusion enable absorption by the small intestine. <p>I can explain how the small intestine is adapted to its function.</p>	<p>Exploring Science. TES.</p>	<p>English.</p> <p>Written evaluation. Extended literacy tasks</p> <p>Cooking. Eatwell guide. Nutrients etc.</p> <p>PE. Healthy diet and exercise. Maths.</p> <p>Units/measurements.</p>

<p>Autumn 2</p> <p>ELC</p> <p>And or/</p> <p>Combustion</p>	<p>ELC – Component 1 – Biology (The human body).</p> <p>And/or</p> <p>Engines. Burning fuels. Oxidation. Fire safety. Air pollution. Global warming. Reducing pollution.</p>	<ul style="list-style-type: none"> • <u>ELC Comp 1 (see ELC scheme) and/or</u> <p><u>Combustion</u></p> <ul style="list-style-type: none"> • I can describe the reactions of hydrogen and hydrocarbons with oxygen. • I can use word equations to model combustion reactions. • I can describe oxidation reactions of metals and non-metals. • I can explain changes of mass seen in oxidation reactions. • I can compare how phlogiston and oxygen explain combustion. • I can use the fire triangle to explain how to control a fire. • I can identify hazard symbols for substances likely to cause fires. • I can identify pollutants that are formed by burning fuels. • I can explain how these pollutants cause problems and how their effects can be reduced. • I can describe the greenhouse effect and how it is caused. <p>I can explain how human activity may be causing global warming.</p>	<p>Exploring Science. TES.</p>	<p>English.</p> <p>Written evaluation. Extended literacy tasks</p> <p>Cooking. Hazards in the kitchen.</p> <p>Outdoor learning – combustion.</p> <p>RI visit. Maths. Units/measurements.</p>
<p>Spring 1</p> <p>ELC</p> <p>And/or</p> <p>Light</p>	<p>ELC – Component 3 – Chemistry (Elements, mixtures and compounds).</p> <p>And/or</p> <p>Seeing things. Light on the move. Reflection. Refraction. Cameras and eyes. Colour. Invisibility cloaks.</p>	<ul style="list-style-type: none"> • <u>ELC Comp 3 (see ELC scheme) and/or</u> <p><u>Light</u></p> <ul style="list-style-type: none"> • I can compare light and sound waves. • I can describe what happens to light when it hits different surfaces. • I can describe how to demonstrate that light travels in straight lines. • I can describe how mirrors and rough surfaces reflect light. • I can describe how an image is formed in a mirror using a ray diagram. • I can recall some uses of lenses. • I can describe how light changes direction at the interface of two different substances. • I can use a model to explain how lenses work. • I can recall the parts of cameras and eyes and state their functions. 	<p>Exploring Science. TES.</p>	<p>English.</p> <p>Written evaluation. Extended literacy tasks</p> <p>Maths. Units/measurements.</p>

		<ul style="list-style-type: none">• I can describe some ways in which the energy transferred by light leads to chemical or electrical effects.• I can describe how to make a spectrum. I can explain why coloured objects appeared coloured.		
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<p>Spring 2</p> <p>ELC</p> <p>And/or</p> <p>Breathing and respiration</p>	<p>ELC – Component 3 – Chemistry (Elements, mixtures and compounds).</p> <p>And/or</p> <p>Water sports and breathing. Aerobic respiration. Gas exchange system. Getting oxygen. Comparing gas exchange. Anaerobic respiration. Fitness training.</p>	<ul style="list-style-type: none"> • <u>ELC Comp 3 (see ELC scheme) and/or</u> <p><u>Breathing and respiration</u></p> <ul style="list-style-type: none"> • I can recall what happens in aerobic respiration. • I can recall the functions of the organs in the gas exchange system. • I can explain how the structure of the lungs allows efficient gas exchange. • I can describe the effects of exercise on breathing and heartbeat rates. • I can describe how substances reach respiring cells from the blood and how waste products are returned to the blood. • I can identify the causes, and explain the effects of, reduced oxygen supply to the body. • I can recall how to detect aerobic respiration. • I can describe how gas exchange happens in different organisms. • I can recall what happens in anaerobic respiration. • I can describe the effects of anaerobic respiration during and after hard exercise. 	<p>Exploring Science. TES.</p>	<p>English.</p> <p>Written evaluation. Extended literacy tasks</p> <p>PE. Respiration, breathing, fitness.</p> <p>Maths. Units/measurements.</p>
<p>Summer 1</p> <p>ELC</p> <p>And/or</p> <p>Earth and space</p>	<p>ELC – Component 6 – Physics (Electricity, magnetism and waves).</p> <p>And/or</p> <p>Changing ideas. Gathering evidence. Seasons. Magnetic earth. Gravity in space. Beyond the solar system. Studying space.</p>	<ul style="list-style-type: none"> • <u>ELC Comp 6 (see ELC scheme) and/or</u> <p><u>Earth and Space</u></p> <ul style="list-style-type: none"> • I can describe some ways of investigating the planets. • I can compare different models of the Solar System. • I can use the tilt of the Earth's axis to explain the changes in the seasons. • I can use a model to explain the pattern of light and dark in the Earth's poles. • I can explain how to arrange magnets so that they attract or repel each other. • I can describe the Earth's magnetic field and how it affects compasses. • I can describe how to find the shape of a magnetic field. • I can calculate weight. • I can recall the factors that effect the strength of gravity. • I can describe how gravity affects objects in space. • I can describe stars, galaxies and constellations. • I can describe the Milky Way. • I can explain what a light year is. 	<p>Exploring Science. TES.</p>	<p>English.</p> <p>Written evaluation. Extended literacy tasks</p>

<p>Summer 2 ELC</p> <p>And/or</p> <p>Rocks</p>	<p>ELC – Component 6 – Physics (Electricity, magnetism and waves).</p> <p>And/or</p> <p>Disaster. Rocks and their uses. Igneous and metamorphic. Weathering and erosion. Sedimentary rocks. Materials in the earth. Living in danger.</p>	<ul style="list-style-type: none"> • <u>ELC Comp 6 (see ELC scheme) and/or</u> <p><u>Rocks</u></p> <ul style="list-style-type: none"> • I can describe the textures of some different rocks. • I can describe how some of the properties of rocks are related to their texture. • I can recall some uses of rocks. • I can describe the structure of the Earth. • I can describe how igneous and metamorphic rocks are formed. • I can explain how the grain size is evidence for the speed of cooling. • I can describe how weathering can break up rocks. • I can describe how weathered rocks are eroded. • I can describe how sedimentary rocks are formed. • I can describe the texture of sedimentary rocks. • I can use the rock cycle model to link the three types of rock. • I can describe how materials are obtained. <p>I can describe some advantages of recycling metals.</p>	<p>Exploring Science. TES.</p>	<p>English.</p> <p>Written evaluation. Extended literacy tasks</p> <p>Maths. Units/measurements.</p>

Half term	Topics discussed. In this unit pupils should learn.		Resources and support	<p>Cross curricular links.</p> <p>Personal development links</p> <p>Careers related</p>
<p>Autumn 1</p> <p>iGCSE</p>	<p><u>1 The nature and variety of living organisms</u></p> <p>The following sub-topics are covered in this section. (a) Characteristics of living organisms (b) Variety of living organisms</p> <p>(a) Characteristics of living organisms</p> <p>Students should:</p> <p>1.1 understand how living organisms share the following characteristics:</p> <ul style="list-style-type: none"> • they require nutrition • they respire • they excrete their waste • they respond to their surroundings • they move • they control their internal conditions • they reproduce • they grow and develop. <p>(b) Variety of living organisms</p> <p>Students should:</p> <p>describe the common features shown by eukaryotic organisms: plants, animals, fungi and protocists Plants: these are multicellular organisms; their cells contain chloroplasts and are able to carry out photosynthesis; their cells have cellulose cell walls; they store carbohydrates as starch or sucrose. Examples include flowering plants, such as a cereal (for example, maize), and a herbaceous legume (for example, peas or beans). Animals: these are multicellular organisms; their cells do not contain chloroplasts and are not able to carry out photosynthesis; they have no cell walls; they usually have</p>		<p>- Use PowerPoint presentation to explain the characteristics of living organisms. Signs of Life.</p> <p>Worksheet based tasks.</p> <p>- Starter activity to check prior learning.</p> <p>- Use the PowerPoint presentation to name and identify the position of the organs in the human digestive system.</p> <p>- Use Human Body model as well as PowerPoint.</p> <p>- Label the organs of the human digestive system.</p> <p>Explain that certain organs secrete enzymes that digest certain nutrients (e.g. protease enzymes/protein).</p> <p>-</p> <p>-</p>	<p>English.</p> <p>Written evaluation. Extended literacy tasks.</p> <p>Art. Vitruvian man (measurements). Autumn pictures (photosynthesis).</p> <p>PE. Respiration, breathing, fitness. PE. Healthy diet and exercise. Reflexes/reactions.</p> <p>Maths.</p> <p>Place value, decimals, rounding, using equations, rearranging equations, charts/graphs.</p> <p>PSHE. Antibiotics/medicines. Pathogens. Healthy lifestyles. Hormones/menstrual cycle/fertility drugs and treatments etc.</p> <p>Healthy living/disease prevention/How our bodies work.</p> <p>NHS careers – Nurses etc. Fitness industry.</p>

nervous co-ordination and are able to move from one place to another; they often store carbohydrate as glycogen. Examples include mammals (for example, humans) and insects (for example, housefly and mosquito). Fungi: these are organisms that are not able to carry out photosynthesis; their body is usually organised into a mycelium made from thread-like structures called hyphae, which contain many nuclei; some examples are single-celled; their cells have walls made of chitin; they feed by extracellular secretion of digestive enzymes onto food material and absorption of the organic products; this is known as saprotrophic nutrition; they may store carbohydrate as glycogen. Examples include Mucor, which has the typical fungal hyphal structure, and yeast, which is single-celled. Protoctists: these are microscopic single-celled organisms. Some like amoeba, that live in pond water, have features like an animal cell, while others, like Chlorella, have chloroplasts and are more like plants. A pathogenic example is Plasmodium, responsible for causing malaria.

1.3 describe the common features shown by prokaryotic organisms such as bacteria
Bacteria: these are microscopic single-celled organisms; they have a cell wall, cell membrane, cytoplasm and plasmids; they lack a nucleus but contain a circular chromosome of DNA; some bacteria can carry out photosynthesis but most feed off other living or dead organisms. Examples include Lactobacillus bulgaricus, a rod-shaped bacterium used in the production of yoghurt from milk, and Pneumococcus, a spherical bacterium that acts as the pathogen causing pneumonia.

1.4 understand the term pathogen and know that pathogens may include fungi, bacteria, protoctists or viruses.
Viruses: these are not living organisms. They are small particles, smaller than bacteria; they are parasitic and can reproduce only inside living cells; they infect every type of living organism. They have a wide variety of shapes and sizes; they have no cellular structure but have a protein coat and contain one type of nucleic acid, either DNA or RNA. Examples include the tobacco mosaic virus that causes discolouring of the leaves of tobacco plants

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- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain the process of respiration.
- Use Human Body model as well as PowerPoint.
- Explain how the body takes in glucose and oxygen and releases carbon dioxide using human body model etc.
- Carbon dioxide test using limewater.
- Create healthy diet/exercise plan.
- Posters warning of dangers of smoking/drinking etc.

TDA – Burning foods

- Starter activity to check prior learning.
- Use the PowerPoint presentation to give examples of pathogens (both bacteria and viruses) that cause disease.

Use PowerPoint/video clips to show how pathogens can reproduce quickly.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to define the terms cell, tissue, organ and organ system.
- Use the PowerPoint presentation to show the position of organs and how they are linked together in organ systems.
- Use Human Body model as well as PowerPoint.
- Label the organs of the human body on a diagram.

Picture of cells etc. within blood for

by preventing the formation of chloroplasts, the influenza virus that causes 'flu' and the HIV virus that causes AIDS.

2 Structure and functions in living organisms

The following sub-topics are covered in this section.

- (a) Level of organisation
- (b) Cell structure
- (c) Biological molecules
- (d) Movement of substances into and out of cells
- (e) Nutrition
- (f) Respiration
- (g) Gas exchange
- (h) Transport

(a) Level of organisation

Students should:

2.1 describe the levels of organisation in organisms: organelles, cells, tissues, organs and systems

(b) Cell structure

Students should:

2.2 describe cell structures, including the nucleus, cytoplasm, cell membrane, cell wall, mitochondria, chloroplasts and vacuole

2.3 describe the functions of the nucleus, cytoplasm, cell membrane, cell wall, mitochondria, chloroplasts and vacuole

2.4 know the similarities and differences in the structure of plant and animal cells

(c) Biological molecules

Students should:

2.7 identify the chemical elements present in carbohydrates, proteins and lipids (fats and oils)

2.8 describe the structure of carbohydrates, proteins and lipids as large molecules made up from smaller basic units:

students to identify.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain how white blood cells ingest pathogens as well as make individual antibodies for specific diseases.

Use video clips to show how white blood cells function.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain how drugs work by altering chemical processes in the human body.
- Use PowerPoint to explain that drugs have to be tested before they can be used to safely treat diseases.

Use PowerPoint/video clips/information leaflets to highlight the consequences of misuse of drugs.

starch and glycogen from simple sugars, protein from amino acids, and lipid from fatty acids and glycerol
2.9 practical: investigate food samples for the presence of glucose, starch, protein and fat
2.10 understand the role of enzymes as biological catalysts in metabolic reactions
2.11 understand how temperature changes can affect enzyme function, including changes to the shape of active site
2.12 practical: investigate how enzyme activity can be affected by changes in temperature
2.13 understand how enzyme function can be affected by changes in pH altering the active site

(d) Movement of substances into and out of cell

Students should:
2.15 understand the processes of diffusion, osmosis and active transport by which substances move into and out of cells
2.16 understand how factors affect the rate of movement of substances into and out of cells, including the effects of surface area to volume ratio, distance, temperature and concentration gradient

(e) Nutrition

Students should:

Flowering plants
2.18 understand the process of photosynthesis and its importance in the conversion of light energy to chemical energy
2.19 know the word equation and the balanced chemical symbol equation for photosynthesis
2.20 understand how varying carbon dioxide concentration, light intensity and temperature affect the rate of photosynthesis
2.21 describe the structure of the leaf and explain how it is adapted for photosynthesis
2.23 practical: investigate photosynthesis, showing the evolution of oxygen from a water plant, the production of

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain how the human body is controlled by the nervous system (electrical impulses) and the endocrine system (chemical messengers).
- Use PowerPoint to explain the structure of the nervous system and glands that secrete hormones in the endocrine system.

Reaction test

PowerPoint activity to introduce diffusion, osmosis and active transport. Possible exp.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to identify glands that secrete hormones.
- Use PowerPoint/Body model to identify target organs that hormones are transported to in the bloodstream.

Use diagram to explain the menstrual cycle and the hormones that stimulate changes to happen within this cycle.

- Starter activity to check prior learning.

Use the PowerPoint presentation to explain how hormones can be used as a method of contraception as well as being used as fertility treatments.

starch and the requirements of light, carbon dioxide and chlorophyll

Humans

2.27 describe the structure and function of the human alimentary canal, including the mouth, oesophagus, stomach, small intestine (duodenum and ileum), large intestine (colon and rectum) and pancreas

2.29 understand the role of digestive enzymes, including the digestion of starch to glucose by amylase and maltase, the digestion of proteins to amino acids by proteases and the digestion of lipids to fatty acids and glycerol by lipases

(f) Respiration

Students should:

2.34 understand how the process of respiration produces ATP in living organisms

2.35 know that ATP provides energy for cells

2.36 describe the differences between aerobic and anaerobic respiration

2.37 know the word equation and the balanced chemical symbol equation for aerobic respiration in living organisms

2.38 know the word equation for anaerobic respiration in plants and in animals

(g) Gas exchange

Students should:

Humans

2.46 describe the structure of the thorax, including the ribs, intercostal muscles, diaphragm, trachea, bronchi, bronchioles, alveoli and pleural membranes

2.47 understand the role of the intercostal muscles and the diaphragm in ventilation

2.48 explain how alveoli are adapted for gas exchange by diffusion between air in the lungs and blood in capillaries

(h) Transport

PowerPoint respiration. Practical carbon dioxide test.

PowerPoint. Gas exchange. Bell jar diaphragm demo. Exercise/pulse rate exp.

PowerPoint 'Blood'.

Composition of blood. Blood vessels. The Heart as a double pump. Adaptations.

Students should:

2.51 understand why simple, unicellular organisms can rely on diffusion for movement of substances in and out of the cell

2.52 understand the need for a transport system in multicellular organisms

Humans

2.59 describe the composition of the blood: red blood cells, white blood cells, platelets and plasma

2.60 understand the role of plasma in the transport of carbon dioxide, digested food, urea, hormones and heat energy

2.61 understand how adaptations of red blood cells make them suitable for the transport of oxygen, including shape, the absence of a nucleus and the presence of haemoglobin

2.62 understand how the immune system responds to disease using white blood cells, illustrated by phagocytes ingesting pathogens and lymphocytes releasing antibodies specific to the pathogen

2.65 describe the structure of the heart and how it functions

2.68 understand how the structure of arteries, veins and capillaries relates to their function

2.69 understand the general structure of the circulation system, including the blood vessels to and from the heart and the lungs

<p>Autumn 2 iGCSE</p>	<p>3 Reproduction and inheritance</p> <p>The following sub-topics are covered in this section.</p> <p>(a) Reproduction</p> <p>(b) Inheritance</p> <p>(a) Reproduction</p> <p>Students should:</p> <p>3.1 understand the differences between sexual and asexual reproduction</p> <p>3.2 understand that fertilisation involves the fusion of a male and female gamete to produce a zygote that undergoes cell division and develops into an embryo</p> <p>Flowering plants</p> <p>3.3 describe the structures of an insect-pollinated and a wind-pollinated flower and explain how each is adapted for pollination</p> <p>3.4 understand that the growth of the pollen tube followed by fertilisation leads to seed formation</p> <p>Humans</p> <p>3.8 understand how the structure of the male and female reproductive systems are adapted for their functions</p> <p>3.13 understand the roles of oestrogen and testosterone in the development of secondary sexual characteristics</p>	<p>PowerPoint. Reproduction – sexual and asexual.</p> <p>Inheritance. Genes, alleles, chromosomes PP.</p> <ul style="list-style-type: none"> - Use PowerPoint presentation to explain the how radiation from the sun is the source of energy for living organisms. - PowerPoint presentation to explain photosynthesis including the word equation. - Practical Session <p>Worksheet based tasks.</p> <ul style="list-style-type: none"> - Starter activity to check prior learning. - Use the PowerPoint presentation to explain how organisms are adapted to live in their natural environment. <p>TDA using choice chambers, eg with woodlice.</p> <ul style="list-style-type: none"> - Starter activity to check prior learning. - Use the PowerPoint presentation to explain food chains and food webs and what the arrows represent. - Construct food chains given a description of the interdependence of organisms in an ecosystem. <p>Differentiate between producers and</p>	<p>English. Written evaluation. Extended literacy tasks. Art. (photosynthesis). PE. Healthy diet and exercise. Maths. Place value, decimals, charts/graphs. PSHE. Reproduction, chromosomes/DNA. Healthy lifestyles. Healthy diet. Our effect on the planet. Reproduction.</p>
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(b) Inheritance

Students should:

3.15 understand that the nucleus of a cell contains chromosomes on which genes are located

3.19 understand how genes exist in alternative forms called alleles which give rise to differences in inherited characteristics

3.20 understand the meaning of the terms: dominant, recessive, homozygous, heterozygous, phenotype, and genotype

3.23 describe patterns of monohybrid inheritance using a genetic diagram

3.25 predict probabilities of outcomes from monohybrid crosses

3.26 understand how the sex of a person is controlled by one pair of chromosomes, XX in a female and XY in a male

3.27 describe the determination of the sex of offspring at fertilisation, using a genetic diagram
3.31 understand how random fertilisation produces genetic variation of offspring

3.33 understand that variation within a species can be genetic, environmental, or a combination of both

3.38 explain Darwin's theory of evolution by natural selection

consumers.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain that dead plants and animals are reused once they have been broken down to their constituent chemical parts by microorganisms etc.

TDA. Investigate the change in temperature as grass cutting decay.

- Starter activity to check prior learning.

Use the PowerPoint presentation to show how plants and animals compete for resources. Use video clips as well.

- Starter activity to check prior learning.

Use the PowerPoint presentation to explain environmental change that is caused by living and non-living factors.

- Starter activity to check prior learning.

The following sub-topics are covered in this section.

(a) The organism in the environment

(b) Feeding relationships

(c) Cycles within ecosystems

(a) The organism in the environment

Students should:

4.1 understand the terms population, community, habitat and ecosystem

4.2 practical: investigate the population size of an organism in two different areas using quadrats

4.5 understand how abiotic and biotic factors affect the population size and distribution of organisms

(b) Feeding relationships

Students should:

4.6 understand the names given to different trophic levels, including producers, primary, secondary and tertiary consumers, and decomposers

4.7 understand the concepts of food chains, food webs, pyramids of number, pyramids of biomass and pyramids of energy transfer

4.8 understand the transfer of substances and energy along a food chain

4.9 understand why only about 10% of energy is transferred from one trophic level to the next (c)

- Use the PowerPoint presentation to explain how various forms of pollution affect our environment.
- Use the internet to research world population increase and the affect this has on the amount of pollution produced.
- TDA. Rainwater acidity.
- TDA. Water quality from various sources.

Lichens in wooded/urban areas.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain that fossil evidence helps to support this theory.
- Fossils
- Use the PowerPoint presentation to show how the peppered moth illustrates natural selection.

Selective breeding in dogs.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain sexual/asexual reproduction.

Use presentation to explain that sexual reproduction gives variation within offspring whereas asexual reproduction gives no variation where the offspring are clones.

- Starter activity to check prior learning.

(c) Cycles within ecosystems

Students should:

4.10 describe the stages in the carbon cycle, including respiration, photosynthesis, decomposition and combustion

5 Use of biological resources

The following sub-topics are covered in this section.

(a) Food production

(b) Genetic modification (genetic engineering)

(a) Food production

Students should:

Crop plants 5.1 describe how glasshouses and polythene tunnels can be used to increase the yield of certain crops

5.2 understand the effects on crop yield of increased carbon dioxide and increased temperature in glasshouses

Micro-organisms

5.5 understand the role of yeast in the production of food including bread

5.6 practical: investigate the role of anaerobic respiration by yeast in different conditions

b) Genetic modification (genetic engineering)

Students should:

- Use the PowerPoint presentation to explain that the genetic information for reproduction is stored within the nucleus of cells. This is DNA.
- Use presentation to explain that chromosomes carry the genes that provides the information that gives characteristics and sex.

Use the PowerPoint presentation to explain genetic engineering.

5.12 understand how restriction enzymes are used to cut DNA at specific sites and ligase enzymes are used to join pieces of DNA together

5.13 understand how plasmids and viruses can act as vectors, which take up pieces of DNA, and then insert this recombinant DNA into other cells

5.14 understand how large amounts of human insulin can be manufactured from genetically modified bacteria

5.15 understand how genetically modified plants can be used to improve food production

5.16 understand that the term transgenic means the transfer of genetic material from one species to a different species

Spring

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iGCSE

1 Principles of chemistry

The following sub-topics are covered in this section.

- (a) States of matter
- (b) Elements, compounds and mixtures
- (c) Atomic structure
- (d) The Periodic Table
- (e) Chemical formulae and equations
- (f) Ionic bonding
- (g) Covalent bonding

(a) States of matter

Students should:

- 1.1 understand the three states of matter in terms of the arrangement, movement and energy of the particles
- 1.2 understand the interconversions between the three

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- Use PowerPoint presentation to explain that an atom is the smallest part of an element that can exist and each element has its own atom.
- PowerPoint presentation to show that elements are organised in order of atomic number on the periodic table. Most elements are metals and these are on the left side of the table.
- Use a blank copy of the periodic table to highlight groups, periods

English. Written evaluation.
 Extended literacy tasks.
 Maths.
 Place value, decimals, rounding, using equations, rearranging equations, charts/graphs.
 History. The atom/Periodic table
 Citizenship. Recycling/waste disposal.
 Food. States of matter.
 Tech. Materials. Metals. Non metals/polymers.
 Hazardous chemicals in our homes etc. Properties of materials and how we recycle them.
 Cleaning contractors.

states of matter in terms of: • the names of the interconversions • how they are achieved • the changes in arrangement, movement and energy of the particles.
1.3 understand how the results of experiments involving the dilution of coloured solutions and diffusion of gases can be explained

(b) Elements, compounds and mixtures

Students should:

1.8 understand how to classify a substance as an element, compound or mixture

1.9 understand that a pure substance has a fixed melting and boiling point, but that a mixture may melt or boil over a range of temperatures

1.10 describe these experimental techniques for the separation of mixtures: • simple distillation • fractional distillation • filtration • crystallisation • paper chromatography.

1.11 understand how a chromatogram provides information about the composition of a mixture
1.12 understand how to use the calculation of R_f values to identify the components of a mixture
1.13 practical: investigate paper chromatography using inks/food colourings

(c) Atomic structure

Students should:

1.14 know what is meant by the terms atom and molecule

1.15 know the structure of an atom in terms of the positions, relative masses and relative charges of sub-atomic particles

1.16 know what is meant by the terms atomic number, mass number, isotopes and relative atomic mass (A_r)

1.17 be able to calculate the relative atomic mass of an element (A_r) from isotopic abundances

(d) The Periodic Table

and certain elements/groups of elements.

- Explain using a practical demonstration of elements etc that they have different properties and these properties determine their use in everyday life.

Demonstration – reactive metals.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain how atoms react together to form new substances called compounds.
- Show that atoms combine to form new compounds with completely different properties.
- Use PP to explain that chemical reactions can be written as word equations with reactants and products.

Practical. Reactive metals produce

hydrogen when reacted with water.

Squeak test.

PP ionic, covalent, metallic bonding.

Ion formation.

Ionic compounds, simple covalent etc.

Structure/properties.

Students should:

1.18 understand how elements are arranged in the Periodic Table: • in order of atomic number • in groups and periods.

1.21 identify an element as a metal or a non-metal according to its position in the Periodic Table

(e) Chemical formulae and equations

Students should:

1.25 write word equations and balanced chemical equations (including state symbols): • for reactions studied in this specification • for unfamiliar reactions where suitable information is provided. 1.26 calculate relative formula masses (including relative molecular masses) (M_r) from relative atomic masses (A_r)

(f) Ionic bonding Students should:

1.37 understand how ions are formed by electron loss or gain

1.38 know the charges of these ions: • metals in Groups 1, 2 and 3 • non-metals in Groups 5, 6 and 7 • hydrogen (H^+), hydroxide (OH^-), ammonium (NH_4^+), carbonate (CO_3^{2-}), nitrate (NO_3^-), sulfate (SO_4^{2-}).

1.39 write formulae for compounds formed between the ions listed above

1.41 understand ionic bonding in terms of electrostatic attractions

1.42 understand why compounds with giant ionic lattices have high melting and boiling points

(f) Covalent bonding

Students should:

1.44 know that a covalent bond is formed between atoms by the sharing of a pair of electrons

1.47 explain why substances with a simple molecular structure are gases or liquids, or solids with low melting and boiling points the term intermolecular

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain using the particle model how particles are organised in each of the three states of matter: solid, liquid, gas.
- Practical demonstration using the three states of matter, ice, water and steam.

Represent the three state of matter in

simple diagrams and link this to

particle energy levels.

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- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain the difference between diamond and graphite even though both materials are entirely made of covalently bonded carbon atoms.

Use PP to explain why these substances

have such different properties and

uses.

- Starter activity to check prior learning.
- Use the PowerPoint to explain that mixtures are combinations of substances that have not chemically reacted and can therefore be separated.
- Give examples of mixtures. Eg air.

forces of attraction can be used to represent all forces between molecules
1.49 explain why substances with giant covalent structures are solids with high melting and boiling points

2 Inorganic chemistry

The following sub-topics are covered in this section.

- (a) Group 1 (alkali metals) – lithium, sodium and potassium
- (b) Group 7 (halogens) – chlorine, bromine and iodine
- (c) Gases in the atmosphere
- (d) Reactivity series
- (e) Acids and alkalis
- (f) Chemical tests

(a) Group 1 (alkali metals) – lithium, sodium and potassium Students should:

- 2.1 understand how the similarities in the reactions of these elements with water provide evidence for their recognition as a family of elements
- 2.2 understand how the differences between the reactions of these elements with air and water provide evidence for the trend in reactivity in Group 1
- 2.3 use knowledge of trends in Group 1 to predict the properties of other alkali metals

(b) Group 7 (halogens) – chlorine, bromine and iodine Students should:

- 2.5 know the colours, physical states (at room temperature) and trends in physical properties of these elements
- 2.6 use knowledge of trends in Group 7 to predict the properties of other halogens

(c) Gases in the atmosphere

Students should:

- Explain that mixtures can be separated into their constituent parts by processes such as filtration, chromatography, distillation and crystallisation.

TDA. Time to filter mixtures of water

and calcium carbonate that has

different particle sizes.

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- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain how substances can be separated using chromatography.

TDA. Ink colours/food colours.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain that metals are found as compounds (ores) and sometimes in their native state.
- Use PP and the internet show how metals (iron in particular) can be extracted by a reduction reaction using carbon.

Pupils should research ways in which

we recycle metals as ores are another

example of a finite resource.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain why metals have their

2.9 know the approximate percentages by volume of the four most abundant gases in dry air
2.10 understand how to determine the percentage by volume of oxygen in air using experiments involving the reactions of metals (e.g. iron) and non-metals (e.g. phosphorus) with air
2.11 describe the combustion of elements in oxygen, including magnesium, hydrogen and sulfur
2.13 know that carbon dioxide is a greenhouse gas and that increasing amounts in the atmosphere may contribute to climate change
2.14 practical: determine the approximate percentage by volume of oxygen in air using a metal or a non-metal

(d) Reactivity series

Students should:

2.15 understand how metals can be arranged in a reactivity series based on their reactions with: • water • dilute hydrochloric or sulfuric acid.
2.17 know the order of reactivity of these metals: potassium, sodium, lithium, calcium, magnesium, aluminium, zinc, iron, copper, silver, gold
2.18 know the conditions under which iron rusts
2.19 understand how the rusting of iron may be prevented by: • barrier methods • galvanising.

(e) Acids and alkalis

Students should:

2.28 describe the use of litmus to distinguish between acidic and alkaline solutions
2.29 understand how the pH scale, from 0–14, can be used to classify solutions as strongly acidic (0–3), weakly acidic (4–6), neutral (7), weakly alkaline (8–10) and strongly alkaline (11–14)
2.30 describe the use of universal indicator to measure the approximate pH value of an aqueous solution
2.31 know that acids in aqueous solution are a source

properties due to the bonding between atoms in their structure.

- Use PP and objects/devices to explain why certain metals have properties useful to us in everyday life.

TDA. Compare properties such as

conductivity and density.

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- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain that pure metals are often too soft so other metals are added to them to alter their properties and make the metals more useful.
- Explain that steel is an alloy. Only pure metals can be found on the periodic table not alloys.

TDA. Investigate the hardness of

different alloys or steels.

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- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain that polymers are large molecules made from a chain of small molecules (monomers).
- Use PP to explain that polymers have many useful properties.

TDA. Compare biodegradability of

different polymers.

of hydrogen ions and alkalis in a aqueous solution are a source of hydroxide ions
2.32 know that alkalis can neutralise acids

(f) Chemical tests

Students should:

2.44 describe tests for these gases:

- hydrogen
- oxygen
- carbon dioxide
- ammonia
- chlorine.

2.45 describe how to carry out a flame test

2.46 know the colours formed in flame tests for these cations: • Li⁺ is red • Na⁺ is yellow • K⁺ is lilac •

Ca²⁺ is orange-red • Cu²⁺ is blue-green. 2.48 describe a test for CO₃²⁻ using hydrochloric acid and identifying the gas evolved

2.49 describe a test for the presence of water using anhydrous copper(II) sulphate

Tests for gases.

Flame tests.

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3 Physical chemistry

The following sub-topics are covered in this section.

- (a) Energetics
- (b) Rates of reaction

(a) Energetics

Students should:

- 3.1 know that chemical reactions in which heat energy is given out are described as exothermic, and those in which heat energy is taken in are described as endothermic
- 3.2 describe simple calorimetry experiments for reactions such as combustion, displacement, dissolving and neutralisation
- 3.3 calculate the heat energy change from a measured temperature change using the expression $Q = mc\Delta T$
- 3.8 practical: investigate temperature changes accompanying some of the following types of change: • salts dissolving in water • neutralisation reactions • displacement reactions • combustion reactions.

(b) Rates of reaction

Students should:

- 3.9 describe experiments to investigate the effects of changes in surface area of a solid, concentration of a solution, temperature and the use of a catalyst on the rate of a reaction
- 3.10 describe the effects of changes in surface area of a solid, concentration of a solution, pressure of a gas, temperature and the use of a catalyst on the rate of a reaction
- 3.12 know that a catalyst is a substance that increases the rate of a reaction but is chemically unchanged at the end of the reaction
- 3.15 practical: investigate the effect of changing the surface area of marble chips and of changing the concentration of hydrochloric acid on the rate of reaction between marble chips and dilute hydrochloric acid

4 Organic chemistry

The following sub-topics are covered in this section.

- Resources Starter activity to check prior learning.
- Use the PowerPoint presentation to explain that chemical reactions transfer energy to the surroundings.
- Demonstrate exothermic reaction..
- Explain that some reactions take in energy.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain how reaction rates can be increased.
- Use a demo with marble chips and hydrochloric acid to show this.
Marble chips size etc.

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- Use PowerPoint presentation to explain how acids and metals react producing salts and hydrogen.
- Use PP to explain how to write word equations for these reactions giving the reactants and products.
- Explain the hydrogen test using PP and demonstrate this.

TDA. Investigate the amount of hydrogen produced when acids react with metals.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain how acids are neutralised by alkalis.

Cross curricular links.

English. Written evaluation. Extended literacy tasks.

Maths.

Place value, decimals, rounding, using equations, rearranging equations, charts/graphs.

History. The development of the Earth.

Citizenship.

Recycling/waste disposal. Energy resources and the effect they have on the environment.

Food. Acids etc.

Tech. Materials. Oils. Lubricants.

Water treatment facilities.

- (a) Introduction
- (b) Crude oil
- (c) Alkanes
- (d) Alkenes
- (e) Synthetic polymers

(a) Introduction Students should: 4.1 know that a hydrocarbon is a compound of hydrogen and carbon only
4.2 understand how to represent organic molecules using molecular formulae, general formulae, structural formulae and displayed formulae

(c) Crude oil

Students should:

- 4.7 know that crude oil is a mixture of hydrocarbons
- 4.9 know the names and uses of the main fractions obtained from crude oil: refinery gases, gasoline, kerosene, diesel, fuel oil and bitumen
- 4.10 know the trend in colour, boiling point and viscosity of the main fractions
- 4.11 know that a fuel is a substance that, when burned, releases heat energy
- 4.12 know the possible products of complete and incomplete combustion of hydrocarbons with oxygen in the air
- 4.13 understand why carbon monoxide is poisonous, in terms of its effect on the capacity of blood to transport oxygen
references to haemoglobin are not required
- 4.14 know that, in car engines, the temperature reached is high enough to allow nitrogen and oxygen from air to react, forming oxides of nitrogen
- 4.15 explain how the combustion of some impurities in hydrocarbon fuels result in the formation of sulfur dioxide
- 4.16 understand how sulfur dioxide and oxides of nitrogen contribute to acid rain

(d) Alkanes

Students should:

- 4.19 know the general formula for alkanes

- Use PP to explain that acids are neutralised by carbonates to produce salts, water and carbon dioxide.
- Explain how word equations can be written for these reactions.
- Demonstrate these reaction and test pH.
- Demonstrate test for carbon dioxide.
- Practical. Crystallise salts.

TDA. Investigate reactions of acids with different carbonates.

Energy reaction profiles PP

SHC exp/PP

Reactivity of metals exp/PP

PP. Crude oil.

Alkanes/Alkenes/ Cracking/Polymerisation

4.20 explain why alkanes are classified as saturated hydrocarbons
4.21 understand how to draw the structural and displayed formulae for alkanes with up to five carbon atoms in the molecule, and to name the unbranched-chain isomers

(e) Alkenes

Students should:

4.23 know that alkenes contain the functional group $>C=C<$
4.24 know the general formula for alkenes
4.25 explain why alkenes are classified as unsaturated hydrocarbons
4.26 understand how to draw the structural and displayed formulae for alkenes with up to four carbon atoms in the molecule, and name the unbranched-chain isomers knowledge of cis/trans or E/Z notation is not required
4.28 describe how bromine water can be used to distinguish between an alkane and an alkene

(f) Synthetic polymers

Students should:

4.44 know that an addition polymer is formed by joining up many small molecules called monomers
4.45 understand how to draw the repeat unit of the addition polymer poly(ethene)
4.46 understand how to deduce the structure of a monomer from the repeat unit of an addition polymer and vice versa
4.47 explain problems in the disposal of addition polymers, including:
• their inertness and inability to biodegrade
• the production of toxic gases when they are burned.

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- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain what Earth's early atmosphere was like and why it was like this.
- Explain how the Earth's atmosphere evolved over time.

Explain how photosynthesis produced oxygen

- Starter activity to check prior learning.

- Use the PowerPoint presentation to explain how carbon dioxide was removed from the atmosphere.
- Use PP to explain where this substance went.
- Explain the composition of today's atmosphere.

Fresh air/exhaled air.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain how crude oil is formed and where it is found.
- Use PP to explain the uses of the fractions of crude oil.

Use PP to explain how useful fractions can be separated from crude oil.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain that burning fuels produces pollution.
- Explain complete and incomplete combustion.

Discuss environmental effects of burning fuels. Eg acid rain.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain what greenhouse gases are and what their affects are.

			<ul style="list-style-type: none"> - Explain how greenhouse gases increase the temperature of the atmosphere. <p>Give examples of greenhouse gases and where they come from.</p> <ul style="list-style-type: none"> - Starter activity to check prior learning. - Use the PowerPoint presentation to explain how water is treated so that it is safe to drink. - Explain that salty water can be distilled to produce fresh water and there is a huge amount of salt water on the planet but this requires a large amount of energy. <p>Investigate the amount of dissolved solids in water from different locations.</p>	
<p>Summer 1 iGCSE</p>	<p>Physics content</p> <p>1 Forces and motion</p> <p>The following sub-topics are covered in this section.</p> <p>(a) Units (b) Movement and position (c) Forces and movement</p> <p>(a) Units Students should:</p> <p>1.1 use the following units: kilogram (kg), metre (m), metre/second (m/s), metre/second² (m/s²), newton (N), second (s) and newton/kilogram (N/kg)</p>		<p>SI units PP. Scalar/Vector quantities.</p> <ul style="list-style-type: none"> - Use PowerPoint presentation to explain how energy is transferred in devices. Use examples like a ball being kicked up into the air, a car speeding up and electrical energy being transferred into light in a light bulb. <p>Use as many real life objects to demonstrate the changes in energy storage.</p>	<p>English. Written evaluation. Extended literacy tasks.</p> <p>Maths. Place value, decimals, rounding, using equations, rearranging equations, charts/graphs. Speed calculations. Distance time graphs.</p> <p>Citizenship. Life skills. Boiling water safely.</p>

b) Movement and position

Students should:

1.3 plot and explain distance–time graphs

1.4 know and use the relationship between average speed, distance moved and time taken: $\text{time taken} = \frac{\text{distance moved}}{\text{average speed}}$

1.5 practical: investigate the motion of everyday objects such as toy cars or tennis balls

1.6 know and use the relationship between acceleration, change in velocity and time taken: $\text{time taken} = \frac{\text{change in velocity}}{\text{acceleration}}$
 $a = \frac{v-u}{t}$

1.7 plot and explain velocity-time graphs

1.8 determine acceleration from the gradient of a velocity–time graph

1.9 determine the distance travelled from the area between a velocity–time graph and the time axis

(c) Forces and movement

Students should:

1.11 describe the effects of forces between bodies such as changes in speed, shape or direction

1.12 identify different types of force such as gravitational or electrostatic

1.16 know that friction is a force that opposes motion

1.17 know and use the relationship between unbalanced force, mass and acceleration: $\text{force} = \text{mass} \times \text{acceleration}$ $F = m \times a$

1.18 know and use the relationship between weight, mass and gravitational field strength: $\text{weight} = \text{mass} \times \text{gravitational field strength}$ $W = m \times g$

1.19 know that the stopping distance of a vehicle is made up of the sum of the thinking distance and the braking distance

1.20 describe the factors affecting vehicle stopping distance, including speed, mass, road condition and reaction time

2 Electricity

The following sub-topics are covered in this section.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain that energy can be transferred usefully, stored or dissipated but cannot be destroyed. Use flow diagrams to explain what energy is transferred to and how much is lost.
- Using the information in the flow diagrams show how efficiency can be calculated as long as input energy and useful output energy are known. Calculations not needed.
- TDA. Rate of cooling with varying levels of insulation.

TDA. Thermal conductivity of different materials. Saucepan handles.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to describe the main energy resources available on Earth.
- Explain the difference between renewable and non-renewable resources.
Explain how turbines are used to turn generators that produce electricity.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain forces are pushes or pulls between objects and these can be contact or non-contact forces.
Use everyday examples of these. Pulling on a handle, pushing a switch, gravity and magnetism.

Recycling/waste disposal.
Tech. Speeds.

Vehicle speed limits
– Braking distances

Building trade –
Thermal insulation.

Radioactive tracers.

- (a) Units
- (b) Mains electricity
- (c) Current and voltage in circuits
- (a) Units

Students should:

2.1 use the following units: ampere (A), coulomb (C), joule (J), ohm (Ω), second (s), volt (V) and watt (W)

- (b) Mains electricity

Students should:

2.4 know and use the relationship between power, current and voltage: power = current \times voltage $P = I \times V$

2.6 know the difference between mains electricity being alternating current (a.c.) and direct current (d.c.) being supplied by a cell or battery

- (c) Current and voltage in circuits

Students should:

2.8 understand how the current in a series circuit depends on the applied voltage and the number and nature of other components

2.9 describe how current varies with voltage in wires, resistors and metal filament lamps, and how to investigate this experimentally

2.10 describe the qualitative effect of changing resistance on the current in a circuit

2.12 know that lamps and LEDs can be used to indicate the presence of a current in a circuit

2.13 know and use the relationship between voltage, current and resistance: voltage = current \times resistance $V = I \times R$

2.14 know that current is the rate of flow of charge

2.16 know that electric current in solid metallic conductors is a flow of negatively charged electrons

2.19 calculate the currents, voltages and resistances of two resistive components connected in a series circuit

3 Waves

All pupils will be able to: explain that reaction times in humans vary.
Most pupils will be able to: measure someones reaction time.
Some pupils will be able to: recognise the effect of alcohol and drugs on reaction times in situations where this can be dangerous.

All pupils will be able to: explain how braking distances can be affected by adverse conditions.
Most pupils will be able to: state

- Starter activity to check prior learning.
- Use the PowerPoint presentation to show how work is done when a force on an object makes it move.
- Use everyday examples to show how it can require a great deal of work to move an object a certain distance.
- Show how friction can cause a temperature increase as an object moves.
TDA. Friction depending on surface of moving block.
- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain what measurements are needed to calculate speed.
- Explain how the measurements can be used to calculate average speed using the speed equation.
- Give pupils examples of different units for speed. In Science we use m/s.
TDA. Speed.
- Use PowerPoint presentation to explain that electrical charge flows in a circuit and this is electrical current. Current depends on the voltage across the component and the resistance of the component.
- Current is measured in amps using an ammeter.
- Voltage is measured in volts using a voltmeter.
- Use meters to measure current and voltage in both series and parallel circuits.

The following sub-topics are covered in this section.

- (a) Units
- (b) Properties of waves
- (c) The electromagnetic spectrum
- (d) Light and sound

(a) Units

Students should:

3.1 use the following units: degree (°), hertz (Hz), metre (m), metre/second (m/s) and second

(b) Properties of waves

Students should:

3.3 know the definitions of amplitude, wavefront, frequency, wavelength and period of a wave

3.4 know that waves transfer energy and information without transferring matter

3.5 know and use the relationship between the speed, frequency and wavelength of a wave: wave speed = frequency \times wavelength $v = f \times \lambda$

3.7 use the above relationships in different contexts including sound waves and electromagnetic waves

3.9 explain that all waves can be reflected and refracted (s)

(c) The electromagnetic spectrum

Students should:

3.10 know that light is part of a continuous electromagnetic spectrum that includes radio, microwave, infrared, visible, ultraviolet, x-ray and gamma ray radiations and that all these waves travel at the same speed in free space

3.11 know the order of the electromagnetic spectrum in terms of decreasing wavelength and increasing frequency, including the colours of the visible spectrum

3.12 explain some of the uses of electromagnetic radiations, including: • radio waves: broadcasting and communications •

various types of adverse conditions. Some pupils will be able to: explain why braking distances can be affected in given scenarios.

All pupils will be able to: state that radioactive decay occurs in unstable nuclei. Most pupils will be able to: explain what alpha, beta and gamma radiation are. Some pupils will be able to: explain the uses and dangers of various types of radiation.

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- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain how stopping distances can be broken down into thinking and breaking distance.
- Explain that slow reactions and excessive speed can cause high stopping distances. Use the highway code to research stopping distances.

stopping distances.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain the effect of adverse road and weather conditions on braking distances. Analyse situations where braking could be affected.

be affected.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain the effect of adverse road and weather conditions on braking distances. Analyse situations where braking could be affected.

be affected.

microwaves: cooking and satellite transmissions • infrared: heaters and night vision equipment • visible light: optical fibres and photography • ultraviolet: fluorescent lamps • x-rays: observing the internal structure of objects and materials, including for medical applications • gamma rays: sterilising food and medical equipment.

3.13 explain the detrimental effects of excessive exposure of the human body to electromagnetic waves, including: • microwaves: internal heating of body tissue • infrared: skin burns • ultraviolet: damage to surface cells and blindness • gamma rays: cancer, mutation and describe simple protective measures against the risks

(d) Light and sound

Students should:

3.14 know that light waves can be reflected and refracted

3.15 use the law of reflection (the angle of incidence equals the angle of reflection)

3.17 practical: investigate the refraction of light, using rectangular blocks, semi-circular blocks and triangular prisms

3.20 describe the role of total internal reflection in transmitting information along optical fibres and in prisms

3.21 explain what is meant by critical angle c

3.23 know that sound waves can be reflected and refracted

4 Energy resources and energy transfers

The following sub-topics are covered in this section.

(a) Units

(b) Energy transfers

(c) Work and power

(a) Units

Students should:

4.1 use the following units: kilogram (kg), joule (J), metre (m), metre/second (m/s), metre/second² (m/s²), newton (N), second (s) and watt (W)

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain that some nuclei are unstable which leads to radioactive decay.
- Explain there are three types of radioactive decay.
- Show how these types of radiation can penetrate various substances.
Explain the uses and dangers of radiation.

PP reflection/refraction. Exp ray tracing etc.

(b) Energy transfers

Students should:

4.2 describe energy transfers involving energy stores: • energy stores: chemical, kinetic, gravitational, elastic, thermal, magnetic, electrostatic, nuclear • energy transfers: mechanically, electrically, by heating, by radiation (light and sound)

4.3 use the principle of conservation of energy

4.4 know and use the relationship between efficiency, useful energy output and total energy output: $100\% \text{ total energy output} = \frac{\text{useful energy output}}{\text{total energy output}} \times 100$

4.5 describe a variety of everyday and scientific devices and situations, explaining the transfer of the input energy in terms of the above relationship, including their representation by Sankey diagrams

(c) Work and power

(d)

Students should:

4.11 know and use the relationship between work done, force and distance moved in the direction of the force: work done = force \times distance moved $W = F \times d$

4.12 know that work done is equal to energy transferred

4.13 know and use the relationship between gravitational potential energy, mass, gravitational field strength and height: gravitational potential energy = mass \times gravitational field strength \times height $GPE = m \times g \times h$

4.14 know and use the relationship: kinetic energy = $\frac{1}{2} \times \text{mass} \times \text{speed squared}$

4.15 understand how conservation of energy produces a link between gravitational potential energy, kinetic energy and work

4.16 describe power as the rate of transfer of energy or the rate of doing work

4.17 use the relationship between power, work done (energy transferred) and time taken: time taken work done power = W/t

- Use PowerPoint presentation to explain how energy is transferred in devices. Use examples like a ball being kicked up into the air, a car speeding up and electrical energy being transferred into light in a light bulb.

Use as many real life objects to demonstrate the changes in energy storage.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain that energy can be transferred usefully, stored or dissipated but cannot be destroyed. Use flow diagrams to explain what energy is transferred to and how much is lost.

Using the information in the flow diagrams show how efficiency can be calculated as long as input energy and useful output energy are known.

PP Work. How to calculate.

GPE and KE PP. Define. Calculate.

Summer Physics content

2

iGCSE 5 Solids, liquids and gases

The following sub-topics are covered in this section.

- (a) Units
- (b) Density and pressure
- (c) Ideal gas molecules

(a) Units

Students should:

5.1 use the following units: degree Celsius (°C), Kelvin (K), joule (J), kilogram (kg), metre (m), metre² (m²), metre³ (m³), metre/second (m/s), metre/second² (m/s²), newton (N) and pascal (Pa)

(c) Density and pressure

Students should:

5.5 know and use the relationship between pressure, force and area:

$$\text{pressure} = \text{force}/\text{area}$$

5.6 understand how the pressure at a point in a gas or liquid at rest acts equally in all directions

(d) Ideal gas molecules

Students should:

5.15 explain how molecules in a gas have random motion and that they exert a force and hence a pressure on the walls of a container

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- Use PowerPoint presentation to explain that electrical charge flows in a circuit and this is electrical current. Current depends on the voltage across the component and the resistance of the component.
- Current is measured in amps using an ammeter.
- Voltage is measured in volts using a voltmeter.
- Use meters to measure current and voltage in both series and parallel circuits.

Investigate materials to find which are the best conductors.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain how a complete circuit is

English. Written evaluation. Extended literacy tasks.

Maths.

Place value, decimals, rounding, using equations, rearranging equations, charts/graphs.

Citizenship. Electrical safety.

Food. Electrical appliances-Power (W).

Tech. Electricity (circuits/safety/appliances/etc).

Electrical safety.

Jobs that use electrical appliances/electrician etc

- 5.16 understand why there is an absolute zero of temperature which is $-273\text{ }^{\circ}\text{C}$
- 5.17 describe the Kelvin scale of temperature and be able to convert between the Kelvin and Celsius scales
- 5.18 understand why an increase in temperature results in an increase in the average speed of gas molecules
- 5.19 know that the Kelvin temperature of a gas is proportional to the average kinetic energy of its molecules
- 5.20 explain, for a fixed amount of gas, the qualitative relationship between:
 - pressure and volume at constant
 - pressure and Kelvin temperature at constant volume.

6 Magnetism and electromagnetism

The following sub-topics are covered in this section.

- (a) Units
- (b) Magnetism
- (c) Electromagnetism

(a) Units

Students should:

6.1 use the following units: ampere (A), volt (V) and watt (W)

(b) Magnetism Students should:

6.4 understand the term magnetic field line

6.6 practical: investigate the magnetic field pattern for a permanent bar magnet and between two bar magnets

6.7 describe how to use two permanent magnets to produce a uniform magnetic field pattern

(b) Electromagnetism

Students should:

6.8 know that an electric current in a conductor produces a magnetic field around it

6.12 understand why a force is exerted on a current-carrying wire in a magnetic field, and how this effect is applied in simple d.c. electric motors and loudspeakers

6.13 use the left-hand rule to predict the direction of the resulting force when a wire carries a current perpendicular

- needed for current to flow. Any breaks in the circuit will stop the flow.
- Cells and batteries can be used to provide current (d.c.) that always passes in the same direction.

Mains electricity is an a.c. (alternating current) supply. Current moves in both directions and the supply has a frequency.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain how a household plug is wired.
- Use the PP to ask questions and trouble shoot problems with various 'wired' plugs.
- Wire an actual plug safely using simple tools.

Select correct fuse.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain that appliances have different power ratings

to a magnetic field
6.14 describe how the force on a current-carrying conductor in a magnetic field changes with the magnitude and direction of the field and current

7 Radioactivity and particles

The following sub-topics are covered in this section.

- (a) Units
- (b) Radioactivity
- (c) Fission and fusion

(a) Units Students should:

7.1 use the following units: becquerel (Bq), centimetre (cm), hour (h), minute (min) and second seconds (s)

(c) Radioactivity

Students should:

7.2 describe the structure of an atom in terms of protons, neutrons and electrons and use symbols such as ${}_{14}^{60}\text{C}$ to describe particular nuclei

7.3 know the terms atomic (proton) number, mass (nucleon) number and isotope

7.4 know that alpha (α) particles, beta (β^-) particles and gamma (γ) rays are ionising radiations emitted from unstable nuclei in a random process

7.5 describe the nature of alpha (α) particles, beta (β^-) particles and gamma (γ) rays, and recall that they may be distinguished in terms of penetrating power and ability to ionise

7.6 practical: investigate the penetration powers of different types of radiation using either radioactive sources or simulations

7.10 explain the sources of background (ionising) radiation from Earth and space

7.12 know the definition of the term half-life and understand that it is different for different radioactive isotopes

(measured in Watts, W and kilowatts, kW).

- Use the equation Energy (kWh) = Power (kW) x Time (Hours, h) to calculate energy usage in a household.

Understand that 1kWh = 1 unit on an electricity bill.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain that magnets have two poles. Unlike poles attract and like poles repel each other when two magnets are brought together.

Use bar magnets to show this as well as the magnetic fields around magnets using iron filings.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain that a magnetic field is produced around a wire when a current flows through it.
- Shaping the wire into a coil/solenoid increases the magnetic force as does inserting an iron core.
- Demonstrate this effect.

7.14 describe uses of radioactivity in industry and medicine
7.15 describe the difference between contamination and irradiation
7.16 describe the dangers of ionising radiations, including: • that radiation can cause mutations in living organisms • that radiation can damage cells and tissue • the problems arising from the disposal of radioactive waste and how the associated risks can be reduced

(d) Fission and fusion

Students should:

7.17 know that nuclear reactions, including fission, fusion and radioactive decay can be a source of energy

7.18 understand how a nucleus of U-235 can be split (the process of fission) by collision with a neutron, and that this process releases energy as kinetic energy of the fission products

7.19 know that the fission of U-235 produces two radioactive daughter nuclei and a small number of neutrons

7.22 understand the role of shielding around a nuclear reactor

7.25 know that fusion is the energy source for stars

8 Astrophysics

The following sub-topics are covered in this section:

(a) Units

(b) Motion in the universe

(c) Stellar evolution

(a) Units Students should:

8.1 use the following units: kilogram (kg), metre (m), metre/second (m/s), metre/second² (m/s²), newton (N), second (s), newton/kilogram (N/kg)

(b) Motion in the universe Students should:

- TDA. Investigate factors that increase the strength of an electromagnet.

Make electromagnets

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain that some nuclei are unstable which leads to radioactive decay.
- Explain there are three types of radioactive decay.
- Show how these types of radiation can penetrate various substances.

Explain the uses and dangers of radiation.

Half life calcs
Uses/ dangers
Fission PP

- Starter activity to check prior learning.
- Use the PowerPoint/slinky to differentiate between transverse and longitudinal waves.
- Draw the two types of waves.

Give examples.

8.2 know that:

- the universe is a large collection of billions of galaxies
- a galaxy is a large collection of billions of stars
- our solar system is in the Milky Way galaxy.

8.3 understand why gravitational field strength, g , varies and know that it is different on other planets and the Moon from that on the Earth.

8.4 explain that gravitational force: • causes moons to orbit planets • causes the planets to orbit the Sun • causes artificial satellites to orbit the Earth • causes comets to orbit the Sun.

8.5 describe the differences in the orbits of comets, moons and planets

(d) Stellar evolution

Students should:

8.7 understand how stars can be classified according to their colour

8.8 know that a star's colour is related to its surface temperature

8.9 describe the evolution of stars of similar mass to the Sun through the following stages:

- nebula
- star (main sequence)
- red giant
- white dwarf.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to define amplitude, wavelength, frequency and period.

Explain how to use the wave speed equation.

- Starter activity to check prior learning.
- Use the PowerPoint presentation to explain The EMS and the various uses of waves with varying frequency/wavelength within this spectrum.
- Explain that these waves are useful but they transfer energy that can be harmful.
- Explain that these waves travel at the speed of light 300000kms.

Investigate the range over which a blue tooth device is effective.

Space PP detailing Universe etc.

Life cycle of a star activity.

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