Science

ALDER
Community High School

Year 9

	Autumn Term			
	Physics	**Electrical Circuits**	**Threshold concept:** **Electricity:** Current as the (rate of) flow of charge. Components with resistance reduce the current. In series circuits the current is the same everywhere in the circuit. In parallel circuits the current divides Electricity is generated using renewable and non-renewable resources **Opposites attract:** Idea of attraction and repulsion concerning magnets and static charge. When two surfaces are rubbed together electrons can be transferred **Key knowledge** • Current electricity • electric current, measured in amperes, in circuits, series and parallel circuits, currents • add where branches meet and current as flow of charge • potential difference, measured in volts, battery and bulb ratings; resistance, measured • in ohms, as the ratio of potential difference (p.d.) to current • differences in resistance between conducting and insulating components (quantitative). • Static electricity • separation of positive or negative charges when objects are rubbed together: transfer of electrons • the idea of electric field, forces acting across the space between objects not in contact	**Key Vocabulary** Potential difference Currents Resistance Series Parallel Power

<table>
<tr><td rowspan="2"></td><td></td><td></td><td>Spiritual, moral, social, cultural
developing social skills through group and practical work.
considering the safety of others during practical work.
Exploring how the access of electricity has transformed societies.</td><td>Career links
Electrical Engineer
Electrician
Electronics engineer
Scientist</td></tr>
<tr><td colspan="3">Watch the following videos to recap knowledge:
Current | Electricity | Physics | FuseSchool
Electricity - KS3 Physics - BBC Bitesize
Electric current KS3 | Y8 Science | Lesson Resources | Oak National Academy</td></tr>
<tr><td></td><td>Biology</td><td>Biochemistry</td><td>Threshold concept:
Respiration
To include the importance of respiration to all living things and the products and reactants of anaerobic and aerobic respiration.
Photosynthesis
To include the importance of photosynthesis for plants to produce glucose and the adaptations of plants to allow this.
Transport and exchange surfaces
To include how particles move across membranes via osmosis, diffusion and active transport.

Key knowledge
Plant nutrition
The concept of photosynthesis and representing it as an equation
Plant adaptations for absorbing sunlight
Plant adaptations for gaseous exchange
The difference between gas exchange, breathing and respiration
Structure and function of the human gaseous exchange system
Estimating lung volume
Adaptations of the lungs
Aerobic and anaerobic respiration in humans
Anaerobic respiration in microorganisms</td><td>Key Vocabulary

Stoma/stomata
Breathing
Alveoli
Aerobic cellular respiration
Anaerobic cellular respiration</td></tr>
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			Spiritual, moral, social, cultural • developing social skills through group and practical work. • considering the safety of others during practical work. • Developing an understanding of the importance of cardiovascular fitness to social and emotional wellbeing.	**Career links** • Clinical scientist, biochemistry • Research scientist (life sciences) • Exercise physiologist • Respiratory therapist • Cardiology consultant • Cardiac nurse • Surgeon
			Watch the following videos to recap knowledge: What Is Aerobic Respiration? | Physiology | Biology | FuseSchool What Is Anaerobic Respiration | Physiology | Biology | FuseSchool What Is Photosynthesis? | Biology | FuseSchool	
	Chemistry	**Chemical Reactions**	**Threshold concept:** **Atoms, Elements, Compounds, Mixtures:** To include the difference between these and common examples. **General Equations:** To include the law of conservation of mass and why this means we need to balance equations, also includes how to balance equations. **Key knowledge** 1. Revisit elements, compounds and mixtures 2. Naming compounds 3. Writing word and symbol equations 4. Conservation of mass and balancing equations 5. Explaining increases and decreases in mass 6. Understanding the difference between acids and bases 7. pH scale and how everyday items link to different pH 8. Indicators – qualitative vs quantitative 9. Neutralisation reactions and being able to name salts formed 10. Acid and Metal Carbonates	**Key Vocabulary** Element Compound Mixture Conservation Acid Base Indicator Neutralisation

			Spiritual, moral, social, cultural • developing social skills through group and practical work. • considering the safety of others during practical work. • Discussions around recent scientific discoveries involving indicators to identify diseases	**Career links** • Research chemist • Lab technician • Pharmacist • Chemical engineer • Food scientist • Forensic Scientist
			Watch the following videos to recap knowledge: - What Is An Element, Mixture And Compound? | Properties of Matter | Chemistry | FuseSchool - What Is The Law of Conservation of Mass | Properties of Matter | Chemistry | FuseSchool - What Makes Something Acidic? | Acids, Bases & Alkali's | Chemistry | FuseSchool - What Is The pH Scale | Acids, Bases & Alkalis | Chemistry | FuseSchool - What Are Indicators & How Do We Use Them? | Chemical Tests | Chemistry | FuseSchool	

	Spring Term			
	Physics	**Waves**	**Threshold concept:** **Sound**: Is a longitudinal wave produced and transmitted by vibrations **Energy:** Conservation of energy; energy cannot be created or destroyed, **Key knowledge** • waves on water as undulations which travel through water with transverse motion. • these waves can be reflected, and add or cancel – superposition • Energy and waves • Pressure waves transferring energy; use for cleaning and physiotherapy by ultra-sound. • waves transferring information for conversion to electrical signals by microphone. • Sound waves	**Key Vocabulary** Longitudinal Transverse frequency amplitude

			• frequencies of sound waves, measured in hertz (Hz); echoes, reflection and absorption • of sound • sound needs a medium to travel, the speed of sound in air, in water, in solids • Light waves • the similarities and differences between light waves and waves in matter • light waves travelling through a vacuum; speed of light	
			Spiritual, moral, social, cultural • developing social skills through group and practical work. • considering the safety of others during practical work. • Understanding the benefits of using ultrasound's and impacts on medicine	**Career links** • Acoustical engineer • Audio Engineer • Medical Sonographer • Telecommunications Engineer
			Watch the following videos to recap knowledge: - Waves - KS3 Physics - BBC Bitesize - Wave Motion | Waves | Physics | FuseSchool	
	Biology	**Health and Infectious Disease**	**Threshold concept:** **Disease and immunity** To include communicable and non-communicable diseases and the immune response. **Key knowledge** • Infectious and non-infectious diseases • Lifestyle diseases • Symptoms and treatment of asthma • Physiological effects of smoking and vaping • Physiological effects of depressants and stimulants • Physiological effects of solvent abuse	**Key Vocabulary** infectious lifestyle disease risk factor drug
			Spiritual, moral, social, cultural • developing social skills through group and practical work. • considering the safety of others during practical work.	**Career links** • Physician • General Practitioner

			• Developing an understanding of the impact of drugs on social, mental and physical health. • Discussing drinking and vaping culture in society.	• Nurse • Midwife • Healthcare technician • Pharmacist • Surgeon • Dentist
			Watch the following videos to recap knowledge: Alcohol | Health | Biology | FuseSchool Dangers of smoking | Health | Biology | FuseSchool How are pathogens spread and controlled | Health | Biology | FuseSchool	
	Chemistry	**Carbon cycle and climate change**	**Threshold concept:** **Key knowledge** - Understanding the role of carbon in life - Carbon cycle - The greenhouse gas effect - Pollutants - Acid Rain - Climate change and global warming	**Key Vocabulary** Pollutant Greenhouse gas Climate Radiation Cycle
			Spiritual, moral, social, cultural • developing social skills through group and practical work. • considering the safety of others during practical work. • Understanding the impact daily lives have on the planet • Debating conservation of resources • Understanding our moral obligation to protect our planet • Discussing ways we can be more conservative with resources	**Career links** • Climate Scientist • Environmental Scientist • Renewable Energy Engineer • Environmental Engineer • Sustainability Consultant

<table>
<tr><td rowspan="2"></td><td></td><td></td><td colspan="2">Watch the following videos to recap knowledge:
- What Is The Carbon Cycle - Part 1| Environmental Chemistry | Chemistry | FuseSchool
- What Is The Carbon Cycle - Part 2 | Environmental Chemistry | Chemistry | FuseSchool
- What is Climate Change? 🌍 Explained for Everyone! | FuseSchool
- How Does Global Warming Effect The Environment | Environmental Chemistry | Chemistry | FuseSchool
- What Is The Natural Greenhouse Effect? | Environmental Chemistry | Chemistry | FuseSchool</td></tr>
<tr><td>Chemistry</td><td>Atoms and the periodic table</td><td>Threshold concept:
Atomic Structure:
To include the location, charge and relative mass of sub-atomic particles in addition to links to the periodic table. Links to include the relationship between electronic structure and location on the periodic table.
Periodic Table:
To include how to locate elements in groups and periods. To include gaining an understanding of how there are chemical and physical patterns and trends in the periodic table.
Key knowledge

1. Atomic Structure – development to current model
2. Calculating protons, neutrons and electrons
3. History of the Periodic Table
4. Modern Periodic Table - groups and periods
5. Halogen patterns and reactivity
6. Transition metals and uses</td><td>Key Vocabulary
Property
Reactivity
Proton
Neutron
Electron
Structure
Pattern
Group
Period</td></tr>
<tr><td></td><td></td><td>Spiritual, moral, social, cultural
• developing social skills through group and practical work.
• considering the safety of others during practical work.
• Reflect on how scientists discovered the order and relationships between elements.
• Appreciate the beauty and complexity of the natural world and the way scientific knowledge develops over time.</td><td>Career links
• Chemist
• Chemical engineer
• Pharmacist
• Lab technician
• Nuclear scientist
• Researcher</td></tr>
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			• Understand how discoveries of elements have transformed society through advances in medicine, technology and energy production. • Learn about the history of the periodic table and the contributions of scientists from different countries and cultures, including Dmitri Mendeleev, whose arrangement of elements laid the foundation for the modern table.	
			Watch the following videos to recap knowledge: How Does The Periodic Table Work | Properties of Matter | Chemistry | FuseSchool What Are Periods & Groups In The Periodic Table? | Properties of Matter | Chemistry | FuseSchool Mendeleev and the Periodic Table | Properties of Matter | Chemistry | FuseSchool Electron Configuration of First 20 Elements | Properties of Matter | Chemistry | FuseSchool Group 7 - The Halogens | Properties of Matter | Chemistry | FuseSchool	

	Summer Term			
	Physics	**Floating and sinking**	**Threshold concept:** **Particle model:** To describe the structure of Solids, liquids and gases and the changes in state. **Forces:** Forces, both contact and non-contact, can be represented with arrows and the motion of an object depends on the resultant force acting on the object **Key knowledge** • Pressure in fluids • atmospheric pressure, decreases with increase of height as weight of air above • decreases with height • pressure in liquids, increasing with depth; upthrust effects, floating and sinking	**Key Vocabulary** Vibrations Volume Density Collisions Pressure

			• pressure measured by ratio of force over area – acting normal to any surface. • Balanced forces • opposing forces and equilibrium: weight held by stretched spring or supported on a • compressed surface.	
			Spiritual, moral, social, cultural • developing social skills through group and practical work. • considering the safety of others during practical work. • Understand the importance of safety when designing structures or vehicles	**Career links** • Mechanical Engineer • Civil Engineer • Meteorologist • Materials scientist
			Watch the following videos to recap knowledge: Bouyancy - BBC Bitesize Density Of Different States | Matter | Physics | FuseSchool Springs | Forces & Motion | Physics | FuseSchool Hooke's law - Forces and movement - KS3 Physics - BBC Bitesize	
	Biology	**Adaptation, evolution and biodiversity**	**Threshold concept:** **Natural Selection** To include genetic variation as the basis for natural selection. **Ecology** To include interactions and interdependence between organisms. **Key knowledge** • Plant adaptations • Animal adaptations • Predator-prey cycles • Adaptations of predators and prey • Competition between organisms in the same species • Heritable and environmental variation • Explaining the process of natural selection • Understanding how natural selection leads to evolution	**Key Vocabulary** competition natural selection evolution conservation gene pool

			• The importance of biodiversity and how humans can carry out conservation.	
			Spiritual, moral, social, cultural • developing social skills through group and practical work. • considering the safety of others during practical work. • Observing the wonder of the vast variety of organisms on Earth. • Developing an appreciation of our social and moral obligation to prevent reduction in biodiversity, and the impacts of its reduction.	**Career links** • Conservation biologist • Agricultural consultant • Behavioural ecologist • Evolutionary scientist • Research scientist • Animal welfare officer.
			Watch the following videos to recap knowledge: What Is Adaptation? | Ecology & Environment | Biology | FuseSchool Evidence for Natural Selection | Evolution | Biology | FuseSchool The Theory of Evolution by Natural Selection | Evolution | Biology | FuseSchool	
	Physics	**Magnets and Electromagnets**	**Threshold concept:** **Opposites attract:** Idea of attraction and repulsion concerning magnets and static charge. When two surfaces are rubbed together electrons can be transferred **Key knowledge** • Magnetism • magnetic poles, attraction and repulsion • magnetic fields by plotting with compass, representation by field lines • Earth's magnetism, compass and navigation • the magnetic effect of a current, electromagnets, D.C. motors (principles only)	**Key Vocabulary** Magnetism Electromagnetism Attract Repel Field lines
			Spiritual, moral, social, cultural • developing social skills through group and practical work. • considering the safety of others during practical work. • Reflecting on how the scientific discoveries about magnetism have change the human understanding of the Earth and Universe	**Career links** • Geologist • Navigation engineer • Mechanical Engineer

			Watch the following videos to recap knowledge: Magnetism guide for KS3 physics students - BBC Bitesize Magnets and magnetic materials - BBC Bitesize Magnets | Magnetism | Physics | FuseSchool	
	Chemistry	**Metals and Materials**	**Threshold concept:** **Atomic Structure:** To include the location, charge and relative mass of sub-atomic particles in addition to links to the periodic table. Links to include the relationship between electronic structure and location on the periodic table. **General Equations:** To include the law of conservation of mass and why this means we need to balance equations, also includes how to balance equations. To include the need to learn general equations in order to write equations that represent neutralisation, combustion, oxidation, displacement **Key knowledge** 1. Properties and structure of metals 2. Group 1 metals 3. Metals and water 4. Metals and acids 5. Reactivity series 6. Displacement with metals 7. Extraction of metals using carbon 8. Polymers 9. Properties of ceramics and composites	**Key Vocabulary** Property Displacement Reactivity Structure Effverscence
			Spiritual, moral, social, cultural • developing social skills through group and practical work. • considering the safety of others during practical work. • Debate the responsible use, recycling and disposal of materials to reduce waste and pollution.	**Career links** • Materials scientist • Metallurgical engineer • Mechanical engineer • Nanotechnologist • Corrosion engineer • Manufacturing

			• Develop a sense of wonder about how metals are formed naturally inside the Earth and how their properties make modern technology possible. • Appreciate the creativity and innovation involved in designing new materials, such as smart materials or alloys. • Reflect on humanity's relationship with natural resources and the environment.	• Construction
			Watch the following videos to recap knowledge: Group 1 - The Alkali Metals | The Periodic Table | Properties of Matter | Chemistry | FuseSchool Uses Of Metals - Gold, Copper, Aluminium, Steel | Properties of Matter | Chemistry | FuseSchool What Are Metallic Bonds | Properties of Matter | Chemistry | FuseSchool Reactivity Series of Metals | Environmental | Chemistry | FuseSchool	