KESTEVEN AND SLEAFORD HIGH SCHOOL

Science Scheme of Learning

Year 8 – Term 2/Units 8

Intent – Rationale

These topics allow development of key practical skills learnt in year 7, allowing them to be developed for application in GCSE study.

The application of the reactivity series to explain why certain metals can only be extracted in certain ways allows students to see real world applications of understanding the periodic table and reactivity series.

Waves are a crucial part of everyday life and the GCSE, and so learning about these fundamentals will benefit students in multiple ways.

There are many different forms of respirations, from aerobic, to anaerobic and even in yeast, here students will learn about the various forms of respiration and the vital role it plays in everyday life.

Sequencing – what prior learning does this topic build upon?	Sequencing – what subsequent learning does this topic feed into?
Builds upon prior learning from Ks1 and Ks2 National curriculum **Builds upon practical skills learnt in year 7**	Biology – Leads to GCSE Topic B9 Respiration Chemistry – Leads to GCSE Topic 10 Using Resources Physics – Leads to GCSE topic P11, P12 and P13
What are the links with other subjects in the curriculum?	**What are the links to SMSC, British Values and Careers?**
• **PE – learning about respiration and the benefits of exercise.**	B8.8 L2 Anaerobic respiration and exercise C4 B8.8 L3 Anaerobic respiration in micro-organisms SP2 C8.8 L1 Reactivity Series GB4e C8.8 L4 Properties of metals GB4b P8.8 L2 Sound Waves BV4 BV5 GB4a GB4g
What are the opportunities for developing literacy skills and developing learner confidence and enjoyment in reading?	**What are the opportunities for developing mathematical skills?**
FROM THE LIBRARY *Chemicals in Action-Metals*; Chris Oxlade-546.3 *Metals;* Brain Knapp-546 *Metals*; Steve parker-620.16 *A Dictionary of Physics*; Alan Isaacs-530.03 *Breathing*; J Johnson-612.2 *Fitness and Health*; Craig Donnellan- Issues613	• Calculations using wave equations in this topic allow opportunities to develop mathematical skills.

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Science Scheme of Learning

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Intent – Concepts

What knowledge will students gain and what skills will they develop as a consequence of this topic?

Know

state the word equations for aerobic respiration
state the symbol equations for aerobic respiration
state the percentages of gases in inhaled and exhaled air
state the word equation for anaerobic respiration in muscle cells
state the word equation for anaerobic respiration in yeast
state some metals that can be extracted using carbon
state that metals that are more reactive than carbon must be extracted using electrolysis
state the typical properties of metals
know that sound waves are caused by vibrating objects.
know that sound is a longitudinal wave.
know that sound waves travel fastest in a solid and slower in gases.
label a diagram of a transverse wave

Apply

describe the benefits of exercise
describe how anaerobic respiration in bacteria can be used to generate biogas
describe how anaerobic respiration provides us with bread, beer and wine
describe the tests for carbon dioxide gas
describe the test for water vapour
use observations of metals' reactions with water and oxygen to make a reactivity series
interpret information on displacement reactions to place metals into a reactivity series
write word equations for these displacement reactions
describe the electrolytic extraction of aluminium and evaluate its environmental impact.
describe how waves transfer energy
describe how waves can reflect and interfere with another wave
Define the term 'ultrasound' and give some uses of ultrasound

Extend

Explain that higher pitched sounds have a higher frequency
explain why anaerobic respiration occurs
explain these properties using a simple model of metallic bonding
use ideas about properties to explain the uses of some metals
explain why other metals cannot be extracted in this way
select the most appropriate way of presenting data and justify my choice

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What subject specific language will be used and developed in this topic?	What opportunities are available for assessing the progress of students?

Aerobic respiration	A biochemical process that takes place in the majority of cells, which release energy from glucose by reacting the glucose with oxygen and producing carbon dioxide and water. Aerobic respiration takes place in the mitochondria of plant, animal and fungal cells.
Anaerobic respiration	A biochemical process occurring within the cell that releases energy from glucose without using oxygen. Many organisms are capable of using anaerobic respiration and some bacteria use *only* anaerobic respiration. Anaerobic respiration releases less energy than aerobic respiration, so if an organism is capable of both, it tends to use aerobic respiration.
Bacterium	A tiny organism that has no nucleus or other organelles such as mitochondria or chloroplasts. Almost all bacteria are single celled but a few species do form colonies.
Biogas	The useful gas that is produced when bacteria break down organic matter via anaerobic respiration (without oxygen). The gas is usually methane, which can be burnt as a fuel. The organic matter could be crop plants or animal waste (dung). Biogas can be 'tapped' from landfill sites.
Biogas generator	The apparatus used for producing biogas.
Cobalt chloride paper	Strips of test paper that have been impregnated with solid cobalt chloride. Cobalt chloride is blue when there is no water present. This is known as anhydrous cobalt chloride. When water is present, cobalt chloride (and thus cobalt chloride paper) turns pale pink.

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Ethanol	A compound that has the formula C_2H_5OH. Ethanol is a type of alcohol. It can be produced by enzymes in yeast in a process called fermentation. It can also be produced on an industrial scale from products derived from crude oil.
Exhaled air	The air that is breathed out. This contains exactly the same amount of nitrogen as the air breathed in, and less oxygen, but more carbon dioxide and water vapour.
Fermentation	A biochemical process in yeast and bacteria when sugars are converted to alcohol, acids and carbon dioxide.
Inhaled air	The air that we breathe in. It contains 78% nitrogen and 21% oxygen, and the remaining 1% is mainly argon with a tiny amount of carbon dioxide and other gases.
Joint	Where two bones meet and usually move separately to allow movement of body parts.
Lactic acid	A chemical produced from glucose in body tissues when they respire without enough oxygen for aerobic respiration. Lactic acid is responsible for the pain that you feel in your muscles when you do strenuous exercise.
Methane	A flammable gas that has the chemical formula CH_4. It is the main component of natural gas – and biogas, because it is also produced as a product of anaerobic respiration of carbohydrates by micro-organisms in a biogas generator or landfill site.
Oxygen debt	The amount of oxygen needed to break down the lactic acid built up in body tissues during anaerobic exercise.
Recovery rate	The time it takes for your heart rate and breathing rate to return to normal after exercise. Generally, the shorter your recovery time, the fitter you are.
Respiration	The release of energy from food. Respiration happens inside all cells to provide the energy needed to function, grow and repair. Respiration can be either aerobic or anaerobic.
Stoma	A hole. When describing the structure of a leaf, a stoma is a small hole, usually on the underside of the leaf, that opens to allow gases to enter and leave the leaf. The plural of stoma is stomata.
Decomposition	In chemistry, this refers to a type of chemical reaction when one compound is split up into other substances.
Ductile	A property of some substances (typically metals) that means that they can be drawn into wires
Electrode	A conductor that can be charged in order to pass an electric current through a non-metallic substance. Positive electrodes are called anodes and negative electrodes are called cathodes.
Electrolyte	A solution or (molten) liquid that can conduct electricity in a circuit. The conduction of electricity through an electrolyte will result in electrolysis.
Extraction	Separating a useful substance from a mixture or compound
Global warming	The warming of the Earth's atmosphere and oceans as a result of an increase in the greenhouse effect.
Greenhouse effect	The trapping of energy from the Sun by the atmosphere.
Malleable	A property that means a particular material can be beaten into shape, for example with a hammer.
Ore	A rock from which enough metal can be extracted to make it worth extracting the rock from the ground (by mining).
Properties	The characteristics of a substance that make it well suited (or poorly suited) for a particular purpose.
Pure	A substance made from only one compound or element.
Reactivity series	A list of elements in order of how reactive they are.
Reducing agent	A chemical that removes oxygen from other chemicals in a chemical reaction.
Reduction	To remove oxygen from another chemical in a reaction
Amplitude	The amplitude is the vertical distance of the peak of the wave from the equilibrium point.
Angle of incidence	The angle between the incident ray and the normal.
Angle of reflection	The angle between the reflected ray and the normal.
Compression	When describing a longitudinal wave, the region where the particles are closely packed is called a compression.
Rarefaction	When describing a longitudinal wave, the region where the particles are widely spaced is called a rarefaction.

Diaphragm	A thin membrane in a microphone that detects sound by oscillating at the same frequency as the sound waves.
Eardrum	A thin layer of skin within the ear that detects sound by vibrating at the same frequency as the sound waves that reach it.
Echo	Reflected waves, typically sound waves.
Echolocation	A method of emitting sound waves and then detecting their echoes to find prey and obstacles that must be avoided.
Frequency	The number of oscillations or waves per second. Frequency is measured in hertz, Hz.
Hertz (Hz)	One hertz is equivalent to one complete vibration, wave or cycle per second
Longitudinal wave	A type of wave in which the particles are vibrating in the same direction as the direction that the wave is travelling.
Peak	When used to describe a transverse wave, the peak is the highest point on the wave.
Pitch	How high or low a musical note is.
Rogue wave	An extremely tall wave that appears as if from nowhere on an otherwise normal sea.
SONAR	A device used by ships and submarines to find the depth of the sea and to detect things like shoals of fish, using sound waves.
Transverse wave	A wave in which the vibrations are at right angles to the direction in which the wave is moving.
Trough	On a diagram of a transverse wave, this is the lowest point. It is the furthest point from a peak.
Ultrasound	Sound waves that have a frequency too high for humans to hear.
Wave	The wave transfers energy without transferring the medium itself.
Wavefront	A line drawn along a wave (when viewed from above) that joins points that all have the same peak.
Wavelength	The distance between two adjacent peaks.

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Intent – Concepts

Lesson title	Learning challenge	Higher level challenge	Suggested activities and resources
B8.8 L1 Aerobic respiration	Can I state the word equations for aerobic respiration? Can I state the symbol equations for aerobic respiration? Can I state the percentages of gases in inhaled and exhaled air?	Can I describe the tests for carbon dioxide gas? Can I describe the test for water vapour?	
B8.8 L2 Anaerobic respiration and exercise	Can I state the word equation for anaerobic respiration in muscle cells? Can I describe the benefits of exercise?	Can I explain why anaerobic respiration occurs?	
B8.8 L3 Anaerobic respiration in micro-organisms	Can I state the word equation for anaerobic respiration in yeast?	Can I describe how anaerobic respiration in bacteria can be used to generate biogas? Can I describe how anaerobic respiration provides us with bread, beer and wine ?	
C8.8 L1 Reactivity Series	Can I use observations of metals' reactions with water and	Can I interpret information on displacement reactions to place metals	

	oxygen to make a reactivity series? ? Can I write word equations for these displacement reactions?	into a reactivity series	
C8.8 L2 Extracting with Carbon	Can I state some metals that can be extracted using carbon?	Can I explain why other metals cannot be extracted in this way?	
C8.8 L3 Extracting with Electricity	Can I state that metals that are more reactive than carbon must be extracted using electrolysis? Can I describe the electrolytic extraction of aluminium	Can I explain evaluate the environmental impact of electrolysis?	
C8.8 L4 Properties of metals	Can I state the typical properties of metals?	Can I explain these properties using a simple model of metallic bonding? Can I use ideas about properties to explain the uses of some metals?	
P8.8 L1 Waves Basics	Can I describe how waves transfer energy? Can I label a diagram of a	Can I describe how waves can reflect and interfere with another wave?	

	transverse wave? Can I state that sound waves are caused by vibrating objects?		
P8.8 L2 Sound Waves	Can I state that sound is a longitudinal wave? Can I state that sound waves travel fastest in a solid and slower in gases?	Can I explain that higher pitched sounds have a higher frequency?	
P8.8 L3 Ultrasound	Can I define the term 'ultrasound' and give some uses of ultrasound?	Can I explain how echolocation is used for sonar?	
P8.8 L4 Echolocation	Can I select the most appropriate way of presenting data?	Can I justify my choice when selecting the most appropriate way of presenting data?	