KESTEVEN AND SLEAFORD HIGH SCHOOL

Science Scheme of Learning

Year 8 – Term 4/Units 10

Intent – Rationale

Students will learn about the variation between organisms of the same and different species. This leads into the mechanisms of inheritance including DNA, genes and chromosomes. Natural and artificial selection are also considered and what can cause extinction.

Types of chemical reaction will be explored, followed by the different types of energy transfers in these reactions. Factors that affect the rate of chemical reactions will be learnt about, including temperature, catalysts, surface area and concentration.

Students will learn about turning moments and levers. They will learn about pressure and how to calculate it. And they will also consider floating and sinking and how to calculate density.

Sequencing – what prior learning does this topic build upon?	Sequencing – what subsequent learning does this topic feed into?
Topic B7.1 Cells and Tissues **Topic B7.3 Environment and adaptation** **Topic B7.4 Variation and classification** **Topic C7.1 Particles** **Topic C7.2 Atoms and Elements** **Topic C7.5 Simple Chemical reactions** **Topic P7.1 Energy Transfers** **Topic P7.2 Forces and Effects**	• GCSE Units B14 Variation and Evolution, B15 Genetics and Evolution, B16 Adaptation, Interdependence and Competition, B17 Organisation of an ecosystem and B18 Biodiversity and ecosystems. • GCSE Topic 4 Chemical Changes, Topic 6 Rates and Extent of Reactions, Topic 5 Energy Changes and Topic 7 Organic Chemistry • GCSE Units P8 Forces and their effects, P9-10 Forces and motion, P11 Force and pressure
What are the links with other subjects in the curriculum?	**What are the links to SMSC, British Values and Careers?**
• Base the content here on what you already know but there will be time in future to liaise further as part of our collaborative work	• GB4e P8.10 L4 • SMSC M B8.10 L4
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 *Crick, Watson and DNA*; Paul Strathern-572 *DNA and Genetic Engineering*; Robert Sneddon-660.6 *Genetics*; Richard Beaty-576.5 *The Stuff of Life*; Mark Schultz-576.5 *Designs in Science: Movement*; Sally Morgan 530 *Forces and Movement*; Peter Riley-531	• Calculating pressure/ density • Calculating moments • Balancing chemical reactions • Applying quantitative predictions to rates of reaction

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Science Scheme of Learning

Year 8 – Term 4

Intent – Concepts

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

Know

- Explain what variation is. Describe DNA, genes and chromosomes. Describe natural selection. Describe selective breeding. Explain why extinctions can occur.
- State the products of complete combustion of a hydrocarbon fuel. Define the terms endothermic and exothermic. Describe two ways to measure the rate of a reaction. Explain why increasing the concentration increases the reaction rate.
- Calculate the moment of a force. Describe the features of a leaver. State the equation for pressure. Describe how the pressure in a fluid changes with depth.

Apply

- Identify different types of variation. Describe how genetic information is passed on to offspring in humans. Apply the principles of natural selection to unfamiliar contexts. Discuss the ethical issues behind selective breeding. Describe the importance of seed banks.
- Write word equations for thermal decomposition of metal carbonates. Describe how measuring temperature changes in the surroundings allows us to identify exothermic and endothermic changes. Use collision theory to explain why increasing the temperature will increase the rate of a reaction. Use ideas about particles to explain why increasing the concentration increases the reaction rate.
- Describe how to balance the moment of a force with another force. Draw diagrams of the leavers and label the load, effort and pivot. Use the equation for pressure. Use pressure to explain how a straw works.

Extend

- Explain what a species is. Explain the history of genetics. Explain natural selection with examples. Explain artificial selection. Analyse the cause of a possible extinction to suggest how to prevent it.
- Define and identify oxidation and reduction reactions. Explain that in a reaction bonds have to be broken and then made. Describe the effect that a catalyst has on the rate of a reaction and explain how they work. Use ideas about particles to explain why grinding lumps of a solid into a powder increases the reaction rate.
- Describe how to increase the moment of a force. Give examples of the uses of levers. Give examples of when high pressure and low pressure are useful. Describe what happens to an object when the pressure on the outside or inside is greater.

What subject specific language will be used and developed in this topic?	What opportunities are available for assessing the progress of students?
	• Genetics timeline show you can challenge B8.10 L2 • Presenting and interpreting data B8.10 L3 Homework • Extinction presentation B8.10 L5 • Observation of role play C8.10 L2 • Assessment of 'show you can' C8.10 L3, P8.10 L1,2,3,4. • Topic 10 summative test – overall understanding of content and the ability to apply to unfamiliar contexts.

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Word	Definition
altitude sickness	An illness caused by very low air pressure. It can be fatal.
antagonistic muscles	Two muscles that work a joint by pulling in opposite directions, eg biceps and triceps.
anticlockwise moment	The moment of a force in an anticlockwise direction around a pivot.
bends	Another name for decompression sickness.
biceps	Muscle found at the front of the arm between the shoulder and elbow.
clockwise moment	The moment of a force in a clockwise direction around a pivot.
compressed	Squeezed together.
contracting	Making something smaller or shorter.
decompression sickness	Bubbles in the blood caused if divers come to the surface too quickly. It can be fatal.
effort	The force put on a lever to put a force on something else.
exert	Push on something.
force multiplier	A lever used to turn a small force into a larger one.
fulcrum	A point around which something turns. Another name for a pivot.
hydraulic	A system which works by transmitting pressure through pipes containing a liquid.
in equilibrium	In balance.
lever	A simple machine which can increase the size of a force.
load	The weight or force on something.
machine	Something which alters the size or direction of a force.
moment	The turning effect of a force. It is calculated using: moment = force x distance of force from pivot.
newton metre (Nm)	The unit for the moment of a force.
pascal (Pa)	A unit for pressure. 1 Pa = 1 N/m^2.
pivot	Another name for a fulcrum.
pneumatic	Containing air or gas under pressure, eg tyres.
pressure	The force on a certain area, measured in newtons per square metre (N/m^2), newtons per square centimetre (N/cm^2), or pascals (Pa).
principle of moments	The principle of moments states that when something is in equilibrium (in balance), the clockwise moment is equal to the anticlockwise moment.
radius bone	The bone in the forearm that the biceps muscle pulls on.
triceps	Muscle found at the back of the arm between the shoulder and elbow.
turning effect	The moment of a force. The way in which a force turns something around a pivot.

Adaptation	A physical or behavioural characteristic that an organism has evolved in order to allow it to have the best chance of survival in a particular habitat.
Artificial selection	When people select organisms to breed that have desirable characteristics.
Chromosomes	A very long strand of DNA, wound up with proteins, that is found in the nucleus of a cell. Chromosomes contain very large numbers of genes.
Competition	Living things within a habitat will fight for resources that are valuable to them.
DNA	(Deoxyribonucleic acid)The molecule that encodes genetic information in all known organisms and many viruses.
Evolution	The change in inherited characteristics of a population over many generations.
Extinct	When the last individual of a species has died.
Gene	A section of DNA that controls one inherited characteristic of an organism. A gene contains the code for building one type of protein molecule.
Gene bank	A store of tissue samples or cells from endangered species.
Natural selection	When certain individuals are better suited to their environment they are more likely to survive and breed, passing on their features to the next generation.
Selective breeding	When humans select individual animals or plants that have desirable characteristics and breed from them, which results in a greater chance that the offspring will have those same characteristics.
Species	A group of organisms that can breed to produce fertile offspring.
Survival of the fittest	When organisms that have particular characteristics that are well suited to the habitat in which they live and allow them to be more successful in feeding, competing with each other and reproducing, they are more likely to survive.

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.
Collide	To bang into something when moving. In chemistry, collision theory helps us to explain the factors that affect the rate (speed) of a reaction.
Combustion	A type of reaction that involves a fuel reacting with oxygen (usually from the air) and releasing thermal energy. Combustion is another name for burning
Concentrated	A solution is concentrated when it has a large amount of solute dissolved into a given volume of solvent. We could also say that the solution has a high concentration. This will mean that within the solution, the solute particles are closer together than in a dilute solution, where there are many more solvent molecules and fewer solute molecules. Concentration is measured in mol/dm^3, so a bottle of hydrochloric acid that is 5 mol/dm^3 is more concentrated than a solution of 1 mol/dm^3.
Dilute	A solution that contains a lot of solvent (usually water) and not very much of the solute. Dilute is the opposite of concentrated. Since concentration is measured in mol/dm^3, a dilute solution would have a low value. For example, 0.1 mol/dm^3 is very dilute compared with 5 mol/dm^3.
Displacement	A chemical reaction in which a more reactive element will displace (push out) a less reactive element from a compound.
Endothermic	A chemical reaction or physical change that involves the absorption of energy from the surroundings. If you touch a test tube containing an endothermic reaction, it will feel cold because thermal energy is being transferred from your hand to the chemicals. A thermometer inserted into the reaction mixture will measure a decrease in temperature.
Exothermic	A chemical reaction or physical change that involves the transfer of thermal energy from the chemicals to the surroundings. If you touch a test tube containing an exothermic reaction it will feel hot because it is transferring energy to your hand. A thermometer inserted into the mixture will measure an increase in temperature.
Limewater	A colourless dilute solution of calcium hydroxide, $Ca(OH)_2$ which can be used to detect the presence of carbon dioxide. If carbon dioxide is passed through limewater it turns cloudy because a white precipitate of calcium carbonate ($CaCO_3$) is formed.
Oxidation	A reaction in which oxygen is added to a substance, or electrons are lost by it.
Reaction rate	The rate of a chemical reaction is a measurement of how fast it occurs. In the lab, this can be measured by recording the time taken for it to finish. The shorter the time taken for the reaction to finish, the faster the rate.

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Thermal decomposition	*A type of chemical reaction in which a compound splits up when it is heated. These reactions absorb a lot of energy and usually take place at very high temperatures.*

Intent – Concepts

Lesson title	Learning challenge	Higher level challenge	Suggested activities and resources
B8.10 L1 Variation	Can I explain what variation is?	Can I explain what a species is?	
B8.10 L2 Genes, chromosomes and DNA	Can I describe DNA, genes and chromosomes?	Can I explain the history of genetics?	
B8.10 L3 Natural Selection	Can I describe natural selection?	Can I explain natural selection and give examples of it?	
B8.10 L4 Selective breeding	Can I describe selective breeding?	Can I explain artificial selection and give examples of it?	
B8.10 L5 Extinction	Can I explain why extinctions can occur?	Can I analyse the cause of a possible extinction to suggest	

		how to prevent it?	
C8.10 L1 Types of chemical reaction	Can I state the products of complete combustion of a hydrocarbon fuel?	Can I define and identify oxidation and reduction reactions?	
C8.10 L2 Energy transfer in reactions	Can I define the terms endothermic and exothermic?	Can I explain that in a reaction bonds have to be broken and then made?	
C8.10 L3 Temperature and catalysts	Can I describe two ways to measure the rate of a reaction?	Can I describe the effect that a catalyst has on the rate of a reaction and explain how they work?	
C8.10 L4 Concentration and surface area	Can I explain why increasing the concentration increases the reaction rate?	Can I use ideas about particles to explain why grinding lumps of	

		a solid into a powder increases the reaction rate?	
P8.10 L1 Turning Moments	Can I Calculate the moment of a force?	Can I describe how to increase the moment of a force?	
P8.10 L2 Levers	Can I describe the features of a leaver?	Can I give examples of the uses of levers?	
P8.10 L3 Pressure	Can I state the equation for pressure?	Can I give examples of when high pressure and low pressure are useful?	
P8.10 L4 Pressure in fluids	Can I describe how the pressure in a fluid changes with depth?	Can I describe what happens to an object when the pressure on the outside or inside is greater?	

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Topic 10 Test	Summative test		