KESTEVEN AND SLEAFORD HIGH SCHOOL

Science Scheme of Learning

Year 7 – Term 1/Units 1

Intent – Rationale

The first 4 lessons allows students to learn about the lab safety rules and equipment. Students practise working safely and lighting Bunsen burners. Students learn how to use a compound microscope and calculate magnification. They learn about the differences and similarities between animal and plant cells. They progress to consider specialised cells their functions and adaptations. This leads onto grouping cells together to form multicellular organisms and organs. Students learn about the particle model and the 3 states of matter. They consider changing states and diffusion and gas pressure. They learn about density investigating the properties of solids, liquids and gases. Students learn about the different energy stores and then consider heat transfer in more detail. They learn about the gravitational store of energy and work done, and energy from fuels.

Sequencing – what prior learning does this topic build upon?	Sequencing – what subsequent learning does this topic feed into?
KS2 NC Y5 Properties and changes of materials **KS2 NC Y5 Forces**	• Topic B7.2 Animal and Plant Reproduction, B8.12 Microbes. Topic C7.2 Atoms and Elements, C7.5 Simple chemical reactions, C7.6 Compounds, C8.9 Reactions of acids, C8.10 Describing reactions. Topic P7.2 Forces and effects, P7.3 Electricity, P7.4 Energy resources, P7.5 Magnets and electromagnets, P7.6 Motion, P8.10 Application of forces, P8.11 Heat transfer. • GCSE Units B1 Cell structure and transport, B2 Cell Division, B3 Organisation and the digestive system, B4 Organising animals and plants. • GCSE Chemistry Topic 1 Atomic Structure and the Periodic Table, Topic 2 Bonding and Topic 4 Chemical Changes • GCSE Units P1 Conservation and dissipation of energy, P2 Energy transfer by heating, P3 Energy resources
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	• B7.1 L3 GB4i • C7.1 L1 GB4agi
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 *Animals Multicell life*. 571.61 *Cells and Systems* 574.8 *Energy 531* (DK) *Killer Energy* 500	• Magnification • Calculating potential energy

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Year 7 – Term 1/Units 1

Intent – Concepts

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

Know

- Understand what science is and the vast range of scientific study that occurs. Name basic scientific apparatus and describe its use. Define the terms: independent, dependent and control variables.
- Describe how to use a compound microscope. List the characteristics of living thing. Describe the structure of specialised animal and plant cells. Explain how multicellular organisms are organised.
- Describe the arrangement and motion of particles in solids, liquids and gases. State the changes of state. Explain how diffusion occurs. State the typical properties of solids, liquids and gases.
- State the eight stores of energy. Explain how substances have a thermal store of energy. Explain how substances have a gravitational store of energy. Explain how to compare the energy in different fuels.

Apply

- Know the lab safety rules and understand the reasons behind them. Light a Bunsen burner safely. Plan and carry out an investigation.
- Describe how to prepare a microscope slide. Describe the structure of generalised animal and plant cells. Link specialised structures in cells to functions. Be able to list some of the different types of tissues found in living organisms.
- Explain why all substances expand when heated, using ideas about particles. Describe what happens during the changes of state. Explain why a can will be crushed when the air is removed from it. Explain how a hydrometer works and the advantages of using these in drinks industry.
- Draw a Sankey diagram. Draw diagrams to summarise the effect of heat energy on the particles of a material. Explain what potential energy is. Identify independent, dependent and control variables.

Extend

- Predict potential hazards in a laboratory. Draw scientific equipment. Explain the steps of the scientific method.
- State the formula for magnification. Explain the function of the parts of these cells. Explain the adaptations of specialised animal and plant cells. Be able to identify the major organs in the human body and identify the organ systems they are part of.
- Give examples of when expansion is useful and when it is a problem. Explain the changes of state. State and explain factors that increase the speed of diffusion. Use ideas about density to explain why some items float in water and others sink.
- Describe how energy can be conserved, dissipated or transferred. Explain how heat is transferred from one object to another. Explain how work done is the same as energy transferred. Evaluate experimental method for sources of error.

What subject specific language will be used and developed in this topic?	What opportunities are available for assessing the progress of students?
	• Show you can task B7.1 L1, B7.2 L2, B7.1 L3, B7.1 L4, C7.1 L2, C7.1 L3, C7.1 L4, P7.1 L1, P7.1 L2, P7.1 L3 • Make a model B7.1 L4 • Role play C7.1 L1 • Plan an experiment P7.1 L4

Word	Definition
Cell	The basic structural unit of all living things.

Cell membrane	The membrane that surrounds a cell. It controls what enters and leaves the cell; this is why the membrane is often described as 'selectively permeable'.
Cell wall	A strong and fairly rigid structure that surrounds the cell membrane in plants, fungi and some microbes. The cell wall does not control what enters and leaves the cell.
Chlorophyll	A complex molecule that is green in colour. It is responsible for absorbing energy from sunlight for photosynthesis in plants and some bacteria.
Chloroplast	An organelle in a plant cell that contains chlorophyll and is where photosynthesis takes place.
Cytoplasm	The liquid inside a cell where chemical reactions happen.
Diffusion	The movement of particles from an area in which they are in high concentration to an area in which they are in lower concentration.
Magnification	The number of times that an image is larger than the actual object.
Microorganism	A living thing that is too small to be seen with the naked eye, so it must be observed and studied using some sort of microscope.
Microscope	An instrument used to see and study very small objects and organisms that are too small to see with the naked eye.
Mitochondrion	A tiny organelle (structure) that is found within the cytoplasm of animal and plant cells, where respiration takes place.
Multicellular organism	A living thing that is made from more than one cell, working together. In the vast majority of multicellular organisms, cells are specialised for specific functions.
Nucleus	In biology, the nucleus is the part of a cell that contains the DNA. The DNA contains the instructions for what the cell should do and produce.
Organ	A part of an animal or plant that contains different types of tissue working together to achieve a particular function.
Organ system	A group of organs that work together within an organism.
Respiration	The chemical reactions that allow living things to release energy from compounds such as glucose.
Specialised cell	A cell that has a specific function within an organism and is adapted for that function.
Tissue	A group of similar cells that work together.
Vacuole	An organelle (structure) in a plant and fungal cell that is filled with sap and keeps the cell (and therefore the plant) firm.

Word	Definition
Boiling	A change of state when a liquid turns into a gas at a temperature known as the boiling point. At this temperature, the average kinetic energy of the particles is high enough that the liquid changes quickly into a gas, and bubbles of gas are usually seen rising through the liquid because the heat is usually applied from below. At temperatures lower than the boiling point, evaporation occurs, when high-energy molecules are lost from the surface of a liquid at a much slower rate than during boiling.

Compressibility	A property that describes how easy it is to squash something so that it takes up less volume (space). Gases are compressible because the particles in a gas are far apart, so they can be pushed closer together. Liquids and solids are not very compressible (or not compressible at all in many cases) because the particles are all touching their neighbours.
Concentration	A measure of the amount of solute (solid) dissolved in a solvent (liquid). In a solution with a high concentration there is a large amount of solute dissolved into a given volume of solvent. 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 g/dm^3, so a bottle of hydrochloric acid that is $5g/dm^3$ is five times more concentrated than a solution of $1\ g/dm^3$.
Condensation	When a gas turns into a liquid, as a result of either being cooled or compressed (or both). The term can also be used to describe the liquid produced when this change happens. So you will see condensation on the mirror in the bathroom when you turn the shower on.
Density	A measurement of an object's mass compared to its volume. Density is calculated by dividing the mass by the volume, so a substance or object with a high density has a large mass in a small volume. If something is denser than water, it will sink in water. If it is denser than mercury, it will sink in mercury. The units of density depend on the units used for mass and for volume. For example, if the mass is in kilograms and the volume in metres cubed, then the units for density will be kg/m^3.
Diffusion	The movement of particles from an area in which they are in high concentration to an area in which they are in lower concentration. This could be in an open space, or through biological membranes. Examples of diffusion include a perfume spreading out through a room so that you can smell it some distance away, and carbon dioxide diffusing out of the blood and into the air in the lungs.
Elastic	A property of a substance or object that means that it returns to its original shape after a force that had changed its shape is removed. Examples of elastic substances include rubber and springs (as long as they are not stretched too far).
Evaporation	When a liquid turns into a gas below its boiling point. This happens slowly as a result of some molecules at the surface of the liquid having enough energy to escape. Evaporation has the effect of cooling down the rest of the liquid that remains. An example of evaporation is when puddles dry up on a warm day.
Expansion	When something increases in size without any change in mass. Most substances expand when they are heated, and this is how many thermometers work.
Freezing	The process when a liquid changes into a solid. This does not need to be water. Any pure liquid can freeze at an appropriately cold temperature.

	For example, the white-hot liquid iron produced in the thermite reaction freezes to solid iron as it cools down after the reaction.
Gas pressure	The force exerted per unit area by a gas on the inside walls of its container. The unit of pressure is the Pascal (Pa), which corresponds to a force of one Newton per square metre.
Melting	The change of state when a solid becomes a liquid. Energy must be supplied for melting to take place. For example, ice melts to form liquid water at 0 °C, but sulfur melts at 115 °C.
Particle Theory	A theory that explains the properties of matter based on substances being made up of tiny particles. This is also known as kinetic theory, because it relies on the particles moving (either by vibrating in a solid, moving over each other in a liquid, or moving freely in a gas).
Properties	The characteristics of a substance that make it well suited (or poorly suited) for a particular purpose. Examples of properties include: high melting point; good conductor of heat; flexible; malleable and poor conductor of electricity.
Sublimation	The change of state when a solid turns straight into a gas without first becoming a liquid. For example, at room pressure solid carbon dioxide (dry ice) sublimes to form gaseous carbon dioxide.
Thermal store	The energy of a substance due to the random motion of its particles. For example, a hot metal rod contains a lot of energy in its thermal store.

Word	Definition
Carbohydrate	Carbohydrates are important in the diet because they act as a short-term energy store.
Chemical store	Energy that is stored within chemicals and can be released during an exothermic chemical reaction.
Conduction	A material that allows heat to be transferred easily through it.
Convection	A method of heat transfer when thermal energy is transferred through a liquid or a gas because of currents caused by heat.
Dissipated	When energy becomes more spread out and less useful in doing work.
Efficiency	The proportion of useful energy that leaves a system expressed as a percentage of the total energy input.
Elastic store	The energy stored by stretching or bending an object.
Electrical work	Moving energy from one store to another using electricity.

Energy store	The way that something holds its energy. Energy can be moved from one store to another in energy transfers (or transformations).
Fat	A group of chemical compounds made from carbon, hydrogen and oxygen that are made by animals and plants as a way to store energy.
Force	An action that can stretch or compress an object, or cause it to speed up, slow down or change its direction of motion.
Friction	A force that acts when two substances touch each other. Friction always opposes motion, preventing two surfaces from sliding over each other, or acting to slow them down if they are already moving.
Fuel	Any substance that can be burnt to release chemical energy as heat. Fuels react with oxygen in combustion reactions.
Gravitational store	Energy stored due to an object's height, which can be released by letting the object fall.
Heat transfer	The transfer of energy between the thermal stores of two objects. Thermal energy will always tend to move from the thermal store of a hot object to the thermal store of a colder object (or the surroundings if they are colder).
Joule	The standard unit of energy.
Kilocalorie	A unit of energy that is commonly used in food labelling and dietary advice. Kilocalories are abbreviated to kcal, but people often refer to them as 'big calories' or simply 'calories', which is confusing because one calorie is actually one thousandth of a kilocalorie! A kilocalorie is the amount of energy that is needed to heat 1 kg of water by 1 degree Celsius (1 °C). It is equivalent to approximately 4200 joules.
Kilojoule	A unit of energy that is equal to 1000 joules
Kilowatt	A unit of power that is equal to 1000 watts
Kinetic store	The energy an object has due to its movement
Law of conservation of energy	The principle that energy can neither be created nor destroyed, just transferred from one store to another.
Magnetic store	The energy stored by the attraction or repulsion of magnetic poles.
Mechanical work	Shifting energy from one store to another, by a force pushing or pulling an object along
Metre	The standard unit of length
Newton	The standard unit of force. It is abbreviated to N. It is named after the British physicist Isaac Newton.
Nuclear store	The energy stored in the nucleus of an atom, which is released in a nuclear power station or nuclear bomb.
Power	The rate at which energy is transferred. Power is measured in watts, W. One watt is equivalent to one joule transferred every second.
Protein	A long molecule made up from many amino acids joined together. In the diet, proteins are needed to repair tissues and for the growth of new cells.

Radiation	Radiation is commonly used to refer to electromagnetic radiation, which is the movement of a wave as a result of vibrations in the electromagnetic field. Examples of electromagnetic radiation include radio waves, infrared, visible light, ultraviolet, X-rays and gamma rays.		
Respiration	The chemical reactions that allow living things to release energy from compounds such as glucose. In general, aerobic respiration can be summarised with the following word equation: glucose + oxygen → carbon dioxide + water.		
Sankey diagram	A flowchart used to show the total energy input of a device, its useful energy output and its wasted energy; the thickness of each arrow represents the proportion of energy flowing along each path.		
Thermal store	The energy of a substance due to the random motion of its particles.		
Weight	The force of gravity on an object. Weight always acts towards the centre of a planet. Its size depends on the mass and the gravitational field strength.		

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Intent – Concepts

Lesson title	Learning challenge	Higher level challenge	Suggested activities and resources
Induction L1 What is Science?	Can I explain what science is and the vast range of scientific study that occurs?	Can I predict potential hazards in a laboratory?	
Induction L2 Drawing scientific equipment and Lighting a Bunsen burner	Can I name basic scientific apparatus and describe its use?	Can I draw scientific equipment?	
Induction L3 and 4 Bunsen burner investigation	Can I define the terms: independent, dependent and control variables?	Can I explain the steps of the scientific method?	
B7.1 L1 Microscopes	Can I describe how to use a light microscope?	Can I state the formula for calculating magnification?	
B7.1 L2 Cells	Can I list the characteristics of living thing?	Can I explain the function of the parts of animal and plant cells?	
B7.1 L3 Specialised Cells	Can I describe the structure of specialised animal and plant cells?	Can I explain the adaptations of specialised animal and plant cells?	
B7.1 L4 Simple and complex organisms	Can I explain how multicellular organisms are organised?	Can I identify the major organs in the human body and identify the organ systems they are part of?	

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C7.1 L1 The particle model	Can I describe the arrangement and motion of particles in solids, liquids and gases?	Can I give examples of when expansion is useful and when it is a problem?	
C7.1 L2 Changing state	Can I state the changes of state?	Can I explain the changes of state?	
C7.1 L3 Diffusion and gas pressure	Can I explain how diffusion occurs?	Can I state and explain factors that increase the speed of diffusion?	
C7.1 L4 Introducing density	Can I state the typical properties of solids, liquids and gases?	Can I use ideas about density to explain why some items float in water and others sink?	
P7.1 L1 Energy	Can I state the eight stores of energy?	Can I describe how energy can be conserved, dissipated or transferred?	
P7.1 L2 Heat Transfer	Can I explain how substances have a thermal store of energy?	Can I explain how heat is transferred from one object to another?	
P7.1 L3 The gravitational store of energy and work done	Can I explain how substances have a gravitational store of energy?	Can I explain how work done is the same as energy transferred?	
P7.1 L4 Energy from fuels	Can I explain how to compare the energy in different fuels?	Can I evaluate experimental method for sources of error?	
Topic 1 test	Summative test		