KS3 Science

St Peter's Centre 2020-21

St Peter's Centre: KS3 Science Curriculum

Term	**Topic**
Autumn 1	**Biology** Structure and function of living organisms The skeletal and muscular systems Gas exchange systems Nutrition and digestion Pathogens, immunity, fighting diseases
Autumn 2	**Chemistry** Atoms, elements and compounds Pure and impure substances (mixtures) The periodic table Chemical reactions – acids and alkalis
Spring 1	**Physics** Describing motion Forces Pressure in fluids Waves
Spring 2	**Biology** Cells and organisation Photosynthesis Cellular respiration
Summer 1	**Chemistry** Metals and other Materials The Earth
Summer 2	**Physics** Energy changes and transfers Current electricity

	Space physics

KS3 Science Curriculum

Lesson Title	Objectives	Activities	Outcomes
Biology Structure and function of living organisms	Know that • Animals and plants contain organs • That tissues make up organs	Cut and stick or labelling diagrams to show organs in humans and plants. Research on organ transplants.	Identify, locate and describe the functions of a range of plant and human organs. State that living things are made up of tissues which themselves are made up of cells.
The skeletal and muscular systems	Know that • The parts of the human skeleton work as a system for support, protection, movement and the production of new blood cells. • Antagonistic pairs of muscles create movement when one contracts and the other relaxes.	Construct a diagram of the skeleton labelling key bones. Make models of different types of joints.	Explain how a physical property of part of the skeleton relates to its function. Explain why some organs contain muscle tissue. Explain how antagonistic muscles produce movement around a joint.
Gas exchange systems	Know that • In gas exchange, oxygen and carbon dioxide move between alveoli and the blood. • Oxygen is transported to cells for aerobic	Look at a model of the lungs. Label a diagram of the lungs and the alveoli.	Explain how exercise, smoking and asthma affect the gas exchange system. Explain how the parts of the gas exchange system are adapted to their function.

	respiration and carbon dioxide, a waste product of respiration, is removed from the body. • Breathing occurs through the action of muscles in the ribcage and diaphragm.		Explain observations about changes to breathing rate and volume. Explain how changes in volume and pressure inside the chest move gases in and out of the lungs.
Nutrition	Know that • The body needs a balanced diet with carbohydrates, lipids, proteins, vitamins, minerals, dietary fibre and water, for its cells' energy, growth and maintenance.	Look at food packets to analyses nutritional information. Plan a meal as part of a balanced diet. Research health effects of unbalanced diets.	Describe possible health effects of unbalanced diets from data provided. Calculate food requirements for a healthy diet, using information provided.
Digestion	Know that • Organs of the digestive system are adapted to break large food molecules into small ones which can travel in the blood to cells and are used for life processes.	Watch a video on digestion. Label a diagram of the digestive system and what each part does.	Describe how organs and tissues involved in digestion are adapted for their role. Describe the events that take place in order to turn a meal into simple food molecules inside a cell
Microorganisms	Know that • there are different types of microorganisms, bacteria, virus, fungi and protist. • some microorganisms are useful in food	Fill in a table summarising the structure and function of the different types of microorganisms. Research the cause of some diseases.	Identify and describe the features of the different types of microorganisms. Describe how microorganisms are used in bread and yogurt production.

	production and medicines. • Know that harmful microorganisms are called pathogens and cause disease		Recognise that pathogens cause infections. Describe ways in which microorganisms can enter the body.
Immunity, fighting diseases	Know that • The body has natural barriers to infection • that the production of antibodies and specialised cells in the blood are part of the defence systems of the body • that not all diseases caused by micro-organisms can easily be treated by drugs • that some medicines contain antibiotics which kill bacteria or prevent their growth • that immunisation helps to protect against some diseases	Label a diagram showing the natural barriers the body has. Discuss medicines that students may have taken for infections. Look at immunisations that students may have had.	Identify natural barriers against infection, eg dry skin, lysozyme, etc in tears and sweat state that antibiotics are effective against bacteria but ineffective against viral infections Explain 'immune' as meaning resistant to disease and that immunisation is a way of raising immunity Recall that vaccines contain microbial material, eg weakened strains, dead micro-organisms, extracts of micro-organisms, that cannot cause infections
Chemistry Atoms, elements and compounds	Know that most substances are not pure elements, but compounds or mixtures containing atoms of different elements. They have different	Use particle diagrams to classify a substance as an element, mixture or compound and as molecules or atoms. Research the properties of certain elements.	Name compounds using their chemical formulae. Given chemical formulae, name the elements present and their relative proportions.

	properties to the elements they contain.	Name simple compounds using rules: change non-metal to –ide; mono, di, tri prefixes; and symbols of hydroxide, nitrate, sulfate and carbonate	Represent atoms, molecules and elements, mixtures and compounds using particle diagrams. Compare and contrast the properties of elements and compounds and give a reason for their differences.
Pure and impure substances	Know • that a pure substance consists of only one type of element or compound and has a fixed melting and boiling point. • The factors that affect solubility	Dissolve sugar in water at different temperatures until the solution is saturated.	Explain how substances dissolve using the particle model. Use the solubility curve of a solute to explain observations about solutions. Analyse and interpret solubility curves.
Separating Mixtures	Know that • Mixtures may be separated due to differences in their physical properties. • The method chosen to separate a mixture depends on which physical properties of the individual substances are different.	Carry out experiments to separate mixtures by filtration, evaporation and chromatography.	Use evidence from chromatography to identify unknown substances in mixtures. Choose the most suitable technique to separate out a mixture of substances.
The periodic table	Know that • The elements in a group all react in a similar way and sometimes show a pattern in reactivity.	Highlight the following on a periodic table Metals are generally found on the left side of the table, non-metals on the right.	Use data to describe a trend in physical properties. Describe the reaction of an unfamiliar Group 1 or 7 element.

	• As you go down a group and across a period the elements show patterns in physical properties.	Group 1 contains reactive metals called alkali metals. Group 7 contains non-metals called halogens. Group 0 contains unreactive gases called noble gases.	Use data showing a pattern in physical properties to estimate a missing value for an element. Use observations of a pattern in chemical reactions to predict the behaviour of an element in a group.
Chemical reactions – acids and alkalis, the pH scale	Know that the pH of a solution depends on the strength of the acid and that strong acids have lower pH values than weak acids.	Identify the following on a pH scale Acids have a pH below 7, neutral solutions have a pH of 7, alkalis have a pH above 7. Test liquids for pH. Acids and alkalis can be corrosive or irritant and require safe handling so an opportunity here to look at hazard symbols.	Identify the best indicator to distinguish between solutions of different pH, using data provided. Use data and observations to determine the pH of a solution and explain what this shows.
Reactions of acids and neutralisation	Know that mixing an acid and alkali produces a chemical reaction, neutralisation, forming a chemical called a salt and water	Carry out a neutralisation reaction. Given the names of an acid and an alkali, work out the name of the salt produced when they react.	Explain how neutralisation reactions are used in a range of situations. Describe a method for how to make a neutral solution from an acid and alkali.
Physics Motion and forces	Know that • forces can be described as pushes or pulls arising from the interaction between 2 objects • non-contact forces are gravity forces acting at a	Sketch the forces acting on an object, and label their size and direction. Evaluate how well sports or vehicle technology reduces frictional or drag forces.	Describe the different types of forces and that they are measured in Newton's. Explain whether an object is in equilibrium.

	distance on Earth and in space, forces between magnets, and forces due to static electricity • When the resultant force on an object is zero, it is in equilibrium and does not move, or remains at constant speed in a straight line.		Describe factors which affect the size of frictional and drag forces.
Elasticity and turning forces	Know that one effect of a force is to change an object's form, causing it to be stretched or compressed. In some materials, the change is proportional to the force applied. Understand moments as the turning effect of forces.	Carry out a practical stretching springs and elastic bands. Plot graphs to show the data collected. Using force and extension data, compare the behaviour of different materials in deformation using the idea of proportionality. Explain how turning forces are used in levers.	Describe how materials behave as they are stretched or squashed. Describe what happens to the length of a spring when the force on it changes.
Speed	Know that if the overall, resultant force on an object is non-zero, its motion changes and it slows down, speeds up or changes direction. Use the formula: speed = distance (m)/time (s) or distance-time graphs, to calculate speed.	Practical to measure speed by collecting distance and time data. Use the equation for speed in calculations. Plot and interpret a distance time graph.	Illustrate a journey with changing speed on a distance-time graph, and label changes in motion. Describe how the speed of an object varies when measured by observers who are not moving, or moving relative to the object.

Pressure in fluids	Pressure acts in a fluid in all directions. It increases with depth due to the increased weight of fluid, and results in an upthrust. Objects sink or float depending on whether the weight of the object is bigger or smaller than the upthrust Use the formula: fluid pressure, or stress on a surface = force (N)/area (m2).	Use the idea of pressure changing with depth to explain underwater effects. Carry out calculations involving pressure, force and area in hydraulics, where the effects of applied forces are increased.	Use diagrams to explain observations of fluids in terms of unequal pressure. Explain why objects either sink or float depending upon their weight and the upthrust acting on them. Explain observations where the effects of forces are different because of differences in the area over which they apply.
Waves Light	Know that • When a light ray meets a different medium, some of it is absorbed and some reflected. • For a mirror, the angle of incidence equals the angle of reflection. • When light enters a denser medium it bends towards the normal; when it enters a less dense medium it bends away from the normal, this is refraction.	Construct ray diagrams to show how light reflects off mirrors, forms images and refracts. Predict whether light will reflect, refract or scatter when it hits the surface of a given material.	Use ray diagrams of eclipses to describe what is seen by observers in different places. Use ray diagrams to describe how light passes through lenses and transparent materials. Describe how lenses may be used to correct vision.
Sound	Know that • Sound consists of vibrations which travel as a longitudinal wave through substances.	Suggest the effects of particular ear problems on a person's hearing. Evaluate the data behind a claim for a sound creation or blocking device,	Explain observations where sound is reflected, transmitted or absorbed by different media.

	• The denser the medium, the faster sound travels. • The greater the amplitude of the waveform, the louder the sound. • The greater the frequency (and therefore the shorter the wavelength), the higher the pitch. Know the auditory range of humans and animals	using the properties of sound waves. Use diagrams to compare the waveforms a musical instrument makes when playing different pitches or volumes.	Explain observations of how sound travels using the idea of a longitudinal wave. Describe the amplitude and frequency of a wave from a diagram or oscilloscope picture. Use drawings of waves to describe how sound waves change with volume or pitch.
Biology Cells and organisation	Know that • Multicellular organisms are composed of cells which are organised into tissues, organs and systems to carry out life processes. • There are many types of cell. Each has a different structure or feature so it can do a specific job.	Draw labelled diagrams of plant and animal cells. Research specialised cells and how they are adapted to their function.	Explain why multi-cellular organisms need organ systems to keep their cells alive. Suggest what kind of tissue or organism a cell is part of, based on its features. Explain how uni-cellular organisms are adapted to carry out functions that in multi-cellular organisms are done by different types of cell.
Using a microscope	Know how to observe, interpret and record cell structure using a light microscope	Use microscopes to observe plant and animal cells. Make drawings of observations.	Explain how to use a microscope to identify and compare different types of cells.
Plants and Photosynthesis 2 lessons	Know that • Plants and algae do not eat, but use energy from light, together with carbon dioxide and water to	Carry out the Iodine test for the presence of starch in a leaf.	Describe ways in which plants obtain resources for photosynthesis. Explain why other organisms are dependent on photosynthesis.

	make glucose (food) through photosynthesis. • They either use the glucose as an energy source, to build new tissue, or store it for later use. • Plants have specially-adapted organs that allow them to obtain resources needed for photosynthesis		Sketch a line graph to show how the rate of photosynthesis is affected by changing conditions. Use a word equation to describe photosynthesis in plants and algae.
Plant reproduction	Know how reproduction in plants takes place, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms	Describe similarities and differences between the structures of wind pollinated and insect pollinated plants.	Describe the main steps that take place when a plant reproduces successfully. Identify parts of the flower and link their structure to their function. Suggest how a plant carried out seed dispersal based on the features of its fruit or seed. Explain why seed dispersal is important to survival of the parent plant and its offspring.
Cellular respiration	Know that • Respiration is a series of chemical reactions, in cells, that breaks down glucose to provide energy and form new molecules. Most living things use aerobic respiration but switch to anaerobic	Suggest how organisms living in different conditions use respiration to get their energy. Describe similarities and differences between aerobic and anaerobic respiration in a table.	Use word equations to describe aerobic and anaerobic respiration. Explain how specific activities involve aerobic or anaerobic respiration.

	respiration, which provides less energy, when oxygen is unavailable		
Chemistry Metals and other Materials	Know that • Metals can be arranged as a reactivity series in order of how readily they react with other substances. • Some metals react with acids to produce salts and hydrogen. • Metals and non-metals react with oxygen to form oxides which are either bases or acids.	Practical or video showing the difference in reactivity between some metals. Practical showing simple displacement reactions	Describe an oxidation, displacement, or metal-acid reaction with a word equation. Identify an unknown element from its physical and chemical properties. Place an unfamiliar metal into the reactivity series based on information about its reactions.
Extracting Metals	Know what an ore is. Know why most metals are found as ores and how we may extract them.	Video of iron and copper being extracted from their ores. Relate the extraction process to their place in the reactivity series.	Explain why most metals are not found in their element form Describe how metals can be extracted using carbon Write word and symbol equations to represent the reactions
Composite Materials	Know the difference between ceramics, polymers and composites and what they are used for	Research these different types of materials and their uses.	Describe some of the properties of ceramics, polymers and composites and explain how their properties link to their uses.
The Earth Structure of the Earth	Know that the Earth is continually changing	Video of continental drift. Research the theories on how the continents have moved and	Label a diagram showing the structure of the Earth and compare the layers in terms of composition, thickness and temperature

	Know that the theories about continental drift have changed over time	look at world maps from long ago.	Explain how the continents move Describe some of the evidence for 'continental drift'
Igneous and Sedimentary Rocks	that igneous rocks crystallise from magma that the rate of cooling and crystallisation determines the grain size in an igneous rock Know how sedimentary rocks are formed from pressure from layers of sediment Know some characteristics of sedimentary rocks	Look at examples of different types of rocks. Look at the crystals and grains with hand lenses.	Describe the formation of intrusive and extrusive igneous rocks Explain the link between cooling rate and crystal sizes Describe the properties of igneous rock Describe the weathering, transportation and deposition of rocks at the Earth's surface Describe the formation and properties of sedimentary rocks
The rock cycle and fossils	Know • that the rock cycle links together the processes of rock formation • how the rock cycle provides a continuous supply and transformation of Earth materials • that the remains of dead organisms and their shelly material can accumulate to form sediments • to use evidence in rock layers to suggest a sequence of events over time	Label a diagram of the rock cycle Look at pictures of various types of fossils. Research Mary Anning and her work with fossils	Describe the formation and properties of metamorphic rocks Apply knowledge of all 3 rock type formations to questions on the rock cycle Describe how fossils are formed Explain how fossils move to the surface of the Earth Interpret diagrams to identify the relative age of fossils

	• about the use of fossils as evidence for evolution		
Physics Energy changes and transfers	We can describe how jobs get done using an energy model where energy is transferred from one store at the start to another at the end. When energy is transferred, the total is conserved, but some energy is dissipated, reducing the useful energy.	List the energy stores and energy transfers. Compare the percentages of energy wasted by renewable energy sources. Understand the word 'dissipated'	Describe how the energy of an object depends on its speed, temperature, height or whether it is stretched or compressed. Show how energy is transferred between energy stores in a range of real-life examples. Calculate the useful energy and the amount dissipated, given values of input and output energy. Explain how energy is dissipated in a range of situations.
Domestic Electricity	We pay for our domestic electricity usage based on the amount of energy transferred. Electricity is generated by a combination of resources which each have advantages and disadvantages. Calculate the cost of home energy usage, using the formula: cost = power (kW) x time (hours) x price (per kWh).	Look at the cost of electricity and use the equation to practice calculations. Research renewable and non-renewable energy resources and how they generate electricity.	Compare the energy usage and cost of running different home devices. Explain the advantages and disadvantages of different energy resources. Represent the energy transfers from a renewable or non-renewable resource to an electrical device in the home
Current electricity Current in circuits	Know that • Current is a movement of electrons and is the same everywhere in a series circuit. • Current divides between loops in a parallel circuit,	Revise circuit symbols. Set up series and parallel circuits and measure current using an ammeter.	Describe how current changes in series and parallel circuits when components are changed. Turn circuit diagrams into real series and parallel circuits, and vice versa.

	combines when loops meet, lights up bulbs and makes components work.		Compare the advantages of series and parallel circuits for particular uses.
Voltage and Resistance	Know that • We can model voltage as an electrical push from the battery, or the amount of energy per unit of charge transferred through the electrical pathway. • In a series circuit, voltage is shared between each component. • In a parallel circuit, voltage is the same across each loop. • Components with resistance reduce the current flowing and shift energy to the surroundings.	Set up series and parallel circuits and measure voltage. Use voltage and current data to work out the resistance of various components in a circuit.	Draw a circuit diagram to show how voltage can be measured in a simple circuit. Use the idea of energy to explain how voltage and resistance affect the way components work. Given a table of voltage against current use the ratio of voltage to current to determine the resistance. Use an analogy like water in pipes to explain why part of a circuit has higher resistance.
Space physics The Earth and Moon	Know that • The solar system can be modelled as planets rotating on tilted axes while orbiting the Sun, moons orbiting planets and sunlight spreading out and being reflected. • This explains day and year length, seasons and	Video showing the rotation of our planet and why we have seasons. Moon flick book to show phases of the moon.	Use secondary data to describe and explain patterns in year lengths in the solar system Describe and explain differences in day length, position of the sun and temperatures in different seasons Explain why the Earth experiences seasons, but not

	the visibility of objects from Earth.		every other planet in the solar system does
The Solar System	Know that our solar system consists of the sun, eight planets and many dwarf planets that orbit the sun and moons that orbit planets	Video of the solar system. Research a planet and find out about it's moons and the spacecraft that have visited it.	Describe the solar system and how the sun was formed. Name the planets in order and explain the difference between the inner and outer planets.
The universe	Know that • Our solar system is a tiny part of a galaxy, one of many billions in the Universe. • Light takes minutes to reach Earth from the Sun, four years from our nearest star and billions of years from other galaxies.	Put in context how small our solar system is in the vast universe.	Define a light year and explain why they are used in astronomy Describe Earth's place in the universe Describe what a star is and why it emits light