

Curriculum Map

Subject: Science

BIOLOGY

PHYSICS

CHEMISTRY

Year: 9 (Beginning September 2022)

	Autumn	Spring	Summer
Content Knowledge	<p>B1: Cell Biology:</p> <ul style="list-style-type: none"> Eukaryotic and Prokaryotic Cells Plant and Animal Cells Specialised Cells Transport across cells <p>Chapter B1 Knowledge:</p> <ul style="list-style-type: none"> Knowing what cells look like under a light microscope and comparing what we can see under an electron microscope. Recalling the differences between plant and animal cells and learning how to organise cells into prokaryotes and eukaryotes. Learning how to calculate order of magnitude to appreciate size. Compare and contrast diffusion, osmosis and active transport. <p>Required Practical:</p> <ul style="list-style-type: none"> Looking at cells under a microscope Investigating osmosis in plant cells <p>P1: Conservation and Dissipation of Energy:</p> <ul style="list-style-type: none"> Changes in Energy Stores Conservation of Energy Energy and Work Energy Dissipation Energy and Efficiency Electrical Appliances 	<p>B2: Cell differentiation and specialisation:</p> <ul style="list-style-type: none"> The Cell Cycle Cell division Cell differentiation Stem cells Therapeutic cloning <p>Chapter B2 Knowledge:</p> <ul style="list-style-type: none"> Knowing the importance of cell differentiation. Describe mitosis and why it is important in cells. Evaluate the use of stem cells. Know the process of therapeutic cloning. <p>P2: Energy Transfers:</p> <ul style="list-style-type: none"> Conduction Infrared Radiation Specific Heat Capacity Heating and Insulating Buildings <p>Required Practical:</p> <ul style="list-style-type: none"> Investigating Thermal Insulators <p>P3: Energy Resources:</p> <ul style="list-style-type: none"> Energy Demands Renewable Resources Non-Renewable Resources Energy and the Environment 	<p>B3): Organisation and the Digestive System:</p> <ul style="list-style-type: none"> Tissues and organs The human digestive system The chemistry of food Catalysts and Enzymes Factors affecting enzymes How the digestive system works Efficient Digestion <p>Chapter B3 Knowledge:</p> <ul style="list-style-type: none"> Outline the hierarchy in cells: cells, tissues, organs, organ systems, and organism. Recall the organs of the human digestive system. Know the basic structure of proteins, carbohydrates and lipids. Describe the role of enzyme action. Describe how enzymes work in the digestive system. Explain how the small intestine is adapted for efficient digestion. Describe the role of bile. Explain how temperature and pH affect enzyme structure and action. Describe what happens when an enzyme becomes denatured. <p>Required Practical:</p> <ul style="list-style-type: none"> Food tests The effect of temperature on the rate of reaction of amylase

- Energy and Power

C1: Atomic Structure

- Structure of the Atom
- Chemical Equations
- Separating Mixtures
- Fractional Distillation and Chromatography
- History of the Atom
- Ions and Isotopes
- Electronic Structure

Knowledge:

- Why atoms have no overall charge
- Understanding the differences between different atoms.
- Knowing how to calculate the number of different sub-atomic particles.
- Learning how to balance equations
- Appreciate how the model of the atom has evolved over time to lead to the modern atom..
- Knowing the differences between atoms and ions.
- Understanding how to separate different liquids by different methods.

C2 - The periodic Table

Content:

- Development of periodic Table
- Electronic Structures and the Periodic table.
- Group 1
- Group 7

Knowledge:

- How the periodic table developed over time.
- How testing a prediction can support or refute new scientific ideas.
- How atomic structure is linked to the periodic table.
- How elements behave in different groups and how these properties change as we go down the group
- The difference between transition metals and alkali metals.

B4: Organising Animals and Plants:

- The heart
- Artificial Pacemakers and Stents
- Breathing and Gas Exchange
- The blood
- Blood vessels

Chapter B4 Knowledge:

- Outline the structure of the heart.
- Label the atrium and ventricles.
- Know where the valves are found in the heart and their role. Describe how blood travels in the heart.
- Discuss the need for an artificial heart or a stent implant.
- Describe the components of the blood and how it travels around the body.
- Describe structural differences in arteries, veins, and capillaries.

Required Practical:

- Mammalian Heart Dissection

C3: Structure and Bonding

- States of Matter
- Atoms into Ions
- Ionic Bonding

C3 knowledge:

- Predicting the states of substances at different temperatures.
- How atoms can form ions.

C5: Chemical Changes

- Displacement reactions
- Extracting Metals
- Salts from metals and bases
- Neutralisation and pH scale

- Strong and Weak Acids
- Reactivity Series

C5 Knowledge:

- Know how some common metals react with water
- How to write ionic displacement reactions
- Identify which substances have been oxidised or reduced
- Predicting products from their reactants
- Deducing the formulae of common salts
- Recall the different reactions of acids
- Why chemicals are either acids or alkali
- How to identify acids and alkalis
- How pH and acid concentration link

Required Practicals

- Making Copper Salts
- Making a salt from a metal carbonate

<p>Skills</p>	<p>Biology:</p> <ul style="list-style-type: none"> To use a microscope to examine cells To be able to carry out calculations involving magnification, real size and image size To be able to calculate the order of magnitude and express answers in standard form <ul style="list-style-type: none"> Qualitatively test for the presence of different food molecules in a variety of foods <p>Physics:</p> <ul style="list-style-type: none"> To recall and apply correct scientific knowledge To qualitatively be able to compare and contrast advantages and disadvantages of renewable and non-renewable energy resources <p>Chemistry:</p> <ul style="list-style-type: none"> Identifying different variables Confidence to carry out practicals Writing risk assessments. Recording data in a table. Evaluate the different models of the atoms and why they are replaced over time. Using SI Units and Standard form 	<p>Biology:</p> <ul style="list-style-type: none"> Modelling cell division Evaluate the use of embryonic vs. Adult stem cells and create a well balanced argument. Qualitatively test for the presence of different food molecules in a variety of foods <p>Physics</p> <ul style="list-style-type: none"> To be able to use and read a thermometer correctly To be able to use a stopwatch accurately and effectively To be able to record scientific data accurately in a table To use an equation- in this case the specific heat equation. When doing this to use correct units and make conversions if required To memories stores and transfers of energy and interpret how energy has been converted in an interaction. To memorise and be able to apply one of three equations taught in the chapter To be able to rearrange one of the equations used in class and then calculate a property. <p>Chemistry:</p> <ul style="list-style-type: none"> Evaluate the different models of the periodic table. Linking the properties of different atoms to their position on the periodic table. Writing balanced equations 	<p>Biology:</p> <ul style="list-style-type: none"> Dissect a mammalian heart and locate the atria, ventricles, heartstrings, valves, coronary arteries. Model inhalation and exhalation using a Bell Jar Qualitatively test how different temperatures affect the rate of reaction in enzymes Interpret graphs showing enzyme rate of reaction Calculate the rate of reaction of an enzyme <p>Chemistry:</p> <ul style="list-style-type: none"> Appreciate the limitations of the particle theory and structure models Linking of group number to charge number Identification of different bonding in different elements Recognition of different compounds from diagrams Deduce reactivity of metals from experimental data Predict reactions of unfamiliar metals when given information of their reactivity Identifying which chemicals have been oxidised or reduced in an ionic equation Evaluate processes used to extract different metals Predict products from their reactants Preparing a salt safely from its reactants
<p>Key Questions</p>	<p>Biology:</p> <ul style="list-style-type: none"> What are the differences between Eukaryotic and Prokaryotic Cells? How big are cells? 	<p>Biology:</p> <ul style="list-style-type: none"> Why do cells divide? How can stem cells be used in human medicine? 	<p>Biology:</p> <p>What are enzymes? What factors affect how an enzyme works? Where are enzymes found?</p>

	<p>Physics:</p> <ul style="list-style-type: none"> • What are the different forms of energy store and transfer? • What is the law of conservation of energy and how is it applied? • What is efficiency and how can you find the efficiency of a device? • How do power and energy relate? <p>Chemistry:</p> <ul style="list-style-type: none"> • How do different types of atoms differ from each other? • How do Scientists carry out and document research? 	<p>Physics:</p> <ul style="list-style-type: none"> • What is conduction? Where does it occur? • What is infrared, how is the transfer of energy by this method useful? • How can heat transfer be reduced or increased? • What are non renewable energy resources? How are they utilised? Why has their use become unsustainable? • What are the alternatives to non-renewable energy and what are the pros and cons of each method? • How can we use the above resources to meet demand? <p>Chemistry:</p> <ul style="list-style-type: none"> • Why was the periodic table such a significant science breakthrough? 	<ul style="list-style-type: none"> • Why is the digestive system important? • What is in our food? • What is blood? • How does blood travels around the body and what does it carry? • How does the heart pump blood around the body? • Why might someone need a stent implant? <p>Chemistry:</p> <ul style="list-style-type: none"> • How do atoms bond to each other? • How can we extract metals from their ores?
<p>Assessment</p>	<p>Diagnostic test on B1 ReACT tasks B1 End of Chapter Test</p> <p>Diagnostic test on P1 ReACT tasks P1End of Chapter Test</p> <p>C1 Diagnostics Test C1 End of Chapter Test C1 ReAct Tasks</p>	<p>Diagnostic test on B2 ReACT tasks B2 End of Chapter Test</p> <p>Diagnostic test on P2 ReACT tasks P2 End of Chapter Test</p> <p>Diagnostic test on P3 ReACT tasks P3 End of Chapter Test</p> <p>C2 Diagnostic Test C2 End of Chapter Test C2 ReAct Tasks.</p>	<p>Diagnostic test on B3 ReACT tasks B3 End of Chapter Test</p> <p>Diagnostic test on B4 ReACT tasks B4 End of Chapter Test</p> <p>C3/C5 Diagnostics Test C3/C5 End of Chapter Test C3/C5 ReAct Task</p>

<p>Literacy/numeracy/SMSC/Character</p>	<p>Biology: Key words: organelle, cell, diffusion, osmosis, active transport, microscope, membrane, specialised</p> <p>Numeracy: Calculating magnification and order of magnitude</p> <p>Key words: division, differentiation, somatic, meristem, cloning, tissue, organ, organ system, organism, carbohydrate, lipid, protein, digestion</p> <p>Physics: Key words: Energy Store, Work done, Spring Constant, Gravitational Potential Energy, Kinetic Energy, Dissipated, Efficiency</p> <p>Numeracy: Calculating percentages, drawing and interpreting graphs and using equations.</p> <p>Chemistry: Keywords: element, atom, groups, compounds, nucleus, electrons, reactants, products, equations, balanced, state symbols, solutions, aqueous, filtration, distillation, crystallisation, chromatography, atomic number, mass number, proton, neutron, ion, isotope, shells</p> <p>Numeracy: Balancing Equations, using standard form and calculation of number of subatomic particles.</p> <p>SMSC:</p> <ul style="list-style-type: none"> • Understand how microscopy techniques have changed over time and lead to recent developments. • Understanding how to choose the right electrical appliance for the job. • Appreciating how the model of the atom has changed over time. • Working together to complete practicals safely. 	<p>Biology: Key words: division, differentiation, somatic, meristem, cloning, tissue, organ, organ system, organism, carbohydrate, lipid, protein, digestion</p> <p>Numeracy: Interpreting data and graphs, calculating percentage, drawing graphs</p> <p>Physics: Key words: Thermal conductivity, Infrared Radiation, Specific Heat Capacity, Biofuel, carbon-neutral, reactor core, geothermal energy, renewable, non-renewable, Nuclear fuel</p> <p>Numeracy: Calculating specific heat capacity, interpreting data, using equations and drawing graphs</p> <p>Chemistry: Keywords - Alkali, pH, universal indicator, halogens, displacement, transition, properties.</p> <p>Numeracy: Balancing equations</p> <p>SMSC:</p> <ul style="list-style-type: none"> • Understanding why the periodic table came about. • Understanding why the periodic table was a scientific breakthrough. • Appreciate the importance of renewable energy. • Understand how new medical treatments come about. • Working together to complete practicals. 	<p>Biology: Key words: enzyme, active site, substrate, small intestine, villi, bile, denature, temperature, pH, platelets, plasma, arteries, veins, capillaries, atria, ventricle, valve, double circulatory system, pacemaker, stent, statins, platelets, plasma, arteries, veins, capillaries</p> <p>Numeracy: Interpreting data and graphs, drawing graphs, calculating percentage, drawing graphs</p> <p>Chemistry</p> <p>Numeracy: Writing Ionic formulae, Calculating charges on ions, Surface area to volume ratio, Balancing equations, Measuring and weight salts and relating pH value to H⁺ concentrations.</p> <p>Keywords: solids, liquids, gases, particle theory, covalent, ionic, metallic, bonding, lattice, polymers, intermolecular, delocalised, fullerenes, alloys, nano, ores, oxidised, reduced, reactivity series, displacement, ionic, electrolysis, neutralisation, alkalis, bases, neutral, pH scale, strong acids, weak acids</p> <p>SMSC</p> <ul style="list-style-type: none"> • Will mining the metal ore impact our environment? • How could we extract metals sustainably? • Understand how the body functions. • Working together to complete the practical safely.
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Enrichment opportunities and futures

Visiting Body World's exhibition in Leicester square- Get up close to real bodies and examine their organs and systems
Investigate how enzymes are used in industry (ie. Washing detergent, foods etc)
Visit the Science Museum in South Kensington- They have a section that looks at organs and medicine

PHYSICS

A visit to the following would be excellent: Science Museum, the National Space Centre, Royal observatory museum and Brunel Museum

The following documentaries are recommended for year 1: any documentary by Jim Al-Khalili or Green Planet to add context to topic P3- non-renewable resources

STEM Club

Visiting Science Museum - There is a specific section for Chemistry on their website

Watching the Royal Institute Lectures on Youtube

Visiting the Summer Fayre at the Royal Society of Chemistry

Research the link between Chemistry and Food. How can we use Chemistry to make different sweets?