

Nailsea School Curriculum Map – Science and Biology

	Topic Title	Key Skills	Content	
Year 7	Term 1	Introduction to science	Working Scientifically - Development of Scientific Thinking 1.5 Experimental Skills and Strategies 2.1, 2.2, 2.3, 2.4, 2.5, 2.6, 2.7 Analysis and Evaluation 3.1, 3.2, 3.5, 3.6 Scientific Literacy 4.1, 4.2, 4.3,	This topic introduces students to science at secondary school, it takes them through various skills and pieces of equipment that they may not have experienced before. Lessons include safety in the lab, drawing Science Apparatus, Measurements & predictions, The Bunsen Burner, Heating Water, Microscopes and Graphs in science.
		Cell biology - organisms	Working Scientifically - Development of Scientific Thinking 1.1, 1.2, 1.3, 1.4 Experimental Skills and Strategies 2.3, 2.4 Analysis and Evaluation 3.1 Scientific Literacy 4.1, 4.2, 4.4	Introduction to living things allows students exploring what it really means to be alive. They then study different types of cells, from typical animal and plant cells to specialised cells. Students investigate cells under a microscope before looking at how living things are organised further into tissues & organs, organ systems, using muscles and bones as our example. Students also apply their knowledge to the organisation of a plant.
	Term 2	Atomic structure and the periodic table – particles	Working Scientifically - Development of Scientific Thinking 1.2, 1.3 Experimental Skills and Strategies 2.1, 2.3, 2.4, 2.6 Analysis and Evaluation 3.1, 3.5, Scientific Literacy 4.1, 4.2	Introduction to particles looks at what all matter is made of. Students investigate the properties of Solids, Liquids and Gases including Particle compression and movement. Students look at the processes through which matter change state. Next students focus on certain behaviours of materials, such as diffusion, dissolving and solubility they then apply this knowledge to lab techniques that allow them to separate mixtures, such as chromatography.
		Energy – Energy stores and transfers	Working Scientifically - Development of Scientific Thinking 1.2, 1.4 Experimental Skills and Strategies 2.1, 2.3, 2.4, 2.6 Analysis and Evaluation 3.1, 3.5, Scientific Literacy 4.1, 4.2, 4.3	Introduction to energy is done through a practical look at energy in different foods. The concept of energy stores and transfers is described to the students from the beginning with a lot of time to practice describing different energy transfers, such as through a practical looking at GPE and KE and designing their own roller coaster & investigating elastic energy. The second half of the topic focuses on energy resources, particularly renewable resources and how electricity is generated. Identifying wasted energy and ways of reducing energy wasted is also studied. There is the opportunity to introduce power ratings to students as well.
	Term 3	Inheritance, variation and evolution - Human reproduction	Working Scientifically - Development of Scientific Thinking 1.2, 1.3, 1.4 Analysis and Evaluation 3.5 Scientific Literacy 4.1	Introduction to reproduction begins by looking at variation before moving on to reproductive organs and cells. Students then learn about the menstrual cycle and fertilization. Reproductive technologies, such as IVF, are looked about before moving on to gestation and birth. The final lesson looks at growing up and the changes that happen at puberty.
		Chemical changes – Acids and alkalis	Working Scientifically - Development of Scientific Thinking 1.2, 1.4 Experimental Skills and Strategies 2.3, 2.4, 2.6 Analysis and Evaluation 3.1, 3.5 Scientific Literacy 4.1, 4.2	Introduction to Reactions looks at physical and chemical changes and how to explain what is happening to the particles during a reaction. Hazards are investigated and precautions that should be taken to reduce these. The second half of the topic is on acids and alkalis, describing what these are, using and making indicators to identify them, and then studying the neutralisation reaction. There is also the opportunity for further practical work with experiments such as rainbow fizz.
	Term 4	Forces	Working Scientifically - Development of Scientific Thinking 1.2, Experimental Skills and Strategies 2.1, 2.3, 2.4, 2.6	Introduction to forces starts by identifying different forces and drawing force diagrams to help identify balanced and unbalanced forces. An investigation into friction is carried out before looking at the factors that affect the speed of an object. Distance-time graphs are introduced, and a speed investigation is carried out.

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			Analysis and Evaluation 3.1, 3.5, Scientific Literacy 4.1, 4.2, 4.3	
		Electricity	Working Scientifically - Development of Scientific Thinking 1.2 Experimental Skills and Strategies 2.1, 2.3, 2.4, 2.6 Analysis and Evaluation 3.1, 3.5 Scientific Literacy 4.1, 4.2, 4.3	Introduction to Electricity teaches students about circuit symbols and how to build circuits. Next the concepts of current and potential difference are looked at, particularly how to measure them. Students create and compare series and parallel circuits before calculating resistance and completing a resistance investigation. The final part looks at static electricity.
	Term 5	Ecology – Ecosystems and plant reproduction	Working Scientifically - Development of Scientific Thinking 1.2, 1.3 Experimental Skills and Strategies 2.1, 2.3, 2.4, 2.6 Analysis and Evaluation 3.1, 3.5, Scientific Literacy 4.1, 4.2	Introduction to Ecosystems gets students to understanding food webs then looks at adaptations of different organisms. This leads on to the adaptations of predators and prey and their relationship to each other. The second half of the topic explores flowering plants, covering fertilization, the importance of insects and understanding seed dispersal.
		Chemistry of the Earth and space physics - Rock cycle and solar system	Working Scientifically - Development of Scientific Thinking 1.1, 1.2, 1.3 Experimental Skills and Strategies 2.1 Scientific Literacy 4.1, 4.2, 4.4	Introduction to rocks and space teaches students the Earth's Structure and the 3 main rock types, igneous, sedimentary and metamorphic rocks and link these together in the rock cycle. The space part of the topic looks at the seasons, phases of the moon, our Solar System and stars and galaxies.
	Term 6	Waves – sound waves	Working Scientifically - Development of Scientific Thinking 1.2, 1.3 Experimental Skills and Strategies 2.1 Analysis and Evaluation 3.1 Scientific Literacy 4.1, 4.2, 4.3	Introduction to sound waves providing time to ensure they have the prior knowledge they require for the topic. Lessons include exploring and describing sound, studying the structure of the ear. Investigating the speed of sound, echoes and ultrasound. Students will also explore how different materials provide sound insulation.
		Recap and science project	Working Scientifically - Development of Scientific Thinking 1.5 Experimental Skills and Strategies 2.2, 2.3, 2.4, 2.6, 2.7 Analysis and Evaluation 3.1, 3.5, 3.8 Scientific Literacy 4.1, 4.2	Each topic can be revisited, links between topics can be highlighted and challenging concepts or misconceptions can be addressed again. If time allows the students will be given the opportunity to complete a science project, an investigation that they will research, plan, carry out and analyse with more independence.
Year 8		Topic Title	Key Skills	Content
	Term 1	Bioenergetics – Respiration and photosynthesis	Working Scientifically - Development of Scientific Thinking 1.2 Experimental Skills and Strategies 2.1, 2.3, 2.4, 2.6 Analysis and Evaluation 3.1, 3.5 Scientific Literacy 4.1	Students learn about reactants and products of aerobic respiration and compare it to anaerobic respiration, looking at how each is used in different sports. Next anaerobic respiration in animals is compared with the same process in yeast, known as fermentation. An investigation into fermentation is carried out before moving on to study photosynthesis. The reactants and products are introduced before studying the structure of a leaf and how it is adapted for photosynthesis. The importance of minerals for a plant is introduced before looking at how water and minerals move around a plant. Finally, the two processes, respiration and photosynthesis, are compared to each other.
		Atomic structure and the periodic table - the periodic table	Working Scientifically - Development of Scientific Thinking 1.2, 1.3	Students compare elements, compounds and mixtures before being introduced to the periodic table. The development of the periodic table is discussed before looking at the elements in more detail. For example, Comparisons are made between metals and nonmetals, the structure of the atom is taught and chemical trends within the periodic table are investigated. Students learn how to use the periodic table to write formulae and deepen their understanding of the composition of common substances.

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		Experimental Skills and Strategies 2.1, 2.3, 2.4, 2.6 Analysis and Evaluation 3.1, 3.5, 3.6 Scientific Literacy 4.1, 4.2, 4.3, 4.4	
Term 2	Forces	Working Scientifically - Development of Scientific Thinking 1.2, Experimental Skills and Strategies 2.1, 2.3, 2.4, 2.6 Analysis and Evaluation 3.1, 3.5, Scientific Literacy 4.1, 4.2, 4.3	The relationship between mass and weight is introduced and repeated throughout the topic. Investigations and demos look at the behaviour of springs, whether objects float or sink and drag. Students study pressure exerted by solids, liquids and gases, applying this knowledge to different scenarios.
	Organisation – breathing and digestion	M Working Scientifically - Development of Scientific Thinking 1.2 Experimental Skills and Strategies 2.1, 2.3, 2.4, 2.6 Analysis and Evaluation 3.1, 3.5 Scientific Literacy 4.1	The structure of the lungs is introduced before students study the mechanism of breathing. An investigation is then carried out into the ways of measuring breathing. The adaptations of the lungs are studied before the impacts of lifestyle choices, such as smoking and vaping, are discussed. The second half of the topic focuses on the digestive system. The importance of a healthy diet, and the impacts of an unhealthy one, are studied. The different food tests for macronutrients are carried out. Next the structure and function of the digestive system are looked at, going into detail around chemical digestion by introducing the role of enzymes.
Term 3	Atomic structure and energy changes - Reaction and separation techniques	Working Scientifically - Development of Scientific Thinking 1.2, 1.4 Experimental Skills and Strategies 2.3, 2.4, 2.6 Analysis and Evaluation 3.1, 3.5 Scientific Literacy 4.1, 4.2	The reactions topic begins by comparing physical and chemical changes. It then looks at how the function of materials relies on the materials' physical properties. Students then look for evidence of chemical reactions and the different types of chemical reactions, such as thermal decomposition, exothermic and endothermic reactions and the gas tests. Students also carry out an enquiry into combustion and are introduced to more word and symbol equations.
	Energy	Working Scientifically - Development of Scientific Thinking 1.2, 1.4 Experimental Skills and Strategies 2.1, 2.3, 2.4, 2.6 Analysis and Evaluation 3.1, 3.5, Scientific Literacy 4.1, 4.2, 4.3	Energy in year 8 looks at the work done equation then focuses on the different methods of heat transfer, conduction, convection and radiation. Students will also investigate how to reduce heat transfer by investigating insulation. Students will then apply this to reducing heat loss in buildings.
Term 4	Inheritance, variation and evolution - Variation and genetics	Working Scientifically - Development of Scientific Thinking 1.2, 1.3, 1.4 Analysis and Evaluation 3.5 Scientific Literacy 4.1	The variation and genetics topic looks further at adaptations of organisms and variation between them. Students are introduced to the structure of our genetic material, the double helix and chromosomes. Students then study the theory of natural selection, biodiversity, and extinction.
	Magnetism and electromagnets - electromagnets	Working Scientifically - Development of Scientific Thinking 1.2 Experimental Skills and Strategies 2.1, 2.3, 2.4, 2.6 Analysis and Evaluation 3.1, 3.5 Scientific Literacy 4.1, 4.2, 4.3	Introduction to electromagnets looks at how magnets behave near each other and how materials act in a magnetic field. Students have the opportunity to make their own compass before moving on from permanent magnets to electromagnets. These are described and the properties investigated.
Term 5	Chemistry of the atmosphere – Earth and atmosphere	Working Scientifically - Development of Scientific Thinking 1.1, 1.2, 1.3	Introduction to Earth and atmosphere looks at how the composition of our current atmosphere has changed compared to when the Earth was first formed. Students then look at the carbon cycle and calculate their carbon footprint before looking at the global consequences of human activities through global warming and climate change. Students look at other resources we rely on the Earth for, how we extract them and the damage this is doing. The concept of living sustainably is introduced.

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			Experimental Skills and Strategies 2.1 Scientific Literacy 4.1, 4.2, 4.4	
		Waves – light waves	Working Scientifically - Development of Scientific Thinking 1.2, 1.3 Experimental Skills and Strategies 2.1 Analysis and Evaluation 3.1 Scientific Literacy 4.1, 4.2, 4.3	Introduction to light involves looking at light as a wave and its behaviour. Next both reflection and refraction are investigated and explained. This links into splitting light through a prism and coloured light. We then go on to introduce the electromagnetic spectrum. There is also an opportunity to create pinhole cameras and explain how these work.
	Term 6	Infection and response - Microbes	Working Scientifically - Development of Scientific Thinking 1.2, 1.4, 1.5 Experimental Skills and Strategies 2.1, 2.3, 2.4, 2.6 Analysis and Evaluation 3.1, 3.5 Scientific Literacy 4.1	Introduction to microbes' recaps cell structure of typical animal and plant cells so students are ready to contrast this with microbes. The basic structure of bacteria, fungi and viruses are introduced. Linking back to anaerobic respiration yeast and fungi are investigated. Helpful and harmful bacteria are studied before looking at how we can stop the spread of diseases.
		Recap and science project	Working Scientifically - Development of Scientific Thinking 1.5 Experimental Skills and Strategies 2.2, 2.3, 2.4, 2.6, 2.7 Analysis and Evaluation 3.1, 3.5, 3.8 Scientific Literacy 4.1, 4.2	Each topic can be revisited, links between topics can be highlighted and challenging concepts or misconceptions can be addressed again. If time allows the students will be given the opportunity to complete a science project, an investigation that they will research, plan, carry out and analyse with more independence.
Year 9		Topic Title	Key Skills	Content
		Assessment throughout year 9 will be by low stakes testing and end of unit tests. These tests will contribute to a cumulative grade for science at the end of year 9.		
	Term 1 Term 2 Term 3	Biology A – Cell fundamentals, Organisation, Plants	Development of Scientific thinking 1.4 Experimental Skills and Strategies 2.2, 2.3, 2.4, 2.6, 2.7 Analysis and Evaluation 3.1, 3.2, 3.6 Scientific Literacy 4.1	This topic is building on the learning of cell biology in year 7, organisation and bioenergetics in year 8. Students look at cell biology in further detail before building on this by examining specific organs/systems (digestive, heart and plant). Students will use microscopes to visualise the cellular world before being offered the opportunity to observe dissections of whole organs/systems.
		Chemistry A	Development of Scientific Thinking 1.1, 1.2 Scientific Literacy 4.1,4.2 and 4.3 Experimental Skills and Strategies 2.3,2.4,2.6	This topic introduces the structure of the atom, the nature and placement of sub-atomic particles before discussing how our modern model of the atom has come about from historic models. Concepts of scientific literacy are introduced by naming simple compounds and thinking about simple chemical equations for reactions. Bonds between atoms in covalent and ionic compounds are studied, looking at electron sharing and transfer respectively before linking these bond types to the properties of various compounds. The final part of chemistry A looks at some chemical maths. Basic ideas of quantity, conservation of mass, changes when products or reactants are released as gases, and the chemistry of solutions.
		Physics A - Forces and their Effects Energy Stores and Transfers Kinetic Theory	Development of Scientific Thinking – 1.3, 1.4, 1.5, Experimental Skills and Strategies – 2.3, 2.4, 2.6 Analysis and Evaluation – 3.1, 3.2, 3.3, 3.5, 3.6,	This unit introduces fundamental concepts in Physics of Forces, Energy and Particles, building upon and developing core ideas covered in KS3. Students consider the effects of balanced and unbalanced forces before applying these ideas to the transfer of energy within and between systems. Having considered macro systems, students will then consider microscopic models of particles, applying ideas of energy and forces to explain state changes and gas pressure.

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		Scientific Literacy – 4.1, 4.2, 4.3, 4.4, 4.5	
Term 4 Term 5 Term 6	Biology B - Infection and response, Homeostasis, Ecology	Development of Scientific thinking 1.2, 1.3, 1.4, 1.6 Experimental Skills and Strategies 2.2, 2.3, 2.4, 2.5, 2.6, 2.7 Analysis and Evaluation 3.3, 3.5, 3.6, 3.7 Scientific Literacy 4.1	This is building on students learning of cell biology, plants, infection and response and human reproduction year 8. Students learn about the 4 different types of pathogens, examples of diseases caused by them and how they cause illness. Students then consider how the human body defends itself from infection. They move onto examine how the human body is controlled by nerves and hormones before examining advantages and disadvantages of different contraceptives and comparing sexual and asexual reproduction. In the summer term we will study the environment around us and sampling.
	Chemistry B	Experimental Skills and Strategies 2.2, 2.3, 2.4, 2.6 Development of Scientific Thinking 1.2,1.4 and 1.5. Analysis and Evaluation 3.1,3.6 Scientific Literacy 4.1,4.5	Chemistry B looks further at reactions and uses of metals and acids. Scientific Literacy is revisited with the naming of compounds formed in these reactions. Practical skills will be developed looking at energy changes during chemical reactions, including measurements and analysis of data. Experiments looking at how changing factors can affect the rate of a chemical reaction will allow for development of further practical skills. Students will be required to plan, analyse and suggest improvements to methods. The final part of chemistry B introduces the study of organic chemistry looking at how we obtain and use products from crude oil. This will be linked to the impact these practices have on our atmosphere.
	Physics B - Motion Circuit Fundamentals Wave Properties	Development of Scientific Thinking – 1.2, 1.4, 1.5, Experimental Skills and Strategies – 2.1, 2.2, 2.3, 2.4, 2.6 Analysis and Evaluation – 3.1, 3.2, 3.3, 3.5, 3.6, 3.7 Scientific Literacy - 4.1, 4.2, 4.3, 4.4, 4.5	This unit introduces the fundamental concept of rates, with an initial focus on representing motion graphically and analysing data. Rate of motion is then applied to the more abstract phenomena of circuits and waves. Students draw upon prior learning of energy stores and transfers to explain observations of electrical currents and wave behaviour in different mediums. Students practical skills are developed through hands-on experience working with a wide range of equipment and measurement taking.

Working Scientifically 1 - Development of Scientific Thinking

- 1.1 How methods and theories develop
- 1.2 Use a variety of models to develop scientific explanations
- 1.3 Appreciate the limits of science and consider ethical issues
- 1.4 Describe and explain everyday technological applications of science
- 1.5 Evaluate risks in practical science and wider social context
- 1.6 Recognise importance of peer review, intended audience and reducing bias.

Experimental Skills and Strategies

- 2.1 Use scientific theory and explanation to develop hypotheses
- 2.2 Plan experiments to test hypotheses

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- 2.3 Apply knowledge of techniques, apparatus, instruments and materials.
- 2.4 Carry out experiments appropriately
- 2.5 Apply knowledge of sampling techniques
- 2.6 Make and record observations and measurements
- 2.7 Evaluate methods and suggest improvements

Analysis and Evaluation

- 3.1 Present observations using appropriate methods
- 3.2 Translate data between forms
- 3.3 Carry out mathematical and statistical analysis
- 3.4 Make estimations of uncertainty
- 3.5 Interpret observations to identify patterns and trends
- 3.6 Make reasoned explanations using data
- 3.7 Evaluate data for accuracy and precision, reliability and reproducibility.
- 3.8 Communicate the scientific rationale for investigations

Scientific Literacy

- 4.1 Use scientific vocabulary, terminology and definitions
- 4.2 Recognise scientific quantities
- 4.3 Use SI units and IUPAC convention for chemical nomenclature
- 4.4 Use prefixes and powers of ten for order of magnitude
Interconvert
- 4.5 units
- 4.6 Use an appropriate number of significant figures in calculations