Holland Park School | *Year 7: Science Overview*

Overview	7.01 Particles Students are introduced to the concept of matter and particles. They are not yet introduced to atoms/ molecules but use the simple particle model. Students learn how the particulate model of matter – and the arrangement, movement and forces of attraction between particles – can explain changes of state, melting and boiling points, evaporation below boiling points, diffusion, properties of matter in the solid, liquid and gas states (including gas pressure) and dissolving. The concept of the conservation of mass is introduced here in the context of physical changes (such as changing state and dissolving). 7.02 Fundamentals of Physics This unit introduces the fundamental concepts of energy stores and pathways. The focus is on the concepts of energy transfer between stores via pathways and the conservation of energy. In the examples, students will be introduced to the chemical store of energy, kinetic store of energy, elastic store of energy, gravitational store of energy, and thermal store of energy; students are not yet expected to learn about electromagnetic, vibration or nuclear stores of energy. They are introduced to transfer pathways: mechanically, electrically, heating, by radiation and by chemical reaction. Students revisit simple electrical circuits (KS2) in the context of stores of energy and the electrical transfer pathway. 7.03 Cells and Organisation Students review relevant knowledge from KS2. They are then introduced to cells as the building blocks within tissues, organs and organ systems. They are taught the components of animal and plant cells and examine some specialised cells. Students are taught that all cells need oxygen and glucose for respiration, the process by which energy is released, and that all cells need to excrete carbon dioxide and water as waste products of this process. They are taught that this happens by diffusion (7.01). 7.04 Chemical Changes Having understood the fundamentals of particles (7.01), students are introduced to atoms, molecules and elements, and then compounds. They are taught how to represent these in diagrams and with symbols and chemical formulae. They are then introduced to chemical changes as a rearrangement of these atoms. They represent these in diagrams, word equations and symbol equations (though they do not balance equations). They develop the idea of the conservation of mass (7.01) in this context. 7.05 Organ Systems Students revisit molecules (7.04) in the context of the gaseous exchange, digestive and circulatory systems in humans. They see how oxygen and carbon dioxide molecules are transported by diffusion, and how large molecules are broken down into smaller molecules in digestion. 7.06 Sound and Light In the context of seeing and hearing, students are taught how lenses can correct vision and how hearing aids and other technology can be used to support those with hearing impairments.

	7.07 Materials Students build on an understanding of properties of materials and how these relate to their use (KS2) by considering the properties and use of composite materials. They are introduced to polymers and ceramics and compare these to metals. 7.08 Life Cycles In the context of seed dispersal in plants, students revisit the idea from KS2 that organisms may heavily rely on each other for survival. Throughout this unit, students gain a comprehensive understanding of the mechanisms of inheritance and reproduction, enabling them to appreciate the complexities of life cycles in both humans and plants. This knowledge fosters a deeper grasp of the interconnections between genetic variation, reproductive processes, and the overall continuity of life, which are essential concepts in biology
Assessment	End of Topic Tests and End of Year Tests Assessments will test factual knowledge, application of that knowledge and working scientifically skills including (but not limited to): identification of independent variables, dependent variables and control variables; repeatability, reproducibility and resolution in readings; writing conclusions, using data to support conclusions; use of evidence in changing scientific ideas.
Additional Resources	Knowledge Organisers

Holland Park School | *Year 8: Science Overview*

Overview	8.01 Heating and Cooling The unit builds on the students' prior understanding of 'Matter' introduced in Year 7 [7.C1.01 Particle model of matter], where they learnt the physical properties of the three states of matter, using the particle model to explain this. Students are taught to explain temperature of matter using the particle model of matter. They review energy stores and pathways (7.02) and are taught about temperature changes in different systems, and how energy tends to spread across a system. They also review changes of state (7.01) and include sublimation for the first time. They apply new knowledge of temperature to endo- and exothermic reactions (7.04). They are taught factors that affect the rate of change of temperature and apply this to their knowledge of the enhanced greenhouse effect (Geography 7.02). Thermal conduction is explained in the context of particles, and students are introduced to density (in simple terms) before learning about thermal convection. (Convection is revisited in Science 8.02 and in Geography 8.04 in the context of movement of tectonic plates). 8.02 Earth and the Atmosphere Building on their prior understanding of particles, mixtures and chemical changes from Year 7, students will explore the dynamic structure and processes of the Earth and its atmosphere. Students will examine the internal structure of the Earth and the theory of continental drift before investigating the formation and characteristics of igneous, sedimentary and metamorphic rocks. Through this, students will develop a deeper understanding of the rock cycle and the processes of weathering and erosion. Students will study fossils and learn about the evolution of the Earth's atmosphere, including the greenhouse effect and global warming. 8.03 Forces and Motion Students build on their knowledge of forces (7.02) and focus specifically on motion and speed. They draw and interpret distance-time graphs. They also consider how speed can be increased by reducing the force of air resistance through streamlining. 8.04 Plants and their Processes Students revisit adaptation (7.03, 7.05, 7.08) in the context of adaptations of the cells, tissues, organs and organ systems involved in optimising photosynthesis, effectively transporting the reactants and products of photosynthesis, and reducing transpiration in plants. 8.05 Electricity 1 Students build on their concrete experience of electrical circuits (KS2) and are introduced to current and potential difference in the context of series circuits (parallel circuits follow in Year 9, to build understanding in small steps). Students are also introduced to the relationship between power, energy transferred and time, and how energy at home is typically measured in kWh. Students then consider the cost of electricity and efficiency of appliances.

	8.06 Interactions and Interdependence Students review the knowledge that offspring inherit half their genome from each parent, in the context of advantageous variation and evolution by natural selection. 8.07 Forces and Work Students build on their practical experience of pulleys, levers and gears (KS2) and simple forces (7.01) and are taught about moments and balance; simple machines; work done and Hooke's law. Their knowledge of pressure in the context of gas pressure (7.01) is formalised here with the equation that connects pressure, force and surface area. 8.08 Acids and Alkalis Students are introduced to acids and alkalis as substances that have similar properties. They are explained in terms of neutralisation reactions, and the pH scale for measuring acidity/alkalinity. They use simple indicators. 8.09 Digestion and Nutrition This unit builds on the work done in year 7 on organ systems and diffusion. Students review polymers (7.07) in the context of digestion, and recognise that proteins and carbohydrates are polymers, (whereas fats are not). They also review pH (8.08) and its impacts on enzyme action. 8.10 Space 1 Students build on understanding of gravity force (7.02) to calculate weight, and therefore how weight is different on Earth to on the Moon. They are also introduced to orbits but are not expected to explain *why* bodies orbit one another.
Assessment	End of Topic Tests and End of Year Tests Assessments will test factual knowledge, application of that knowledge and working scientifically skills including (but not limited to): identification of independent variables, dependent variables and control variables; repeatability, reproducibility and resolution in readings; writing conclusions, using data to support conclusions; use of evidence in changing scientific ideas.
Additional Resources	Knowledge Organisers

Holland Park School | *Year 9: Science Overview*

Overview	9CR Reactivity This unit is the groundwork for much of the GCSE Chemistry – particularly the work on metal extraction, but also the ideas around useful materials from the Earth, particularly metals. The unit begins by recapping the work covered in year 8 on basic atomic structure and electron configuration and then adds on neutron numbers, atomic mass and formula mass. Writing chemical formulae and balancing equations are brought together too, and this is a good place to start students writing symbol equations if they haven't already done so. Students find writing the formula and balancing the equation difficult – they frequently miss out the correct formula writing using ion charges – so there are lots of opportunities for differentiation here. At a minimum, students should be using the formula for common acids and attempting to balance simple equations provided. More able students may be able to use ion charges to write and balance whole equations. The skills introduced in the first few lessons (writing ionic formulae, RFM and balancing equations) are consolidated throughout the unit whilst they look at a variety of chemical reactions. The latter part of the scheme introduces the reactivity series and how it can be used to predict and/or explain reaction outcomes. The required practical in this unit is displacement reactions and focusses on the application of the reactivity series. There are many opportunities within this scheme to interleave conservation of mass ideas by incorporating mass calculations that link directly to the reactions carried out. 9CE Energetics and Rates This topic will introduce the idea of rates and factors that affect rates for the first time. How rates are measured is covered first, focusing on the element of time that is essential. There is a required practical, which uses the same reaction as the first lesson to avoid confusion and just allow the changing of concentration. The ideas of surface area and catalysts are introduced. If you have time, you could also do the effect of temperature here. The unit then covers types of reaction – endothermic, exothermic, combustion as a type of oxidation reaction and thermal decomposition. 9PS Sound waves This unit builds on the work in year 8 on light waves and makes several links to it. The unit begins by reviewing the work from year 8 and establishing the different types of waves. Waves are introduced, and water and sound waves are used as examples. The idea of absorption of energy leading to an increase in the thermal store of a substance is revisited here too. The unit then looks at the speed of sound in different media and is a chance to revisit accurate language around particle theory. Then, uses of ultrasound and how microphones and loudspeakers work. The last lesson provides a chance to revisit electromagnetism, and a galvanometer is a nice way of demonstrating the connection between electricity and magnetism.

	9BB Biological Systems and Processes This unit of work begins with a recap of organizational hierarchy, with students recalling the function of different organ systems. Students will then focus on the skeletal and muscular systems, considering how these two interact to produce movement and locomotion. Students will be introduced to the concept of antagonistic muscle pairings and will investigate the forces exerted by different muscles involved in movement. Students will then examine the respiratory system, looking at the mechanism of breathing, lung volumes and the role of diffusion in gas exchange. The impacts of drugs and exercise on the respiratory and other systems will be explored. Finally, students will consider the basis of life by investigating the structure and function of DNA. The work of key scientists and a model for inheritance will be introduced. Through this module students will be introduced to key biological concepts such as DNA as a blueprint for life and its link to cells, tissues, organs, organs, organs, organ systems and organisms 9BE Ecological Relationships and Classification This unit begins by recapping basic KS3 knowledge of food chains, and building on this to look at food webs, what organisms are dependent on each other for and bioaccumulation. Students will then look at factors that affect populations of organisms, impacts of changing populations and undertake the required practical to estimate daisy population. They then move on to classify living organisms, focusing on the features of the main chordate group. This leads into how well adapted organisms are to their environment and how these adaptations may improve over time by mutations and natural selection. The unit finishes by focusing on biodiversity and the importance of taking steps to maintain, and where possible improve, biodiversity. 9PF Forces in Action This unit builds on forces from year 7 to look at how forces can cause turning effects, how this can be amplified, how forces can cause deformation and what elastic deformation is, how forces are linked to energy (work done) and how machines can reduce the force needed to do a particular job. There are lots of opportunities to make links with real life objects (bikes, cars, screwdrivers), engineering, tools etc. There is a lot of maths, although the relationships are simple, so challenge can be built by rearrangement and unit changes. GCSE AQA Trilogy Biology B1 Cells are the basic unit of all forms of life. In this unit we explore how structural differences between types of cells enable them to perform specific functions within the organism. These differences in cells are controlled by genes in the nucleus. For an organism to grow, cells must divide by mitosis producing two new identical cells. If cells are isolated at an early stage of growth before they have become too specialised, they can retain their ability to grow into a range of different types of cells. This phenomenon has led to the development of stem cell technology. This is a new branch of medicine that allows doctors to repair damaged organs by growing new tissue from stem cells. Students will learn basic optical microscopy techniques including magnification calculations. Building on Key Stage 3 work on diffusion, students will relate this phenomena to transport across exchange surfaces. GCSE AQA Trilogy Physics P1

	The concept of energy emerged in the 19th Century. The idea was used to explain the work output of steam engines and then generalized to understand other heat engines. It also became a key tool for understanding chemical reactions and biological systems. In this unit, students will learn how to calculate the energy efficiency of an energy transfer and will learn how to calculate the energy stored in a moving object. Students will learn how to calculate elastic potential energy and understand how gravitational potential energy can be used to determine the maximum theoretical velocity of an object in motion. Students will also learn how to calculate the power of different appliances and will compare these. GCSE AQA Trilogy Chemistry C1 The periodic table provides chemists with a structured organisation of the known chemical elements from which they can make sense of their physical and chemical properties. Students will study the historical development of the periodic table and models of atomic structure provide, as good examples of how scientific ideas and explanations develop over time as new evidence emerges. Students will learn how the arrangement of elements in the modern periodic table can be explained in terms of atomic structure. Building on Key Stage 3 work students will learn how to calculate relative atomic mass calculations and to write electron configurations of atoms. GCSE AQA Trilogy Physics P3 Building on Key Stage 3 work on particles and density students learn how the particle model is used to predict the behaviour of solids, liquids and gases and that this has many applications in everyday life. Students are introduced to different particle models including the kinetic model and evaluate these. Students will learn how to calculate densities of objects. Students will understand heating and changes of state in terms of changes in kinetic and potential energy stores and will learn how to calculate the specific heat capacities of objects.
Assessment	End of Topic Tests and End of Year Tests Assessments will test factual knowledge, application of that knowledge and working scientifically skills including (but not limited to): identification of independent variables, dependent variables and control variables; repeatability, reproducibility and resolution in readings; writing conclusions, using data to support conclusions; use of evidence in changing scientific ideas.
Additional Resources	Knowledge Organisers