SHUTTLEWORTH COLLEGE

5 year Overview – Year 7

Brief overview
In year 7, basic knowledge and skills from Key Stage 2 are built upon using specialist resources and scientific experiments to hone basic investigational skills. We split up the science curriculum into biology (the science of living things), chemistry (properties and structure of substances and materials and how they react) and physics (how things work) from the beginning of year 7 and make students aware of how they are interlinked. In September, science students start by learning the fundamentals of these three specialisms by studying cells, the particle model and forces. This gives students a good basis of understanding for building up their knowledge to more complex content throughout the year such as heat transfer, reproduction and the structure of the Earth.

Term	Autumn term				Spring term			Summer term		
Unit title	**Cells**	**Particle model**	**Forces**	**Movement**	**Digestion**	**Elements**	**Electricity in a circuit**	**Reproduction**	**Earth structure**	**Heating and cooling**
Big question/ core concept	- What is a cell? - How do we use a microscope? - How are cells adapted to their function?	- What is matter? - Why and how do substances change state? - Why do gases exert a pressure?	- What is a force? - What can forces do?	- How is the body organised? - What is the role of the skeleton? - How do muscles work?	- Why is a balanced diet important? - How do we get nutrients and water from food?	- What is the world around us made of? - What are elements? - Why can you separate some substances and not others?	- What happens when something electrical is turned on? - How does a battery work?	- What is puberty? - What is fertilisation? - What are the main structures of the male and female reproductive system?	- How is the inside of the Earth structured? - How are rocks formed?	- How does heat energy move? - What is the difference between heat and temperature?
Knowing	- Structure and function of cells - Microscopes - Specialised cells - Diffusion - Multicellular and unicellular organisms	- Particle model - States of matter - Changes of state - Diffusion - Gas pressure - Solutions	- Forces and their effects - Gravity - Friction - Elastic forces	- Levels of organisation - Skeletal system - Muscles and antagonistic pairs - Joints - Ligaments and tendons	- Food groups - Food tests - Unhealthy diets - Digestive system - Enzymes	- Atoms - Elements - Compounds - Mixtures - Separating techniques	- Current - Circuit diagrams and symbols - Series and parallel circuits - Potential difference/voltage - Batteries	- Puberty - Reproductive systems - Fertilisation - Pregnancy - Menstrual cycle	- Structure of the Earth - Composition of the atmosphere - Sedimentary rocks - Igneous rocks - Metamorphic rocks - The rock cycle	- Stores of energy and energy transfers - Heat and temperature - Conduction - Convection - Radiation - Insulation
Applying	- Label a plant and animal cell - Use a microscope to observe cells - Explain how some specialised cells are adapted to their function - Describe diffusion	- Use models to explain particle arrangement - Relate diffusion to particles - Explain how temperature affects gas pressure	- Describe the forces acting on an object - Explain the difference between mass and weight - Investigate the effects of friction - Predict what forces will do to elastic objects	- Group things by the level of organisation - Describe the function of the skeleton - Explain how antagonistic pairs work - Describe the role of joints and connective tissue	- Extract information from food labels - Investigate foods using food tests - Describe health effects of an unhealthy diet - Describe the role of the digestive system using models	- Label an atom - Describe the difference between elements, compounds and mixtures - Use different techniques to separate substances	- Draw a circuit diagram - Construct a circuit using the components and wires - Investigate how a series and parallel circuit affects the current and voltage - Explain how a battery works	- Describe the changes that happen during puberty - Label the male and female reproductive systems - Explain what happens during fertilisation - Describe what can affect the growth of a foetus - Identify key events on a diagram of the menstrual cycle	- Label the layers inside the Earth - Describe how the different types of rock are formed - Explain how one rock type can turn into another using the rock cycle	- Group materials as conductors or insulators - Describe the difference between heat and temperature - Explain the three ways in which heat can move using models - Investigate insulating materials
Assessment	End of unit assessment Assessed in mid term assessment in HT3	End of unit assessment Assessed in mid term assessment in HT3	End of unit assessment Assessed in mid term assessment in HT3	End of unit assessment Assessed in mid term assessment in HT3	End of unit assessment Assessed in end of year assessment in HT5	End of unit assessment Assessed in end of year assessment in HT5	End of unit assessment Assessed in end of year assessment in HT5	End of unit assessment	End of unit assessment	End of unit assessment

SHUTTLEWORTH COLLEGE

5 year Overview – Year 8

Brief overview
In year 8, students further build on their ability to work scientifically by being taught skills such as data analysis, graph drawing and using equations. They will also continue to develop on the core foundations of biology, chemistry and physics by studying more in depth units such as the process of breathing and how it links to respiration, reactions of metals with other substances such as acids and water, and how forces (that students previously learnt in Y7) cause motion in objects.

Term	Autumn				Spring			Summer			
Unit title	**Breathing**	**Periodic table**	**Motion**	**Respiration**	**Photosynthesis**	**Metals and non-metals**	**Magnetism**	**Interdependence**	**Climate**	**Waves**	**Light**
Big question/ core concept	- How does oxygen get into our bodies? - How are the lungs structured?	- What does the periodic table show? - How can patterns in reactions be predicted using the periodic table?	- What causes objects to move?	- How do we get the energy required to function? - What is the difference between aerobic and anaerobic respiration?	- How do plants grow and reproduce?	- What properties do metals have? - How do they react with other substances?	- How do magnets affect each other and magnetic materials? - Why does a compass always point north?	- How do organisms rely on each other? - How does a change in one population affect others?	- What is global warming and how is it affecting our climate? - How are humans having an impact on global warming?	- How does energy travel from one place to another? - How does sound travel differently to light?	- How do we see objects? - How do we see colour?
Knowing	- Breathing - The respiratory system - Effects of exercise - Gas exchange - Asthma - Smoking - Alcohol - Drugs	- The history of the periodic table - The structure of the periodic table - Group 1 - Group 7 - Group 0	- Speed - Moments - Pressure in solids - Pressure in fluids	- Aerobic respiration - Anaerobic respiration in animals - Anaerobic respiration in yeast	- Photosynthesis - Leaves - Plant minerals - Flowers and pollination - Fertilisation and germination - Seed dispersal	- Properties of metals and non-metals - Reactions of metals with acids - Reactions of metals with oxygen and water - The reactivity series - Displacement reactions	- Magnetic materials - Magnetic fields - Electromagnetism - Uses of electromagnets	- Food chains and food webs - Disruption to food webs - Sampling techniques - Competition	- Earth's atmosphere - The greenhouse effect - Global warming and climate change - The carbon cycle	- Transverse and longitudinal waves - Sound waves - The electromagnetic (EM) spectrum	- Properties of light - Reflection - Refraction - The eye - Colour and filters
Applying	- Describe the process of breathing - Label the respiratory system - Explain how the lungs are adapted to gas exchange - Discuss the long and short term effects of smoking, alcohol and drugs	- Create a timeline of the scientists and the discoveries that led to the modern periodic table - Compare the properties of group 1, 7 and 0	- Use an equation to calculate speed - Give examples of turning forces - Calculate the pressure underneath your feet - Explain why a balloon gets smaller if you put it in the freezer	- Explain the difference between respiration and breathing - Compare aerobic and anaerobic respiration - Describe some uses of anaerobic respiration	- Give the equation for photosynthesis - Describe how leaves are adapted to their function - Label the parts of a flower - Investigate factors affecting seed dispersal	- Compare the properties of metals and non-metals - Describe what happens when a metal reacts with acid, oxygen and water - State the reactivity series - Predict the outcome of reactions caused by displacement	- State the 4 main magnetic materials - Investigate the shape of a magnetic field - Draw the shape of a magnetic field - Explain how to make an electromagnet stronger	- Draw a food chain and a food web - Explain how a change in one population affects another - Describe a predator-prey cycle - Sample a population using quadrats and transects	- Test for different gases - Explain the changes in the atmosphere over time - Describe how humans are contributing to global warming - Give examples of climate change - Label the carbon cycle	- Use models to explain how the 2 types of wave travel - Describe how we hear a sound - Test the upper frequency limit of your hearing - Produce a rhyme to remember the waves of the EM spectrum	- Describe how we see luminous and non-luminous objects - Draw ray diagrams - Investigate reflection and refraction - Compare the eye with a camera - Explain how we see different colours
Assessment	End of unit assessment Assessed in mid term assessment in HT3	End of unit assessment Assessed in mid term assessment in HT3	End of unit assessment Assessed in mid term assessment in HT3	End of unit assessment Assessed in mid term assessment in HT3	End of unit assessment Assessed in end of year assessment in HT5	End of unit assessment Assessed in end of year assessment in HT5	End of unit assessment Assessed in end of year assessment in HT5	End of unit assessment	End of unit assessment	End of unit assessment	End of unit assessment

SHUTTLEWORTH COLLEGE

5 year Overview – Year 9

Brief overview
This year students will continue to build on the foundations of science, consolidating learning from Y8 and making progress towards key KS4 concepts. The KS3 curriculum has been sequenced to include more complex topics in Y9 such as genetics, chemical reactions and static electricity. Students will also develop scientific enquiry skills, resilience and independence in preparation for KS4 and their GCSE exams. The final units of KS3 are taught through to Easter. After Easter, the first KS4 units are introduced: Ecology, which builds on the knowledge the students gained in the interdependence (Y8) and evolution (Y9) units, Chemistry of the atmosphere which builds on the climate unit from Y8, and Magnetism which build upon the magnetism unit from Y8.

Term	Autumn				Spring				Summer (KS4)			
Unit title	**Inheritance**	**Acids and alkalis**	**Energy**	**Motion 2**	**Evolution**	**Types of reaction**	**Resistance and charge**	**Earth resources**	**Space**	**B1 fundamentals**	**C1 fundamentals**	**P1 fundamentals**
Big question/ core concept	- Why do we not look exactly like our parents or siblings?	- How can we test to see whether substances are an acid or an alkali? - What happens when you react and acid and an alkali?	- What are the main energy stores? - What happens to wasted energy?	- What causes objects to move? - How can we represent motion on a graph?	- How do adaptations help species to survive? - What is natural selection?	- How do substances changes during chemical reactions? - Why do some substances react and not others?	- What affects resistance in a circuit? - Why do we sometimes get a shock off a shopping trolley/car door?	- How do we extract and use resources from the Earth?	- Why do we have day and night? - What is a year?	- What are animals and plants made up of? - Why are animals so different to plants?	- What is the world around us made up from? - Why do we use symbols for elements? - What do atoms really look like? - Why can you separate some substances and not others?	- What is energy? - How is it transferred? - How can we generate energy from different resources?
Knowing	- DNA - Genetics - Variation - Adaptations	- Acids and bases - pH scale - Indicators - Acid and metal reactions - Neutralisation	- Energy stores - Energy from food - Energy resources - Energy transfers and work done - Efficiency - Power	- Speed and velocity - Distance-time graphs - Acceleration - Velocity-time graphs - Relative motion	- Adaptations - Natural selection - Extinction - Biodiversity	- Conservation of mass - Combustion - Endothermic and exothermic reactions - Thermal decomposition - Rates of reaction	- Current and voltage - Resistance - Factors affecting resistance - Static electricity	- Reactivity series - Extraction using carbon - Electrolysis - Polymers, composites and ceramics - Recycling	- Objects in space - The solar system - Gravity, mass and weight - The Earth - Seasons	- animal cells - plant cells - bacteria cells - specialised cells - microscopy - cell differentiation	- History of the atom - Electronic structure - Elements and compounds - Mixtures	- Energy stores and systems - Energy transfer - Efficiency - Insulation - Energy resources (renewable and non-renewable)
Applying	- Describe the structure of DNA - Predict characteristics in offspring - Categorise characteristics into inherited or environmental	- Investigate the pH of different household substances - Compare different indicators - Complete word equations for the reaction of an acid with an alkali	- Name and give examples of the energy stores - Compare energy from different foods - Compare renewable and non-renewable energy resources - Calculate efficiency, work done and power of different objects	- Calculate velocity of different objects - Draw a distance-time graph and a velocity-time graph - Describe how the shape of the graph links to the motion of the object - Explain relative motion	- Explain how some organisms are adapted to their environment - Describe the key points which lead to a species changing - State possible causes of extinction - Explain how we can conserve biodiversity	- Investigate the products of combustion - Compare endothermic and exothermic reactions - Explain how the rate of a reaction can be increased	- Explain how temperature affects resistance - Investigate factors affecting resistance - Describe what happens when charged objects are placed near each other - Explain why our hair sticks to the balloon when rubbed	- Use the reactivity series to predict displacement reactions - Explain how we extract metals from the Earth - Describe how electricity is used to break down substances - Produce a life cycle assessment	- Describe the objects in space - Name the 8 planets of the solar system in order - Explain the effect that gravity has on objects - Explain what is meant by a leap year - Describe the changes in the seasons	- Name the differences between plant/animal and bacterial cells - Describe the function of cell organelles - Explain how cells are adapted for their function - Use magnification calculation to work out image/magnification - <u>REQUIRED PRACTICAL</u>: Use a light microscope to observe, draw and label a selection of plant and animal cells	-Name compounds from elements when given formulae or symbol equations -Explain the changes between the different models of the atoms - Calculate the numbers of protons, neutrons and electrons in an atom or ion -Describe, explain and give examples of the specified processes of separation and purification techniques	- Name the energy stores - Explain what happens to energy when it is dissipated - Explain how one energy store can be transferred to another e.g. bungee jump - Explain what is meant when we say an object is 'efficient' - Compare renewable and non-renewable energy resources
Assessment	End of unit assessment Assessed in mid term assessment in HT3	End of unit assessment Assessed in mid term assessment in HT3	End of unit assessment Assessed in mid term assessment in HT3	End of unit assessment Assessed in mid term assessment in HT3	End of unit assessment Assessed in end of year assessment in HT5	End of unit assessment Assessed in end of year assessment in HT5	End of unit assessment Assessed in end of year assessment in HT5	End of unit assessment Assessed in end of year assessment in HT5End of unit assessment	End of unit assessment	Assessed at end of B1 unit in Y10.	Assessed at end of C1 unit in Y10.	Assessed at end of P1 unit in Y10.

SHUTTLEWORTH COLLEGE

5 year Overview – Year 10 – AQA Combined science trilogy – Biology

(additional content for separate science students in *bold italics*)

Brief overview					
In Year 10, students will generally study the same Biology content regardless of whether they have chosen combined science or the separate sciences. All students will focus on the overarching themes of cells and organisation at the beginning of KS4 and then move onto Infection and Bioenergetics (where there is additional content for separate science students shown in ***bold italics***). Students will also gain more knowledge and experience in the skills required in working scientifically, particularly in relation to the required practicals needed for the AQA GCSE.					
Term	**Autumn**	**Spring 1**	**Spring 2**	**Summer 1**	**Summer 2**
Unit title	**B1 - Cells**	**B3 – Infectious Disease and Response**	**B2 - Organisation**		**B4 Bioenergetics**
Big question/ core concept	- How do plants and animals get bigger? - How do substances get into and out of cells?	- How do we give other people our disease? - How does a vaccine stop you getting a disease?	-What happens to the food that you eat? - What are enzymes and where do you find them?	- Why does breathing keep you alive? - Why does your heart need to work so hard?	- What do you need oxygen for? - How do plants make glucose?
Knowing	- cell division - mitosis - diffusion - osmosis - active transport	- viral diseases - bacterial diseases - protist and fungal diseases - human defence systems - vaccination - antibiotics and painkillers - drug development	- principles of organisation - digestive system - enzymes - digestive enzymes	- lungs - heart - coronary heart disease - blood vessels - blood - health - cancer	- photosynthesis and limiting factors - uses of glucose - plant structure/ tissues - aerobic and anaerobic respiration in animals - fermentation - metabolism
Applying	- Draw simple diagrams to describe mitosis. - Define the terms diffusion, osmosis and active transport. - Give examples of substances that diffuse into and out of cells. - Calculate and compare surface area: volume ratios. - REQUIRED PRACTICAL: Osmosis Investigate the effect of a range of concentrations of salt or sugar solutions on the mass of plant tissue.	- Define the term pathogen and state the four main groups of pathogen. - Describe symptoms, transmission, prevention and treatment for measles, HIV and AIDS, salmonella and gonorrhoea. - Describe bodies line of defences - Explain how vaccines prevent disease ***- REQUIRED PRACTICAL: culturing microorganisms***	- Explain the terms cell, tissue, organ, organ system and organism. - Label digestive system - Describe the functions of the organs in the system - Use lock/key theory and collision theory to explain enzyme action. - REQUIRED PRACTICAL: Food tests -REQUIRED PRACTICAL: investigate effect of PH on rate of amylase reaction	- Describe and label a diagram of the heart showing four chambers, vena cava, pulmonary artery, pulmonary vein and aorta. - Label the main structures in the gas exchange system - Explain how the blood vessels are adapted for their function. - Describe problems associated with the heart and explain how they can be treated. - Describe some causes of cancer - Give examples of non-communicable disease	- Write the word and symbol equation for photosynthesis and respiration - State factors that can limit the rate of photosynthesis. - Define terms aerobic and anaerobic -explain useful products of fermentations - Give examples of metabolic reactions ***- Know/apply inverse square law*** - REQUIRED PRACTICAL: Investigate light intensity on rate of photosynthesis
Assessment	End of unit assessment. Also assessed in end of year mock exam in May/June.	End of unit assessment	End of unit assessment. Also assessed in end of year mock exam in May/June.	End of unit assessment. Also assessed in end of year mock exam in May/June.	End of unit assessment

SHUTTLEWORTH COLLEGE

5 year Overview – Year 10 – AQA Combined science trilogy – Chemistry

(additional content for separate science students in *bold italics*)

Brief overview						
At the beginning of year 10, students will develop their knowledge and understanding of atomic structure, the periodic table and bonding. They will then move onto chemical analysis and organic chemistry (where there is additional content for separate science students shown in ***bold italics***). Students will also gain more knowledge and experience in the skills required in working scientifically, particularly in relation to the required practical's needed for the AQA GCSE.						
Term	**Autumn 1**	**Autumn 2**	**Spring 1**	**Spring 2**	**Summer 1**	**Summer 2**
Unit title	**C1 - Atomic structure**	**C2 - Structure and bonding**		**C5 – Energy changes**	**C8 – Chemical analysis**	**C9 – Chemistry of the atmosphere**
Big question/ core concept	What is the world around use made up from? How was the periodic table developed?	How does the physical world around us function in relation to structure and bonding of chemicals and the properties?	How does the physical world around us function in relation to structure and bonding of chemicals and the properties? How is table salt formed?	What is the difference between exothermic and endothermic reactions? What are catalysts, activation energy and overall energy?	How can we test if a substance is pure? How can we use scientific methods to accurately analyse chemicals?	- How is human activity affecting the Earth's atmosphere? - What effect does pollution have on the environment?
Knowing	- Isotopes - Periodic table - Group 1 - Group 7 - Group 0	- Metallic bonding - Covalent bonding - Polymers and giant covalent structures ***- Nanoparticles***	- Ionic bonding - Giant ionic structures - States of matter	- Endothermic and exothermic reactions - Reaction profiles ***- Batteries and fuel cells***	- Purity and formulations - Chromatography ***- Testing for ions*** ***- Instrumental methods***	- The Earth's atmosphere - Greenhouse gases - Atmospheric pollutants
Applying	- Use an equation to calculate relative atomic mass - Explain how the position of an element in the periodic table is related to the arrangement of electrons in its atoms - Describe the steps and scientists involved in the development of the periodic table - Explain how the atomic structure of metals and non-metals relates to their position in the periodic table - Predict properties from given trends down group 1,7 and 0.	- Explain chemical bonding and properties in terms of electrostatic forces and the transfer or sharing of electrons. - Describe common substances that consist of small molecules from their chemical formula - Draw dot and cross diagrams to show the sharing of electrons ***- Evaluate the uses and possible risks of nanoparticles***	- Draw dot and cross diagrams for ionic compounds - Describe the limitations of using dot and cross, ball and stick, two and three-dimensional diagrams to represent a giant ionic structure - Calculate the empirical formula of an ionic compound - Explain the properties of ionic substances	- Compare exothermic and endothermic reactions - Evaluate uses and applications of exothermic and endothermic reactions - Draw simple reaction profiles (energy level diagrams) - Calculate bond energies - Interpret data for relative reactivity of different metals - Evaluate the use of hydrogen fuel cells in comparison with rechargeable cells and batteries	- Describe and distinguish pure and impure substances - Describe formulations and give examples - REQUIRED PRACTICAL: Explain how paper chromatography separates mixtures - Calculate Rf values from chromatograms ***- REQUIRED PRACTICAL: use chemical tests to identify the ions in unknown single ionic compounds*** ***- Compare instrumental methods with chemical tests***	- Explain the changes in the composition of the atmosphere over time - Describe ways in which greenhouse gases are being released - Describe the effects that different pollutants have on the natural environment
Assessment	End of unit assessment. Also assessed in mid year mock exam in February and mock exam in November Y11.	End of unit assessment. Also assessed in mid year mock exam in February and mock exam in November Y11.	End of unit assessment. Also assessed in mid year mock exam in February and mock exam in November Y11.	End of unit assessment. Also assessed in end of year mock exam in May/June and mock exam in November Y11.	End of unit assessment. Also assessed in mock exam in February Y11.	End of unit assessment. Also assessed in mock exam in February Y11.

SHUTTLEWORTH COLLEGE

5 year Overview – Year 10 – AQA Combined science trilogy – Physics (additional content for separate science students in *bold italics*)

Brief overview
In Year 10, students will generally study the same physics content for the first 2 terms regardless of whether they have chosen combined science or the separate sciences. All students will focus on the overarching themes of energy and electricity at the beginning of KS4 and then move onto waves (where there is additional content for separate science students shown in ***bold italics***). Students will also gain more knowledge and experience in the skills required in working scientifically, particularly in relation to the required practicals needed for the AQA GCSE.

Term	Autumn	Spring 1	Spring 2	Summer 1	Summer 2
Unit title	**P1 - Energy**	**P2 - Electricity**		**P3 - Particle model of matter**	**P4 - Atomic structure**
Big question/ core concept	What is energy? How can we calculate energy? What happens when it is transferred?	How do electrical circuits work? How does the type of circuit affect the current, voltage and resistance?	How is electricity transported around the country and into our homes? How is a plug designed to keep us safe?	How does the arrangement of atoms within a substance affect its properties? How can models be used in science?	Can nuclear radiation be useful? Why is radioactive decay random?
Knowing	- Energy stores and systems - Gravitational potential energy (GPE) - Kinetic energy (KE) - Elastic potential energy (EPE) - Power and work done	- Circuit diagrams and symbols - Series and parallel circuits - Current - Potential difference - Resistance - Ohm's law - Ohmic and non-ohmic conductors	- Factors affecting resistance of a wire - Electrical energy transfers - Electrical power - Mains electricity (AC/DC) - Plugs and safety - National Grid - ***Static electricity***	- States of matter - Changes of state - Density - Specific latent heat - Specific heat capacity - Gas pressure	- Types of radiation - Radioactive decay - Decay equations - Half life - Contamination and irradiation - ***Medical uses of radiation*** - ***Nuclear fission and fusion***
Applying	- Name the energy stores - Explain what happens to energy when it is dissipated - Use equations to calculate KE, GPE and EPE - Use an equation to calculate power and work done - ***REQUIRED PRACTICAL (TRIPLE ONLY): investigate insulating materials***	- Recognise and draw circuit symbols - Use symbols to draw complete circuits - Use models to explain how current and voltage differ in series and parallel circuits - REQUIRED PRACTICAL: investigate how current and voltage are affected by different components	- REQUIRED PRACTICAL: investigate how the length of wire affects resistance - Calculate energy costs - Correctly wire a plug - Explain why transformers are needed in the National Grid - ***Describe the electric fields around charged objects***	- Draw the particle arrangement in solids, liquids and gases - REQUIRED PRACTICAL: calculate the density of different objects - Describe and explain the shape of a heating curve of a substance - Calculate specific latent heat and specific heat capacity - Explain why the pressure changes as temperature changes - ***Use Boyle's law to calculate pressure changes***	- Compare the properties of alpha, beta and gamma - Calculate the half life from a decay curve - Predict the new isotopes produced when radioisotopes decay - ***Explain how the properties of radiation is linked to their use*** - ***Describe the process of nuclear fission in a power station***
Assessment	End of unit assessment. Also assessed in mid-year mock exam in February and paper 1 mock in November Y11.	End of unit assessment. Also assessed in end of year mock exam in May/June and paper 1 mock in November Y11.	End of unit assessment. Also assessed in end of year mock exam in May/June and paper 1 mock in November Y11.	End of unit assessment. Also assessed in end of year mock exam in May/June and paper 1 mock in November Y11.	End of unit assessment. Also assessed in mock exam in November

SHUTTLEWORTH COLLEGE

5 year Overview – Year 11 – AQA Combined science trilogy – Biology

(additional content for separate science students in *bold italics*)

Brief overview
In Year 11 students will generally study the same Biology content regardless of whether they have chosen combined science or the separate sciences. All students will focus on the overarching themes of homeostasis and genetics at the beginning of the year and then move onto Ecology (where there is additional content for separate science students shown in ***bold italics***). There will be two chances for students to sit a full science paper in the two mock windows (November and February) and there will be lots of exam practise taking place throughout the year in lessons, with a big emphasis on ensuring the students understand how the content links in with other areas of science and the wider world.

Term	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer term
Unit title	**B5 - Homeostasis**	**B6 - Genetics and Evolution**		**B7– Ecology**	**Revision and exams**
Big question/ core concept	- How do you control your internal environment? - How does your body respond to danger and keep you safe?	- How can organisms reproduce from one parent - How are your characteristics inherited?	- How have different species involved? - What is the proof for evolution?	- Why is the cycling of materials important? - What will happen if we keep releasing greenhouses gases at the current rate?	
Knowing	- structure and function of nervous system - endocrine system - control of blood glucose - reproduction/ contraception ***- the brain*** ***- the eye*** ***- control of body temperature*** ***- water and nitrogen balance*** ***- plant hormones***	- sexual and asexual reproduction - meiosis - DNA and the genome - genetic inheritance and inherited disorders - sex determination ***- advantages/disadvantages of sexual and asexual reproduction*** ***- DNA structure***	- variation - evolution - selective breeding - genetic engineering - fossils and evidence of evolution ***- cloning*** ***- theory of evolution*** ***- speciation*** ***- understanding of genetics***	- cycling materials - biodiversity and waste management - land use and deforestation - global warming ***- trophic levels and biomass pyramids*** ***- factors affecting food security*** ***- farming and sustainable fisheries*** ***- biotechnology***	
Applying	- Explain the importance of being able to respond to environmental changes and coordinate behaviour. - Describe the functions of the main structures in the nervous system. - Describe and label the endocrine system - Describe how blood glucose concentration is monitored and controlled. - Explain the role of hormones in menstrual cycle and contraception - <u>REQUIRED PRACTICAL</u>: reaction time ***- Label the brain and explain function of sections*** ***- Label eye and give function of structures***	- Explain why sexual reproduction results in variety - Describe meiosis explaining why it occurs - Use punnet square to determine probability - Describe structure of DNA, chromosomes - Explain with examples inherited disorders ***- Describe the structure of DNA using diagrams and models.*** ***- Describe advantages and disadvantages of sexual and asexual reproduction.*** ***- Describe in simple terms how a protein is synthesised.***	- Define the term genetic engineering - Classify characteristics as being due to genetic, environmental or a combination of these causes - Explain why humans selectively breed plants and animals. - Describe Darwin's theory of evolution by natural selection. - Define the term extinction. ***- Describe the evidence for the theory of evolution by natural selection.*** ***- Describe the work of Wallace and Jean-Baptiste Lamarck.***	- Interpret and explain the processes in diagrams of the carbon, water and decay cycles. - Explain the role of microorganisms in cycling materials through an ecosystem. - Explain the terms greenhouse effect and global warming. ***- <u>REQUIRED PRACTICAL</u>: decay*** ***- Construct and interpret pyramids of biomass from data.*** ***- Describe how microorganisms can be grown in large vats to produce useful products*** ***- Explain why some fish stocks are declining and why this is a problem.***	
Assessment	End of unit assessment. Also assessed in mock exam in November.	End of unit assessment. Also assessed in mock exam in February.	End of unit assessment. Also assessed in mock exam in February.	End of unit assessment.	

SHUTTLEWORTH COLLEGE

5 year Overview – Year 11 – AQA Combined science trilogy – Chemistry (additional content for separate science students in *bold italics*)

Brief overview
In year 11, students will build their knowledge on chemical reactions by studying energy and chemical changes in detail. Chemical reactions take place at different rates, therefore they will also study rates of reactions. There will be two chances for students to sit a full science paper in the two mock windows (November and February) and there will be lots of exam practise taking place throughout the year in lessons, with a big emphasis on ensuring the students understand how the content links in with other areas of science and the wider world.

Term	Autumn 1	Autumn 2	Spring 1	Spring 2	Summer
Unit title	**C4 – Chemical changes**	**C7 - Organic chemistry**	**C6 – The rate and extent of chemical change**	**C10 - Using resources**	**Revision + Exams**
Big question/ core concept	How can we make and prepare pure, dry samples of salts? How can we decompose ionic compounds and get useful products? Why do chemical reactions always involve a transfer of energy? How are different metals extracted?	How do we use carbon in our everyday life? How can we make hydrocarbons useful?	How do all the chemical reactions in the world occur? How do all the chemical reactions in the world occur?	How are the earths natural resources used to manufacture useful products?	
Knowing	- Reactivity series - Reactions of metals - Neutralisation ***-Titrations*** - Extraction of metals - Electrolysis - Electrolysis of aluminium	- Hydrocarbons - Fractional distillation ***- Reactions of alkenes, alcohols and carboxylic acids*** ***- Polymerisation***	- Moles - Rate of reaction - Collision theory - Reversible reactions - Equilibrium	- Sustainable development - Potable water - Lifecycle assessments ***- Using materials*** ***-The Haber process and the use of NPK fertilisers***	
Applying	- Describe the reactions of metals with water or dilute acids - Identify the substances which are oxidised or reduced in terms of gain or loss of oxygen -REQUIRED PRACTICAL: preparation of a pure, dry sample of a soluble salt from an insoluble oxide or carbonate -Describe the use of universal indicator or a wide range indicator to measure the pH ***-REQUIRED PRACTICAL: React volumes of solutions of a strong acid and a strong alkali by titration.*** - State the products of the electrolysis of molten/ aqueous solutions - Explain why a mixture is used as the electrolyte - Explain why the positive electrode must be continually replaced. -REQUIRED PRACTICAL: investigate what happens when aqueous solutions are electrolysed using inert electrodes	- Deduce alkanes given their formulae in different forms -Explain how fractional distillation works in terms of evaporation and condensation - Describe the conditions used for catalytic and steam cracking ***- Describe and explain the reactions of alkenes, alcohols and carboxylic acids*** ***- Draw diagrams to represent the formation of a polymer from a given alkene monomer*** ***-Explain condensation polymerisation by reference to the functional groups***	- Explain changes during reactions in terms of the particle model - Calculate the mass of solute in a given volume of solution -REQUIRED PPRACTICAL: Investigate how changes in concentration affect the rates of reaction - Describe what is meant by reversible reaction and equilibrium - Describe the energy changes in reversible reactions - Predict the effect of changes on systems at equilibrium for pressure, concentration and temperature	- State examples of natural products that are added or replaced by agricultural and synthetic products - REQUIRED PRACTICAL: analysis and purification of water samples from different sources - Compare LCAs for plastic and paper bags - Evaluate ways of reducing the use of limited resources ***- Compare physical properties of different materials*** ***-Apply the principles of dynamic equilibrium to the Haber process***	
Assessment	End of unit assessment. Also assessed in mock exam in November.	End of unit assessment. Also assessed in mock exam in February.	End of unit assessment.	End of unit assessment.	

SHUTTLEWORTH COLLEGE

5 year Overview – Year 11 – AQA Combined science trilogy – Physics

(additional content for separate science students in *bold italics*)

Brief overview
In year 11, the fundamental topic of energy will be built upon in the units of forces (what forces are and how they cause a change of motion in an object), the particle model (that matter is made up of particles, and their arrangement and movement affects their properties) and atomic structure (what is nuclear radiation and why is it so dangerous?). Separate scientists will also cover an extra physics unit this year, looking at space and how the objects within it came to be. There will be two chances for students to sit a full science paper in the two mock windows (November and February) and there will be lots of exam practise taking place throughout the year in lessons, with a big emphasis on ensuring the students understand how the content links in with other areas of science and the wider world.

Term	Autumn 1	Autumn 2	Spring 1	Spring 2		Summer term
Unit title	**P5 Forces**		**P6 Waves**	**P7 Magnetism**	***P8 Space (TRIPLE ONLY)***	**Revision and exams**
Big question/ core concept	How do forces affect motion? How can forces be represented on a diagram?	How can the motion of an object be represented graphically? What happens when objects collide?	What is a wave? How can waves be used for communications?	Why do magnets attract or repel? How can an electric current produce a magnetic field? How can magnets make things move?	***How are stars like our Sun formed?*** ***Why might one theory in science be replaced by another?***	
Knowing	- What are forces? - Gravity and weight - Resultant forces - Work done - Elastic forces ***- Moments, levers and gears*** ***- Pressure in fluids***	- Speed and velocity - Distance-time graphs - Acceleration - Velocity-time graphs - Terminal velocity - Newton's laws - Stopping distances - Momentum (higher only) ***- Forces in collisions***	- Transverse and longitudinal waves - Properties of waves - Refraction - Electromagnetic waves - Uses and dangers ***- Sound waves and waves used for detection and exploration*** ***- Lenses and reflection*** ***- Black body radiation***	- Permanent and induced magnetism - Magnetic fields - Electromagnetism - The motor effect - Motors ***- Electromagnetic induction*** ***- Loudspeakers and microphones*** ***- Transformers***	***- Objects in space*** ***- The Solar system*** ***- Life cycle of a star*** ***- Orbital motion*** ***- The Big Bang theory*** ***- Red shift***	
Applying	- Compare mass and weight - Represent forces using arrows - Calculate resultant forces - Explain how resultant forces cause a change in motion - Describe Hooke's law - REQUIRED PRACTICAL: Investigate the relationship between force applied and extension of an elastic object ***- Calculate pressure within a column of water***	- Describe the motion of an object from a motion graph - Calculate distance travelled by finding the area beneath a V-T graph - REQUIRED PRACTICAL: investigate how mass and force affect the acceleration of an object - State what factors affect the thinking distance - Explain the changes in momentum for a given example	- Compare transverse and longitudinal waves - REQUIRED PRACTICAL: calculate wave speed in a ripple tank - Label both types of wave - Explain how waves in the EM spectrum are suitable for their uses - REQUIRED PRACTICAL: investigate how colour affect IR emission ***- Draw ray diagrams*** ***- Explain how ultrasound is used***	- Compare permanent and induced magnets - Investigate the shape of the magnetic field around a magnet - Explain how the strength of an electromagnet can be changed - Predict the direction of motion using Fleming's Left Hand rule - Describe the factors affecting the motor effect ***- Explain how EM induction produces a current in a wire*** ***- Calculate potential difference in transformers***	***- State the names of some of the objects found in space*** ***- Describe the life cycle of a star much bigger than the Sun*** ***- Explain how an object can be both travelling at a constant speed and accelerating*** ***- Explain how red shift provides evidence that supports the Big Bang theory***	
Assessment	End of unit assessment. Also assessed in mock exam in Feb.	End of unit assessment. Also assessed in mock exam in Feb.	End of unit assessment.	End of unit assessment	***End of unit assessment.***	