WFA Progression Map - planning for knowledge/skills etc to build & accumulate sequentially over time

WESTON FAVELL ACADEMY

Key: ***Bold*** writing shows development or progression from previous year. *<u>Underline</u> shows cross-over of key concepts with other end-points

Faculty: Science			**Subject: Biology (Triple route 9-11))**			
End points	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**	**Year 11**
Understanding of core concepts of "the cell"	Describe the ways in which nutrients and water are transported within animals, including humans.	Cells as the fundamental unit of living organisms includes how to observe, interpret and record cell structures using light and electron microscopes The function of cell organelles including cell wall, cell membrane, cytoplasm, nucleus, vacuole, ribosomes, mitochondria (for aerobic respiration) and chloroplasts (for photosynthesis) The differences between plant, animal and bacterial cells <u>Osmosis, diffusion and active transport</u> Adaptations of specialised cells including egg cells, sperm cells and red blood cells <u>Adaptations of unicellular organisms e.g. amoeba and euglena</u>	**Understand the links between cell specialisation and adaptation** <u>The reactants and products for photosynthesis including the use of word equations</u> <u>The reactants and products of aerobic respiration including the use of word equations and the linking of these to the function of cells and of organ systems in response to change.</u> <u>The dependence on most of the Earth's life on the glucose produced during photosynthesis</u> **The ways in which the energy produced by photosynthesis is used in animals and plants including to produce long molecules (e.g. proteins) for growth /repair, for active transport, to produce stores of**	Cells as the basic structural unit of all organisms; **<u>Adaptations of cells related to their functions;</u>** **The main sub-cellular structures of eukaryotic and prokaryotic cells** **Stem cells in animals and meristems in plants** **<u>Factors affecting the rate of enzymatic reactions carbohydrates, proteins, nucleic acids and lipids as key biological molecules</u>** **<u>The importance of cellular respiration</u>** **<u>The processes of aerobic and anaerobic respiration (symbol equations)</u>** **<u>Photosynthesis as the key process for "food production" and therefore biomass for life the process of photosynthesis (symbol equations) - Links to Ecology</u>**		**<u>Importance of plant reproduction through insect pollination in human food security</u>** **<u>How organisms affect, and are affected by, their environment,</u> including the accumulation of toxic materials** <u>Some abiotic and biotic factors which affect communities;</u>

			chemical energies in living things etc. **<u>The adaptations of the cells in leaves to maximise photosynthesis</u>** **<u>The adaptation of cells in the lung to maximise active transport</u>**	Factors affecting the rate of photosynthesis Understand aerobic and anaerobic respiration in living things, including the use of word and symbol equations (balanced where necessary) Understand the process of anaerobic respiration as a source of energy in humans and in microorganisms (including linked to fermentation in yeast) – Links to homeostasis The similarities and differences between aerobic and anaerobic respiration		<u>The importance of interactions between organisms in a community</u> How materials cycle through abiotic and biotic components of ecosystems The role of microrganisms (decomposers) in the cycling of materials through an ecosystem
	NC/Spec coverage	**NC/Spec coverage**	**NC/Spec coverage** •life processes depend on molecules whose structure is related to their function •the fundamental units of living organisms are cells •life on Earth is dependent on photosynthesis in which green plants and algae trap light from the Sun to fix carbon dioxide and combine it with hydrogen from water to make organic compounds and oxygen •organic compounds are used as fuels in cellular respiration to allow the other chemical reactions necessary for life				
Appreciation of the function of multicellular organisms	Identify and name the main parts of the human circulatory system, and describe the functions of the heart, blood vessels and blood Recognise the impact of diet, exercise, drugs and lifestyle on the way their bodies function	The hierarchical organisation of multicellular organisms: from cells to tissues to organs to systems to organisms The structure and functions of the human skeleton (support, protection, movement and making blood cells) biomechanics The interaction between skeleton and muscles The function of muscles and	<u>State what happens during digestion including describing the roles of its different parts and their adaptations</u> <u>Reproduction in humans</u> (as an example of a mammal), including the structure and function of the male and female reproductive systems, menstrual cycle (without details of hormones), gametes, fertilisation, gestation and birth, to include the effect of maternal lifestyle on the foetus through the placenta	The content of a healthy human diet: carbohydrates, lipids (fats and oils), proteins, vitamins, minerals, dietary fibre and water, and why each is needed calculations of energy requirements in a healthy diet Understand the components of blood and their roles Understand the structure, function and adaptions of the circulatory system **<u>The tissues and organs of the human digestive system,</u>**	**<u>The relationship between health and disease</u>** **<u>How the body maintains a stable internal environment</u>** Non-communicable diseases <u>the impact of lifestyle factors on the incidence of non-communicable diseases</u> Communicable diseases including STIs in humans (including HIV/AIDs) Bacteria, viruses and fungi as pathogens in animals and plants	

		examples of antagonistic muscles The structure and functions of the gas exchange system in humans The mechanism of breathing to move air in and out of the lungs, using a pressure model to explain the movement of gases, including simple measurements of lung volume	Reproduction in plants, including flower structure, wind and insect pollination, fertilisation, seed and fruit formation and dispersal, including quantitative investigation of some dispersal mechanisms plants Making carbohydrates in leaves by photosynthesis and gaining mineral nutrients and water from the soil via roots the role of leaf stomata in gas exchange in plants	**including adaptations to function and how the digestive system digests food (enzymes simply as biological catalysts)** The importance of bacteria in the human digestive system The effects of recreational drugs (including substance misuse) on behaviour, health and life processes The consequences of imbalances in the diet, including obesity, starvation and deficiency diseases The impact of exercise, asthma and smoking on the human gas exchange system	**Body defences against pathogens and the role of the immune system against disease reducing and preventing the spread of infectious diseases in animals and plants** The process of discovery and development of new medicines **The relationship between the structure and functions of the human circulatory system** Nervous coordination and control in humans the structure and function of the human nervous system the structure and function in a reflex arc Hormonal coordination and control in humans Hormones in human reproduction, hormonal and non-hormonal methods of contraception Homeostasis **The need for transport systems in multicellular organisms, including plants**	
	NC/Spec coverage	**NC/Spec coverage** •the fundamental units of living organisms are cells, which may be part of highly adapted structures including tissues, organs and organ systems, enabling life processes to be performed more effectively				
Understanding of how	Living things are classified into broad groups according to	The variation between individuals within a species being continuous or	Interdependence of organisms in an ecosystem,	**Photosynthesis as the key process for "food production" and therefore biomass for life**		How the genome and environment influence the

organisms interact with each other and with their environment	common observable characteristics and based on similarities and differences, including microorganisms, plants and animals Give reasons for classifying plants and animals based on specific characteristics. Recognise that living things have changed over time and that fossils provide information about living things that inhabited the Earth millions of years ago Recognise that living things produce offspring of the same kind, but normally offspring vary and are not identical to their parents Identify how animals and plants are adapted to suit their environment in different ways and that adaptation may lead to evolution.	discontinuous, to include measurement and graphical representation of variation Heredity as the process by which genetic information is transmitted from one generation to the next A simple model of chromosomes, genes and DNA in heredity, including the part played by Watson, Crick, Wilkins and Franklin in the development of the DNA model differences between species	including food webs and insect pollinated crops Importance of plant reproduction through insect pollination in human food security How organisms affect, and are affected by, their environment, including the accumulation of toxic materials	**the process of photosynthesis (symbol equations)**		development of the phenotype of an organism The potential impact of genomics on medicine The genome as the entire genetic material of an organism Most phenotypic features being the result of multiple, rather than single genes Single gene inheritance and single gene crosses with dominant and recessive phenotypes Sex determination in humans Genetic variation in populations of a species The process of natural selection leading to evolution The evidence for evolution Developments in biology affecting classification Selective breeding of plants and animals in agriculture The uses of modern biotechnology including gene technology Some practical and ethical considerations of modern biotechnology

						Levels of organization within an ecosystem Some abiotic and biotic factors which affect communities; The importance of interactions between organisms in a community The variation between individuals within a species being continuous or discontinuous, to include measurement and graphical representation of variation The variation between species and between individuals of the same species meaning some organisms compete more successfully, which can drive natural selection Changes in the environment which may leave individuals within a species, and some entire species, less well adapted to compete successfully and reproduce, which in turn may lead to extinction The importance of maintaining biodiversity and the use of gene banks to preserve hereditary material How materials cycle through abiotic and biotic components of ecosystems The role of microrganisms (decomposers) in the cycling

						of materials through an ecosystem Organisms are interdependent and are adapted to their environment The importance of biodiversity Methods of identifying species and measuring distribution, frequency and abundance of species within a habitat Positive and negative human interactions with ecosystems
	NC/Spec coverage	NC/Spec coverage •living organisms are interdependent and show adaptations to their environment •the chemicals in ecosystems are continually cycling through the natural world •the characteristics of a living organism are influenced by its genome and its interaction with the environment •evolution occurs by the process of natural selection and accounts both for biodiversity and how organisms are all	**NC/Spec coverage** •living organisms may form populations of single species, communities of many species and ecosystems, interacting with each other, with the environment and with humans in many different ways •living organisms are interdependent and show adaptations to their environment •the characteristics of a living organism are influenced by its genome and its interaction with the environment	**NC/Spec coverage** •living organisms are interdependent and show adaptations to their environment •the characteristics of a living organism are influenced by its genome and its interaction with the environment	**NC/Spec coverage** •living organisms are interdependent and show adaptations to their environment •the characteristics of a living organism are influenced by its genome and its interaction with the environment	**NC/Spec coverage** •living organisms may form populations of single species, communities of many species and ecosystems, interacting with each other, with the environment and with humans in many different ways •the characteristics of a living organism are influenced by its genome and its interaction with the environment •living organisms are interdependent and show adaptations to their environment •evolution occurs by the process of natural

		related to varying degrees	•evolution occurs by the process of natural selection and accounts both for biodiversity and how organisms are all related to varying degrees			selection and accounts both for biodiversity and how organisms are all related to varying degrees
Understanding of how to structure scientific investigations		Explaining every day and technological applications of science Understand that scientific methods and theories develop as earlier explanations are modified To take account of new evidence and ideas Ask questions based on observations of the real world Identifying independent, dependent and control variables Make/record observations and measurements interpret observations and data to draw conclusions Evaluate the reliability of methods	Explaining every day and technological applications of science Making decisions based on the evaluation of evidence and arguments Ask questions and develop a line of enquiry based on observations of the real world Make/record observations and measurements with a range of methods Apply mathematical concepts and calculate results Evaluate the reliability of methods and suggest possible improvements	Explaining every day and technological applications of science Recognising the importance of communication of results to a range of audiences Considering ethical issues which may arise Planning experiments to make observations, test hypotheses or explore phenomena make and record observations and measurements using a range of apparatus and methods Interpret observations and data to draw conclusions Identify further questions arising from their results evaluating risks in practical science	Explaining every day and technological applications of science Evaluating associated personal, social, economic and environmental implications Evaluating risks in the wider societal context, including perception of risk Pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility Using scientific theories and explanations to develop hypotheses Make predictions using scientific knowledge and understanding Applying a knowledge of a range of techniques, apparatus and materials to select those appropriate for experiments Independently make and record observations and measurements using a range of methods for different investigations	Explaining every day and technological applications of science Appreciating the power and limitations of science Recognising the importance of peer review of results Using scientific theories and explanations to develop hypotheses Make predictions using scientific knowledge and understanding Select, plan and carry out the most appropriate types of scientific enquiries to test predictions Applying a knowledge of a range of techniques, apparatus, and materials to select those appropriate both for fieldwork and for experiments Consider the accuracy of measurements Be aware of health and safety considerations

					Evaluating methods and suggesting possible improvements and further investigations Recognising when to apply a knowledge of sampling techniques to ensure any samples collected are representative Present observations and data using appropriate methods, including tables and graphs Translating data from one form to another	Present reasoned explanations in relation to predictions and hypotheses Evaluate data showing awareness of potential sources of random and systematic error carry out and represent mathematical and statistical analysis Represent distributions of results and making estimations of uncertainty Communicate the scientific rationale for investigations, including the methods used, the findings and reasoned conclusions, using paper-based and electronic reports and presentations
	NC/Spec coverage	**NC/Spec coverage** Through the content across all three disciplines, students should be taught so that they develop understanding and first-hand experience of working scientifically				
Having a good grasp of numerical, analytical and literacy skills in order to communicate scientific ideas effectively	Apply mathematical concepts and calculate results Present observations and data using appropriate methods, including tables and graphs	Developing their use of scientific vocabulary Recognise SI units Use simple equations	Developing their use of scientific vocabulary Use SI units Use simple equations + carry out appropriate calculations Undertake basic data analysis	Developing their use of scientific vocabulary Use IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature Derive simple equations Carry out simple statistical techniques Recognising the importance of scientific quantities using SI units unless inappropriate Using prefixes and powers of ten for orders of magnitude	Developing their use of scientific vocabulary Recognising the importance of scientific quantities using SI units unless inappropriate and changing them accordingly Using prefixes and powers of ten for orders of magnitude using an appropriate number of significant figures in calculations for both large and small numbers	Developing their use of scientific vocabulary Through the content across all three disciplines, students should be taught so that they develop understanding and first-hand experience of working scientifically

				using an appropriate number of significant figures in calculations		
	NC/Spec coverage	**NC/Spec coverage** Through the content across all three disciplines, students should be taught so that they develop understanding and first-hand experience of working scientifically				