KS4 GCSE Biology – AQA Foundation – Year 11

		HT1 COMMUNICABLE DISEASES	HT2 BIOENERGETICS	HT3 TROPHIC LEVELS	HT4 BIODIVERSITY & FOOD SECURITY	HT5 REVISION	HT6 REVISION
Learning outcomes/composite knowledge: Pupils will be able to…		**LO1:** Communicable diseases **LO2:** Vaccines **LO3:** Antibiotics	**LO1:** Photosynthesis **LO2:** Rate of photosynthesis **LO3:** Aerobic vs anaerobic respiration	**LO1:** Ecosystem factors vs adaptations **LO2:** Food chains vs trophic levels **LO3:** Carbon vs water vs nitrogen cycle	**LO1:** Waste management **LO2:** Maintaining biodiversity **LO3:** Food security	Exams	Exams
Knowledge Components	Summative Component Knowledge:	**Know that communicable diseases are infectious diseases caused by pathogens.** **Know that pathogens may be viruses, bacteria, protists or fungi. They may infect plants or animals.** **Know that pathogens can be spread by direct contact, by water or by air.** **Know the methods people can use in their daily lives to reduce the spread of diseases.** **Know that in schools a maximum incubation temperature of 25ºC is used to reduce the risk of growing pathogens that might be harmful to humans.** **Know some common viral, bacterial and fungal diseases in humans**	**Know the photosynthetic reaction** **Know that the rate of photosynthesis may be limited by: low temperature, shortage of CO_2, shortage of light, shortage of chlorophyll.** **Know that the factors that can limit the rate of photosynthesis are called limiting factors.** **Know that limiting factors are important economically in greenhouses.** **Know that glucose produced in photosynthesis may be: used for respiration, converted into starch for storage, used to produce fats and oils for storage or cellulose to strengthen cell walls** **used to produce amino acids for protein synthesis** **Know that respiration is an exothermic reaction.**	**Know that traditionally organisms have been classified into groups depending on their structure and characteristics.** **Know that organisms were classified into smaller and smaller groups.** **Know that Carl Linnaeus studied the similarities and differences between organisms to classify them. He developed the binomial system to name organisms by genus and species.** **Know that Carl Woese developed the three domain system to classify organisms as: Archaea (primitive bacteria), Bacteria (true bacteria) and Eukaryota (protists, fungi, plants and animals).** **Kow that biotic factors are living factors that can affect a community.**	**Know that biodiversity is the variety of all life on Earth.** **Know that great biodiversity ensures stability of ecosystems.** **Know that the future of the human species relies on us maintaining a good level of biodiversity.** **Know that human activities can reduce biodiversity and we should try to stop this.** **Know that rapid growth in the human population means more resources are used and more wastes are produced, which could lead to more pollution.** **Know that pollution kills plants and animals which can reduce biodiversity.** **Know that waste may pollute water with sewage, fertilisers or toxic chemicals.**		

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		Know that viral diseases include measles and AIDS, which is caused by HIV. Know that viral disease cannot be treated with antibiotics. Know that bacterial diseases include salmonella food poisoning and the sexually transmitted disease gonorrhoea. Know that humans can also be infected with fungal diseases. Know that malaria is caused by a protist transmitted by mosquitos. Know that the spread of malaria is controlled by preventing the vectors (mosquitos) from breeding and by using mosquito nets to avoid being bitten. Know that the body defends itself against the entry of pathogens. Know that bacteria may produce toxins that make us feel ill and damage tissues. Know that viruses live and reproduce inside cells, causing damage. Know that the immune system tries to destroy pathogens that enter the body.	Know that organisms need energy for chemical reactions, movement and to keep warm. Know that during aerobic respiration glucose and oxygen react to release energy. Know that anaerobic respiration is the incomplete oxidation of glucose so less energy is released than in aerobic respiration. Know that anaerobic respiration in yeast cells is called fermentation and has economic importance in the manufacture of bread and alcoholic drinks. Know that during exercise the heart and breathing rates increase and breath volume increases to supply oxygen to muscle cells faster. Know that muscle cells can respire anaerobically if there is insufficient oxygen. This produces lactic acid and creates an oxygen debt. Know that lactic acid can cause muscle fatigue. The	Know that abiotic factors are non-living factors which can affect a community. Know that organisms have adaptations for survival, they may be structural, behavioural or functional. Know that extremophiles can survive in very extreme environments, such as high temperature or pressure, or in high salt concentration. Know that a food chain begins with a producer which synthesises, molecules. Know that producers are eaten by consumers. Know that consumers that eat other animals are predators, and those eaten are prey. Know that in a stable community the numbers of predators and prey rise and fall in cycles. Know that organisms obtain food as producers, consumers or decomposers. Know that producers are mostly plants and algae. They transfer about 1% of	Know that waste may pollute air with smoke and gases such as sulphur dioxide, which contributes to acid rain. Know that waste may pollute land with toxic chemicals such as pesticides and herbicides, which may be washed from the land into water. Know that humans reduce the amount of land available for other plants and animals by building, quarrying, farming and dumping waste. Know that the destruction of peat bogs to produce compost releases carbon dioxide into the atmosphere. It destroys habitats and reduces biodiversity. Know that large scale deforestation occurs to: provide land for cattle and rice fields to provide more food and grow crops from which biofuel can be produced. Know that the destruction of large areas of trees has: increased the release of carbon dioxide by burning and microbial activity, reduced the rate at which carbon dioxide is removed		

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		Know that a vaccine contains a small amount of dead or inactive pathogens. These stimulate white blood cells to produce antibodies. Know that immunity allows a person to produce specific antibodies quickly to prevent infection. Know that if a large proportion of the population is immune to a pathogen, the spread of the pathogen is very much reduced.	cells stop contracting efficiently. Know that when exercise stops, the oxygen debt must be repaid by continuing to breathe deeply. Know that blood transports lactic acid to the liver where it is converted back into glucose. Know that the oxygen debt is the amount of oxygen needed to oxidise lactic acid. Know that metabolism means all the chemical reactions happening in a living organism. Know that metabolism includes: the conversion of glucose to starch, glycogen and cellulose, the formation of lipids, the formation of amino-acids and proteins, respiration the breakdown of excess proteins to form urea for excretion	incident light for photosynthesis. Know that consumers include herbivores, carnivores and omnivores. Know that decomposers break down dead plant and animal matter. Know that he stages in a food chain are called trophic levels. Know that only about 10% of the biomass at each trophic level is transferred to the level above. Know that materials are recycled to provide the building blocks for future organisms. Know that the main processes involved in recycling carbon in the carbon cycle. Know the main processes in the water cycle. Know that the decay cycle returns carbon to the atmosphere as carbon dioxide and mineral ions to the soil. Know the factors which affect the rate of decay of organic matter.	from the atmosphere by photosynthesis to be 'locked up' in wood led to a reduction in biodiversity. Know that levels of carbon dioxide and methane in the atmosphere are increasing and contribute to 'global warming'. Know that consequences of global warming include: loss of habitat when low lying areas flood, changes in the distribution of species where temperature of rainfall changes, changes in migration patterns. Know that programmes have been put in place to reduce the negative effects on ecosystems and biodiversity. Know that environmental changes affect the distribution of species in an ecosystem. Know the factors affecting food security. Know that new ways must be found to feed all people without endangering the ecological balance of the planet.		

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				Know that compost provides gardeners and farmers with a natural fertiliser for plants and crops. Know that anaerobic decay produces methane gas. Know that biogas generators can produce methane which can be used as a fuel.	Know the efficiency of food production can be improved by restricting energy transfer from food animals. Know that battery chickens and calves raised in pens are examples of 'factory farming'. Know that fish grown in cages can be fed high protein food and have restricted movement. Know that there are moral and ethical objections to some 'factory farming' techniques. Know that modern biotechnology techniques enable large quantities of microorganisms to be cultured in industrially controlled vats for food or medical purposes. Know that the fungus Fusarium is useful for producing mycoprotein, a protein-rich food suitable for vegetarians. Know that GM crops could provide more food or food with improved nutritional value, eg Golden rice.		
	Disciplinary Component	Know how to plan and carry out a safe investigation.	Know the word and symbol equation for photosynthesis.	Know how quantitative data on the distribution and abundance of	Know how to interpret graphs and tables to make predictions		

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	Knowledge:	**Know how scientific methods and applications develop over time. Evaluate personal, social and economic implications of antibiotics.** **Know how to evaluate risks related to vaccinations.**	**Know how to investigate the effect of light intensity on the rate of photosynthesis using an aquatic organism such as pondweed.** **Know the word and symbol equation for aerobic respiration.** **Know the word equation for anaerobic respiration in muscle cells.** **Know the symbol equation for anaerobic respiration in some plant and yeast cells.** **Know how to carry out the test and interpret the results. Recall test for oxygen.** **Know how to interpret results of test and relate to photosynthesis equation.** **Know how to amend the method to measure rate of photosynthesis.** **Know how to use a model to embed understanding of process.**	**organisms can be obtained by: random sampling with quadrats and sampling along a transect.(sampling)** **Know that today powerful microscopes are used to see internal structures. This and biochemical analysis has led to new classification systems.** **Know how feeding relationships and energy transfer can be represented by food chains.** **Know how pyramids of biomass can be constructed to represent the relative amount of biomass at each level in a food chain.**	**Know how to write a conclusion based on results.**		
National Curriculum reference		Communicable diseases including sexually transmitted infections in humans (including HIV/AIDs)	Photosynthesis as the key process for food production and therefore biomass for life	Levels of organisation within an ecosystem Some abiotic and biotic factors which affect	Organisms are interdependent and are adapted to their environment		

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	Non-communicable diseases Bacteria, viruses and fungi as pathogens in animals and plants 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 process of photosynthesis Factors affecting the rate of photosynthesis. The importance of cellular respiration; the processes of aerobic and anaerobic respiration	communities; the importance of interactions between organisms in a community How materials cycle through abiotic and biotic components of ecosystems The role of microorganisms (decomposers) in the cycling of materials through an ecosystem	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		
Common misconceptions	Pupils often think that antibiotics kill viruses.	Pupils often think that respiration does not occur in plants.	Pupils often use 'independent' and 'dependent' variables interchangeably.	Pupils don't often associate monocultures to a reduction in food security.		
Exemplar Composite Task(s)	**LO1:** Define the term pathogen and state the four main groups of pathogen. **LO2:** Explain how the immune system defends against disease. **LO3:** Plan and carry out a safe investigation into the effect of disinfectants or antibiotics on bacterial growth.	**LO1:** Explain why photosynthesis is important for the survival of other organisms. **LO2:** Required practical 4: investigate a factor that affects the rate of photosynthesis. **LO3:** Explain why anaerobic respiration is less efficient than aerobic respiration.	**LO1:** Measure the population size of a common species in a habitat. **LO2:** Construct and interpret pyramids of biomass from data. **LO3:** Required practical: investigate the effect of temperature on the rate of decay of fresh milk by measuring PH change.	**LO1:** Interpret graphs showing human population growth. **LO2:** Explain and evaluate conflicting pressures on maintaining biodiversity. **LO3:** Interpret population and food production statistics to evaluate food security.		