Yearly learning steps: Science (Biology)

The grade descriptors given here are indicative only. Please see the mastery learning goal sheets and PLCs for more detailed content.

Biology			
Year	**Subject content and skills**	**Working scientifically**	**Assessments**
7	**Grade 1**: Know that there is variation between individuals and that some is caused by gens, some by the environment and some by a combination of both. Know that the menstrual cycle prepares the female body for pregnancy and stops if fertilisation occurs. Know the roles of the human skeleton. Know that an organism is structured from cell to organ system. **Grade 2**: Know that variation between individuals is important for the survival of a species. The development of the foetus depends on the internal environment provided by the mother. Describe the role of antagonistic pairs of muscles. Describe the function of the major parts of a plant and animal cell **Grade 3**: Plot bar charts and line graphs to shoe continuous and discontinuous data. Use a diagram to show stages in development of a foetus. Use a diagram to explain the function of an antagonistic pair of muscles. Explain how to use a microscope of identify and compare cells **Grade 4**: Explain how variation helps a particular species in a changing environment Describe likely causes of low fertility in males and females. Explain how the structure of a part of the skeleton is related to its function. Suggest which tissue a cell comes from based on its features.	**Grade 1**: Make and record observations and measurements using a range of apparatus and methods **Grade2**: Carry out experiments appropriately having due regard to the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations. Use scientific vocabulary, terminology and definitions, including SI units **Grade3**: Apply the cycle of collecting, presenting and analysing data, including observation, analysis, interpretation and communication. Recognise the importance of scientific quantities and understand how they are determined. Use prefixes and powers of ten for orders of magnitude **Grade 4**: Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena. Recognise when to apply a knowledge of sampling techniques to ensure any samples collected are representative. Use an appropriate number of significant figures in calculations.	One end of topic test and levelled task per unit.

8	**Grade2**: Know that organisms in a food web depend on each other and that changes in one affects another. Know that plants reproduce sexually to produce seeds. Describe, in simple terms, the process of gas exchange. Describe, in simple terms, the role of the digestive system. **Grade 3**: Explain the effect of changes in the environment and toxic materials on the population of a species. Identify the parts of a flower and link their structure to their function. Explain how exercise, smoking and asthma affect the gas exchange system. Describe the possible health effects of an unbalanced diet. **Grade 4**: combine food chains to form a food web. Explain why seed dispersal is important to the parent plant ant to its offspring. Explain how different parts of the gas exchange system are adapted for their function. Explain how the structure of different parts of the digestive system are related to their function. **Grade 5**: Suggest what might happen if an unfamiliar species is added to a food web. Describe the similarities and differences between seed pollinated and wind pollinated plants. Predict how a change in the gas exchange system could affect other parts of the body. Design a diet for a person with a specific dietary need.	**Grade2**: Carry out experiments appropriately having due regard to the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations. Use scientific vocabulary, terminology and definitions, including SI units **Grade3**: Apply the cycle of collecting, presenting and analysing data, including observation, analysis, interpretation and communication. Recognise the importance of scientific quantities and understand how they are determined. Use prefixes and powers of ten for orders of magnitude **Grade 4**: Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena. Recognise when to apply a knowledge of sampling techniques to ensure any samples collected are representative. Use an appropriate number of significant figures in calculations **Grade 5**: Understand how scientific methods and theories develop over time. Use scientific theories and explanations to develop hypotheses. Evaluate methods and suggest possible improvements and further investigations. Interconvert units. Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment	One end of topic test and levelled task per unit.
9	**Grade 2**: Know, in simple terms, the difference between aerobic and anaerobic respiration. Know that plants have specially adapted organs to obtain the raw materials needed	**Grade2**: Carry out experiments appropriately having due regard to the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations.	One end of topic test and levelled task per unit.

	for photosynthesis. Describe in simple terms, the meaning of evolution and biodiversity. Describe, in simple terms, the structure of DNA.	Use scientific vocabulary, terminology and definitions, including SI units	
	Grade 3: Use work equations to describe aerobic an anaerobic respiration. Use a work equation to describe photosynthesis in plants and algae. Use data to explain why a species has become extinct, or adapted to a changing environment. Use a diagram to show how genes are inherited.	**Grade3**: Apply the cycle of collecting, presenting and analysing data, including observation, analysis, interpretation and communication. Recognise the importance of scientific quantities and understand how they are determined. Use prefixes and powers of ten for orders of magnitude	
	Grade 4: Explain how specific activities involve aerobic and anaerobic respiration. Explain why other organisms are dependent on photosynthesis. Explain how a lack of biodiversity can affect an ecosystem. Explain why offspring usually look similar, but not identical to their parents.	**Grade 4**: Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena. Recognise when to apply a knowledge of sampling techniques to ensure any samples collected are representative. Use an appropriate number of significant figures in calculations	
	Grade 5: Explain similarities and differences between aerobic and anaerobic respiration. Suggest how particular conditions could affect plant growth. Predict and explain the changes in a population over time, due to natural selection. Suggest arguments for and against genetic modification	**Grade 5**: Understand how scientific methods and theories develop over time. Use scientific theories and explanations to develop hypotheses. Evaluate methods and suggest possible improvements and further investigations. Interconvert units. Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment	
	Grade 6: Explain how organisms living in different conditions use respiration to get their energy. Suggest reasons for particular adaptations of leaves, roots and stems. Evaluate ways of preserving plant and animal materials for future generations. Describe fertilisation, gamete production and cell replication in terms of the number of chromosomes.	**Grade 6**: Evaluate risks both in practical science and the wider societal context, including perception of risk in relation to data and consequences. Recognise the importance of peer review of results and of communicating results to a range of audiences.	

10	**Grade3**: Describe in simple terms, the structure and function of common biological structures and systems. For example eukaryotic and prokaryotic cells, plant structure and, the digestive system and reflexes. **Grade4**: Describe in detail complex biological systems, for example the heart, brain, eye and reproductive system in humans **Grade 5**: Describe in detail complex biological systems and begin to link their structure to their function. For example the links between leaf structure and photosynthesis, enzyme structure and function and human responses to infection and disease. **Grade6**: Explain in detail complex biological processes, for example diffusion and osmosis, vaccination and immunity, homeostasis and growth and differentiation **Grade7**: Evaluate complex biological interactions, for example the effects of diet exercise and disease on the body, the development of new drugs and factors which affect aerobic and anaerobic respiration.	**Grade3**: Apply the cycle of collecting, presenting and analysing data, including observation, analysis, interpretation and communication. Recognise the importance of scientific quantities and understand how they are determined. Use prefixes and powers of ten for orders of magnitude **Grade 4**: Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena. Recognise when to apply a knowledge of sampling techniques to ensure any samples collected are representative. Use an appropriate number of significant figures in calculations **Grade 5**: Understand how scientific methods and theories develop over time. Use scientific theories and explanations to develop hypotheses. Evaluate methods and suggest possible improvements and further investigations. Interconvert units. Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment **Grade 6**: Evaluate risks both in practical science and the wider societal context, including perception of risk in relation to data and consequences. Recognise the importance of peer review of results and of communicating results to a range of audiences. **Grade 7**: Explain everyday and technological applications of science; evaluate associated personal, social, economic and environmental implications; and make decisions based on the evaluation of evidence and arguments.	End of topic tests and mock exams in years 10 and 11.

	Grade8: Make informed suggestions and predictions about complex ethical issues, for example, stem cell research, use of monoclonal antibodies, organ transplants and contraception/ fertility treatments.	**Grade 8**: Use a variety of models such as representational, spatial, descriptive, computational and mathematical to solve problems, make predictions and to develop scientific explanations and understanding of familiar and unfamiliar facts.	
11	**Grade3**: Describe in simple terms, the structure and function of common biological structures and systems. For example the structure of DNA, feeding relationships and animal adaptation **Grade4**: Describe in detail complex biological systems, for example the carbon cycle, competition in animals and plants and the genome and inheritance. **Grade 5**: Describe in detail complex biological systems and begin to link their structure to their function. For example types of reproduction, fossils and extinction and adaptation in animals and plants. **Grade6**: Explain in detail complex biological processes, for example global warming, evolution, inheritance and genetics and antibiotic resistance in bacteria.	**Grade3**: Apply the cycle of collecting, presenting and analysing data, including observation, analysis, interpretation and communication. Recognise the importance of scientific quantities and understand how they are determined. Use prefixes and powers of ten for orders of magnitude **Grade 4**: Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena. Recognise when to apply a knowledge of sampling techniques to ensure any samples collected are representative. Use an appropriate number of significant figures in calculations **Grade 5**: Understand how scientific methods and theories develop over time. Use scientific theories and explanations to develop hypotheses. Evaluate methods and suggest possible improvements and further investigations. Interconvert units. Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment **Grade 6**: Evaluate risks both in practical science and the wider societal context, including perception of risk in relation to data and consequences. Recognise the importance of peer review of results and of communicating results to a range of audiences.	End of topic tests and mock exams in years 10 and 11.

	Grade7: Evaluate complex biological interactions, for example DNA structure and protein synthesis, energy transfers in food chains and food webs and genetic engineering. **Grade8:** Make informed suggestions and predictions about complex ethical issues, for example genetic engineering and cloning, global warming and screening for genetic disorders. **Grade 9:** Evaluate complex and novel information and apply to new contexts. For example, in relation to environmental changes and genetics.	**Grade 7**: Explain everyday and technological applications of science; evaluate associated personal, social, economic and environmental implications; and make decisions based on the evaluation of evidence and arguments. **Grade 8**: Use a variety of models such as representational, spatial, descriptive, computational and mathematical to solve problems, make predictions and to develop scientific explanations and understanding of familiar and unfamiliar facts. **Grade 9**: Appreciate the power and limitations of science and consider any ethical issues which may arise.	