Intent, sequencing, and narrative thread

Department: Science: biology

What is the **intent statement** for you subject? What does the **discipline offer** young people? What is the subject's **purpose**? This should be a short, snappy statement.	
	Students in science will gain a broad understanding and curiosity of past, present and future concepts in each of the three scientific disciplines. The curriculum is delivered in a creative and innovative way by subject specialists. We understand that not all students will go on to become the next Einstein; the scientific community is made of those who appreciate science at all levels. Therefore, our biology curriculum at TCS aims to inspire those who wish to work within the discipline of science in our local community (such as nurses) as well as the wider community (such as vaccine production).
What are the **core aims** of the curriculum? What **key knowledge** do you want students to have at the end of their learning journey?	
Year 7	**Core Aims:** The principal focus of science teaching in the whole of key stage 3 is to develop a deeper understanding of a range of scientific ideas in the subject disciplines of biology, chemistry and physics. Students should begin to see the connections between these subject areas and become aware of some of the big ideas underpinning scientific knowledge and understanding. Examples of these big ideas are the links between structure and function in living organisms, the particulate model as the key to understanding the properties and interactions of matter in all its forms, and the resources and means of transfer of energy as key determinants of all of these interactions. Students are encouraged to relate scientific explanations to phenomena in the world around them and start to use modelling and abstract ideas to develop and evaluate explanations. Students should understand that science is about working objectively, modifying explanations to take account of new evidence and ideas and subjecting results to peer review. Students should decide on the appropriate type of scientific enquiry to undertake to answer their own questions and develop a deeper understanding of factors to be taken into account when collecting, recording and processing data. They should evaluate their results and identify further questions arising from them. Students should develop their use of scientific vocabulary, including the use of scientific nomenclature and units and mathematical representations. Through the content across all three disciplines, students are taught to: • pay attention to objectivity and concern for accuracy, precision, repeatability and reproducibility • understand that scientific methods and theories develop as earlier explanations are modified to take account of new evidence and ideas, together with the importance of publishing results and peer review • evaluate risks • ask questions and develop a line of enquiry based on observations of the real world, alongside prior knowledge and experience • make predictions using scientific knowledge and understanding

- select, plan and carry out the most appropriate types of scientific enquiries to test predictions, including identifying independent, dependent and control variables
- use appropriate techniques, apparatus, and materials during fieldwork and laboratory work, paying attention to health and safety
- make and record observations and measurements using a range of methods for different investigations; and evaluate the reliability of methods and suggest possible improvements
- apply sampling techniques
- apply mathematical concepts and calculate results
- present observations and data using appropriate methods, including tables and graphs
- interpret observations and data, including identifying patterns and using observations, measurements and data to draw conclusions
- present reasoned explanations, including explaining data in relation to predictions and hypotheses
- evaluate data, showing awareness of potential sources of random and systematic error
- identify further questions arising from their results
- understand and use SI units and IUPAC (International Union of Pure and Applied Chemistry) chemical nomenclature
- use and derive simple equations and carry out appropriate calculations
- undertake basic data analysis including simple statistical techniques

Key knowledge:	**Key skills:**
7Sci - Intro into science	• Basics in experimental design • Measuring • Recording data • Presenting data
7B1 - Cells and movement	• State organelles and their function of animal and plant cells. • Safe handling of a microscope. • Describe structure and function of skeleton and muscles.
7B2 - Digestion and breathing	• State function of all organs in digestive and circulatory system. • Explain why certain nutrients are needed in a balanced diet. • Describe how nutrients are removed from intestine and how gas exchange occurs using a pressure model.

	7B3 - Ecosystems	• Explain interdependence using food webs. • Describe how toxins can accumulate. • Describe photosynthesis and explain the dependence of almost all life on photosynthetic organisms.

Year 8	**Core aims:**	
	See above for KS3 aims	
	Key knowledge:	**Key skills:**
	8B1 - Reproduction	• State name and function of parts of the male and female reproductive system. • State name and function of parts of flowers.
	8B2 - Variation and evolution	• Describing and graphing continuous and discontinuous data. • Model the role of genes and chromosomes in heredity
	8Sci Science investigations	• Design investigations using the key experimental skills learned throughout the year.

Year 9	**Core aims:**

	See above for KS3 aims	
	Key knowledge:	**Key skills:**
	9B1 – Cells	• Builds on Cells and Movements unit in KS3 • Calculate magnification. • State function and use of stem cells
	9B2.1 – Organisation (digestion)	• Use quantitative methods for recording enzymatic digestion. • Qualitatively explore the nutrients present in food.
	9B2.2 - Organisation (heart and health)	• Describe how cancer can develop. • Interpret graphical representations of health statistics.

	Core aims:
Year 10	The principal focus of science teaching in the whole of key stage 4 is to further develop the range of scientific ideas in the subject disciplines of biology, chemistry and physics introduced at key stage 3. They build on the big ideas and discover more depth to the abstract theories. Examples would be explaining how cells are able to differentiate into multiple types and eventually new organisms, how the movement of electrons dictates the properties of chemical reactions and the resulting products, and the mathematical models that underpin energy and forces. Students continue to develop their use of scientific vocabulary, including the use of scientific nomenclature and units and mathematical representations. Through the content across all three disciplines, students are taught to: • Understand how scientific methods and theories develop over time. • 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. • Appreciate the power and limitations of science and consider any ethical issues which may arise. • 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.

	• 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. • Use scientific theories and explanations to develop hypotheses. • Plan experiments or devise procedures to make observations, produce or characterise a substance, test hypotheses, check data or explore phenomena. • Apply a knowledge of a range of techniques, instruments, apparatus, and materials to select those appropriate to the experiment. • Carry out experiments appropriately having due regard for the correct manipulation of apparatus, the accuracy of measurements and health and safety considerations. • Recognise when to apply a knowledge of sampling techniques to ensure any samples collected are representative. • Make and record observations and measurements using a range of apparatus and methods. • Evaluate methods and suggest possible improvements and further investigations. • Presenting observations and other data using appropriate methods. • Translating data from one form to another. • Carrying out and represent mathematical and statistical analysis. • Representing distributions of results and make estimations of uncertainty. • Interpreting observations and other data (presented in verbal, diagrammatic, graphical, symbolic or numerical form), including identifying patterns and trends, making inferences and drawing conclusions. • Presenting reasoned explanations including relating data to hypotheses. • Being objective, evaluating data in terms of accuracy, precision, repeatability and reproducibility and identifying potential sources of random and systematic error. • Communicating the scientific rationale for investigations, methods used, findings and reasoned conclusions through paper-based and electronic reports and presentations using verbal, diagrammatic, graphical, numerical and symbolic forms. • Use scientific vocabulary, terminology and definitions. • Recognise the importance of scientific quantities and understand how they are determined. • Use SI units (eg kg, g, mg; km, m, mm; kJ, J) and IUPAC chemical nomenclature unless inappropriate. • Use prefixes and powers of ten for orders of magnitude (eg tera, giga, mega, kilo, centi, milli, micro and nano). • Interconvert units. • Use an appropriate number of significant figures in calculation.	
	Key knowledge:	**Key skills:**
	10B3 – Infection and response	• Describe how pathogens infect animals and plants. • Explain how vaccines can produce an immune response.

	10B4 – Bioenergetics	• Measure photosynthesis in an aquatic plant species. • Investigate how glucose is used by plants. • Explain how tissues of a leaf are adapted for photosynthesis.
	10B5 – Homeostasis	• Describe how nerves and hormones can coordinate and control the human internal environment. • Interpret graphical data about hormone levels in the body

Year 11	**Core aims:**	
	See Key Stage 4 aims	
	Key knowledge:	**Key skills:**
	11B7 – Ecology	• Explain the importance of biodiversity • Collect sample data on abiotic factors affecting growth of plants.
	11B6 – Inheritance, variation and evolution	• Construct genetic diagrams to explain single gene crosses. • Explain the uses of selective breeding and modern biotechnology techniques including ethical arguments for and against.

		• Explain the theory of evolution using evidence from fossil records.