Intent, sequencing, and narrative thread

Department: Science: physics

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 physics curriculum at TCS aims to inspire those who wish to work within the discipline of science in our local community (such as radiographers) as well as the wider community (such as aeronautics).
What are the **core aims** of the curriculum? What **key knowledge** do you want students to have at the end of their learning journey?	
	Core Aims:
Year 7	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 – Introduction to science	• Basics in experimental design • Measuring • Recording data • Presenting data
7P1 – speed, gravity and space	• Interpreting distance-time graphs • Calculating gravity • Explaining how seasons manifest on earth
7P2 – energy transfers and costs	• Calculating fuel bills and costs • Describing energy changes within a closed system
7P3 – voltage and current	• Describing current, voltage and resistance in an electrical circuit. • Explaining static electricity in terms of charges.
7P4 – light and sound	• Investigating reflection, refraction and dispersion. • Describing colour in terms of frequencies of light.

Year 8	**Core aims:**

	See KS3 aims	
	Key knowledge:	**Key skills:**
	8P1 – contact forces and pressure	• Drawing force diagrams • Calculating pressure • Explaining how forces cause interact with objects
	8P2 – magnets and electromagnets	• Drawing magnetic field • Exploring the magnetic field of a current
	8P3 – work, heating and cooling	• Investigating how temperature differences lead to energy transfer • Explaining conduction, convection and radiation as methods of transfer.
	8P4 – wave effects and properties	• Investigating how waves can be added together or cancelled out • Stating the order of the EM spectrum
	8Sci Science investigations	• Design investigations using the key experimental skills learned throughout the year.

Year 9	**Core aims:**	
	See KS3 aims	
	Key knowledge:	**Key skills:**
	9P1: Energy	• Calculating kinetic, gravitational and elastic energy. • Calculating power.
	9P3: Particles	• Drawing particle diagrams to explain changes of state • Investigating and calculating the density of regular and irregular solids • Calculating energy changes involved in heating and cooling

Year 10	**Core aims:**

	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:**
	10P2: Electricity	• Measuring resistance in circuits • Drawing circuit diagrams • Calculating power transfer
	10P4: Atomic Structure	• Representing the decay of nuclei as nuclear equations • Interpreting half life graphs
	10P5: Forces part 1	• Explaining forces as vector quantities

Year 11	**Core aims:**	
	See Ks4 aims	
	Key knowledge:	**Key skills:**
	11P5: forces part 2	• Estimating speeds in everyday contexts • Calculating acceleration and work done
	11P6: waves	• Describing the uses of the EM spectrum • Calculating the speed of waves using standard form • Describing the movement of waves through different media
	11P7: Magnetism and Electromagnetism	• Exploring permanent and induced magnetic fields • Explaining how solenoids can be used to increase magnetic effects • Describe how transformers are used in the national grid
	SEPARATES ONLY 11P8: Space	• Describing the life cycle of stars.