TCEAT Curriculum & Assessment Overview: Science

Course description and overarching aims (Intent)

Scientific understanding is vital for students to understand the world around them and to drive change in the world. We have designed a curriculum that ensures students foster a sense of curiosity and creativity, whilst learning the essential aspects of scientific knowledge. Working backwards from where we wanted the students to be when they left our Trust, we have used GCSE (and, for our higher and advanced tiers, A level) criteria, as well as our understanding of what it means to be (and think like) a real world scientist to design a curriculum which builds upon prior learning, including KS1 and KS2 expected knowledge (for Year 7 and 8).

Curriculum model overview (Implementation)

Content knowledge is built upon using a spiral approach, with fundamentals of scientific understanding learnt first. Concepts are then revisited and built on with greater detail. New concepts, which require foundational understanding, are introduced later, and finally concepts requiring the linking of multiple scientific ideas are introduced. We have designed our curriculum so that both science-specific and general skills are developed through repeated experience. Each repeated encounter is in context and of increasing complexity (also a spiral approach) which supports students' cognitive load.

Three tiers and three outcomes

Our curriculum is structured so that all students can access the appropriate level of support and challenge. There are three tiers (Core, Higher, Advanced) which cover the same topics at increasing levels of challenge. All lessons have three differentiated outcomes (labelled Gold/Silver/Bronze) at KS3 and KS4. At KS5, each lesson is differentiated into three outcomes. These allow the students to have a high ownership of their learning and a sense of purposeful progression. This means not only is it possible for all students to learn the same key content, at a level appropriate to their current understanding, but it also allows students to move between tiers where appropriate. The spiral nature of the curriculum results in students having the opportunity for further developments in these topics the next time the topic is revisited.

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Example:

LESSON OUTCOMES	CORE TIER	HIGHER TIER	ADVANCED TIER
Define balanced diet	Bronze		
Recall some of the effects of an unbalanced diet	Silver	Bronze	
Describe some of the effects of an unbalanced diet	Gold	Silver	Bronze
Describe energy requirements in a healthy daily diet		Gold	Silver
Create balanced meals for a variety of people			Gold

Assessment Objectives

We have overarching objectives which summarise the skills covered, or the handling of content involved. The internal school assessment system has integrated assessment objectives so that students can be aware of and consciously work on the different strands of content and skills within the subject /course. The internal school system uses the same objectives from Year 7 to Year 13 so that students can build the habit of subject specific self-review as a continuous process from KS3 to KS5

A01 Demonstrate knowledge and understanding

This requires students to remember and understand key scientific ideas, as well as scientific techniques and procedures. This fundamental skill is the foundation to using and developing scientific knowledge both theoretical and practical. It is essential enough time is spent to ensure this knowledge is secure in students' long term memory.

A02 Apply knowledge and understanding

This requires students to apply their knowledge and understanding of scientific ideas, as well as scientific techniques and procedures. By ensuring A01 is secure, students are able to apply their knowledge to known and unknown contexts, which will set them up for future learning, employment and understand the world around them.

A03 Analyse information and ideas

This requires students to interpret and evaluate scientific knowledge, such as experimental data, to make judgements and conclusions by drawing on their knowledge and understanding (A01). This also requires students to develop and improve experimental procedures such as method writing.

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		Year 7		Year 8			
		Q1-Q3	Q4	Q1	Q2	Q3	Q4
Advanced-Higher	A01	70	60	70	60	70	60
	A02/3	30	40	30	40	30	40
Higher-Advanced	A01	70	60	70	70	70	60
	A02/3	30	40	30	40	30	40
Core-Higher	A01	70	60	70	50	70	60
	A02/3	30	40	30	50	30	40

		Year 9	Year 10	Year 11	
		Q1-Q4	Q1-Q4	Q1	Q2-Q3
Advanced	A01		50	60	40
	A02/3		50	40	60
Advanced-Higher	A01	80	50	60	40
	A02/3	20	50	40	60
Core-Higher	A01	80	50	60	40
	A02/3	20	50	40	60

		Year 12	Year 13	
		Q1-4	Q1-2	Q3
Biology	A01	60	40	33
	A02/3	40	60	67
Chemistry	A01	40	40	40
	A02/3	60	60	60
Physics	A01	35	35	35
	A02/3	65	65	65

		Year 12		Year 13
		Q1-3		Q1-3
Laboratory Science	A01	29	P01	102
	A02	40	P02	70
	A03	31	P03	41

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Knowledge:

- Substantive knowledge - all concepts, models, laws and theories of science

  - Atoms and Chemical Reactions
  - Forces and fields
  - Forces and their effects
  - Energy stores and energy transfers
  - Earth and the atmosphere
  - Space
  - Cells
  - Competition and ecosystems
  - Genetics
  - Evolution

- Disciplinary knowledge - How substantive knowledge is established through scientific enquiry:

  - Predicting cause and effect
  - Experiment design and risk assessment
  - How and why we use scientific equipment
  - Presenting, using and manipulating data
  - Drawing conclusions
  - Changing theories
  - Real world use of Science
  - Ethics and implications

- Disciplinary Literacy

  Communication of ideas is central to becoming confident with scientific knowledge. Our curriculum is designed to develop student's communication and confidence through explicit teaching of literacy and oracy; in particular tier 3 vocabulary (including root words, prefixes and suffixes), and regular use of connective, discussion, experimental write up and exam command words.

  - Increase understanding and use of subject specific vocabulary (substantive and disciplinary) including root word, prefixes and suffixes
  - Develop how to communicate their subject knowledge in written and verbal responses
  - Understand the common exam command words and how to structure their answers accordingly

Curriculum seven-year plan:

The science curriculum is designed to converge at key points throughout the academic year. Each term includes one of the three scientific disciplines, allowing students to revisit biology, chemistry and physics concepts frequently. Science students will follow *the TCEAT curriculum as mapped below:*

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	Big ideas of Science [1]	Simplified idea	Key stage 2	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13
Scientific Knowledge	All material in the Universe is made of very small particles.	Atoms and Chemical Reactions	States of matter (Y4) Properties and changes of materials (Y5)	C1 – Matter C2 - Acids and Bases	C3 – Periodic Table and reactions C4 – Chemical reactions C5 – Energy resources	C1 – Atomic structure and periodic table C2 – States of matter and mixtures C3 – Fuels and atmosphere B1 – Key concepts in Biology P3 – Particle model	C4 – Bonding and calculating mass C5 – Acids C5b - Qualitative Analysis (triple only) P5 – Electricity C6 – Metals and rates B6b – Key concepts 2 (triple only not WP)	C7 – Physical Chemistry C7b - Organic Chemistry (Triple) P7 – Radioactivity B9, C8 and P8 - Revision	M4 – Electrons, waves and photons M2 – Foundations in chemistry M3 – Periodic table and energy M4 – Core organic chemistry T4 – Materials and Chemical properties T5 – Acids/bases and chemical change T9 – Particles and radiation	M5 – Newtonian world and astrophysics M6 – Particles and medical physics M5 – Physical chemistry and transition elements M6 – Organic chemistry and analysis LSC2/LSC5 The atom/Bonding LSC3 Amount of substance LSC4 Acids
	Objects can affect other objects at a distance.	Forces and fields	Forces (Y3&5)	P1 – Forces and Space P2 - Light and Sound I2c – SA and mass investigation	P4 – Electricity and magnetism	P2 - Waves	P4 – Forces P6 – Magnetism and Electromagnetism P4b – Astronomy (triple only) P5 – Electricity	B9 and P8 - Revision	M3 – Forces and motion M4 – Electrons, waves and photons T6 – Electricity	M5 – Newtonian world and astrophysics M6 – Particles and medical physics LSP5 Magnetism and electromagnetism
	Changing the movement of an object requires a net force to be acting on it.	Forces and their effects	Forces (Y3&5)	P1 – Forces and Space	P5 - Motion	P1 – Energy	P4 – Forces P6 – Magnetism and Electromagnetism	B9 and P8 - Revision	M3 – Forces and motion T7 – Magnetism and electromagnetism	M5 – Newtonian world and astrophysics M6 – Particles and medical physics
	The total amount of energy in the Universe is always the same but energy can be transformed when things change or are made to happen.	Energy stores and energy transfers	Light (Y3&6) Sound (Y4) Electricity (Y4&6)	P2 - Light and Sound	P4 – Electricity and magnetism P3 – Heating and cooling I5 – Fuels investigation I4 – Resistance of a wire	P1 – Energy P2 – Waves C3 – Fuels and atmosphere P3 – Particle model	C4 – Bonding and calculating mass P4 – Forces P5 – Electricity B6a – Plant structures and their functions P6 – Magnetism and Electromagnetism	C7 – Physical Chemistry P7b – Waves (triple only not WP) P7 - Radioactivity B9, C8 and P8 - Revision	M3 – Forces and motion M4 – Electrons, waves and photons M3 – Periodic table and energy T8 – Waves	M5 – Newtonian world and astrophysics M6 – Particles and medical physics LSP3 Electricity LP6 Nuclear Physics
	The composition of the Earth and its atmosphere and the processes occurring within them shape the Earth's surface and its climate.	Earth and the atmosphere	Rocks (Y3) Earth and Space (Y5)	P1 – Forces and Space	C5 – Energy resources P3 – Heating and cooling	C3 – Fuels and atmosphere	P4 – Forces (triple content) B6a – Plant structures and their functions C6 – Metals and rates	P7 – Radioactivity B9, C8 and P8 – Revision	M2 – Foundations in chemistry M3 – Periodic table and energy M4 – Core organic chemistry	M6 – Particles and medical physics M5 – Physical chemistry and transition elements M6 – Organic chemistry and analysis LSC6/7 Physical chemistry LSC8 Organic Chemistry and analysis
	The solar system is a very small part of one of millions of galaxies in the Universe.	Space	Earth and Space (Y5)	P1 – Forces and Space		P2 - Waves	P4b – Astronomy (triple only)	P8 – Revision		M5 – Newtonian world and astrophysics
	Organisms are organised on a cellular basis.	Cells	Plants (Y3) Living things and their habitats (Y4)	B1 - Organs and health B2 – Reproduction	B4 – Microbiology	B1 – Key concepts in Biology B2 – Cells and control B3 – Exchange and transport in animals	B4a – Genetics B5 – Animal co-ordination, control and homeostasis B6 – Plant structures and their functions B6b – Key concepts 2 (triple only not WP)	B7 – Health and Disease B9 – Revision	M2 – Foundations in biology M3 – Exchange and transport M4 – Biodiversity, evolution and disease T1 – Cells and tissues T3 – Microbiology and immunology	M5 – Communication, homeostasis and energy Module 6 Genetics, evolution and ecosystems LSB2 Cell Structure LSB3 Respiration LSB4 Metabolic pathway
	Organisms require a supply of energy and materials for which they are often dependent on or in competition with other organisms.	Competition and ecosystems	Plants (Y3) Living things and their habitats (Y5), Animals, including humans (Y3-6)	B3 - Ecology B1 - Organs and health	B6 – Organic energy	B3 – Exchange and transport in animals	B4b – Natural selection and GMO B6 – Plant structures and their functions	B8 Ecosystems and material cycles B9 – Revision	M3 – Exchange and transport M4 – Biodiversity, evolution and disease	M5 – Communication, homeostasis and energy M6 Genetics, evolution and ecosystems LSB7 Ecosystems
	Genetic information is passed down from one generation of organisms to another.	Genetics	Plants (y3) Evolution and inheritance (Y6)	B2 - Reproduction	B5 - Genetics	B2 – Cells and control	B4a – Genetics B4b – Natural selection and GMO	B9 – Revision	M2 – Foundations in biology T2 – Genetics	M6 Genetics, evolution and ecosystems LSB5 Genetics
	The diversity of organisms, living and extinct, is the result of evolution.	Evolution	Evolution and inheritance (Y6)	B2 - Reproduction B3 - Ecology	B5 - Genetics		B4b – Natural selection and GMO	B8 Ecosystems and material cycles B9 – Revision	M4 – Biodiversity, evolution and disease	M6 Genetics, evolution and ecosystems
Scientific Skills	Science assumes that for every effect there is one or more causes, and that scientific explanations, theories and models are those that best fit the facts known at a particular time.	Predicting cause and effect Experiment design and risk assessment How and why we use scientific equipment Presenting, using and manipulating data Drawing conclusions Changing theories	Working scientifically (Y5&6)	I1 - Intro to Science I2 – Scientific method I2b – Measurements I2c – SA and mass investigation I3 – Toothpaste investigation All topics present opportunities for explicit teaching of skills	I4 – Resistance of a wire I5 – Fuels investigation All topics present opportunities for explicit teaching of skills	All topics present opportunities for explicit teaching of skills	All topics present opportunities for explicit teaching of skills	All topics present opportunities for explicit teaching of skills	All modules present opportunities for explicit teaching of skills	All modules present opportunities for explicit teaching of skills LSB1 Health and safety in the lab LSB6 Data collection and processing
	The knowledge produced by science is used in some technologies to create products to serve human ends.	Real world use of Science		All topics present opportunities for explicit teaching of skills	All topics present opportunities for explicit teaching of skills	All topics present opportunities for explicit teaching of skills	All topics present opportunities for explicit teaching of skills	All topics present opportunities for explicit teaching of skills	All modules present opportunities for explicit teaching of skills	All modules present opportunities for explicit teaching of skills LSB1 Health and safety in the lab
	Applications of science often have ethical, social, economic and political implications.	Ethics and implications		All topics present opportunities for explicit teaching of skills	All topics present opportunities for explicit teaching of skills	All topics present opportunities for explicit teaching of skills	All topics present opportunities for explicit teaching of skills	All topics present opportunities for explicit teaching of skills	All modules present opportunities for explicit teaching of skills	All modules present opportunities for explicit teaching of skills LSB1 Health and safety in the lab

1 – Harlen, W. (2010). Principles and big ideas of science education. Association for Science Education. (https://www.ase.org.uk/bigideas)

Denotes revisiting topics through review, application and extension / Denotes only taught at Ada, EF, and WP

Scientific knowledge colours, link to the most represented specialism i.e. the first big idea has content from all specialisms, with chemistry being most represented. Therefore, this 'big idea' has been linked primarily to chemistry for the purpose of this document, but all units should be reviewed .

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Year 7

B1 Organs and health
Cell structure Microscopes Organs Skeleton and movement Nutrients Healthy living Smoking and vaping Testing for biomolecules
Building on: b1 - Living things and their habitats (KS2) b3 - Animals, including humans (KS2)
Leading to: Y8 B4 - Microbiology Y9 B1 - Key concepts Y10 B6b - Key concepts 2* Y11 B7 - Health and disease

B2 Reproduction
Gametes Mammalian reproductive systems Sexual intercourse Foetal development Puberty and the menstrual cycle Plant reproduction
Building on: b1 - Living things and their habitats (KS2) b2 -Plants (KS2)
Leading to: Y8 B5 - Genetics Y9 B2 - Cells and control Y10 B4a - Genetics Y10 B5 - Animal coordination and homeostasis Y11 B7 - Health and disease

B3 Ecology
Classification Sampling techniques Predator and prey Food chains and webs Evolution by natural selection
Building on: b1 – Living things and their habitats (KS2) b4 – Evolution and inheritance (KS2)
Leading to: Y10 B4a - Genetics Y10 B4b – Natural selection and genetic modification Y11 B8 – Ecosystems and cycles

Year 8

B4 Microbiology
Cell structure Microscopes Specialised cells Microorganisms Disease Immunity Vaccination
Building on: Y7 B1 - Organs and health Y7 B2 - Reproduction
Leading to: Y9 B1 - Key concepts Y9 B2 - Cells and control Y10 B6a - Plant structures and their functions Y10 B6b - Key concepts 2* Y11 B7 - Health and disease

B5 Genetics
Variation DNA and chromosomes Inheritance Genetic crosses Sexual and asexual reproduction Cloning Selective breeding
Building on: b4 - Evolution and inheritance (KS2) Y7 B2 - Reproduction
Leading to: Y9 B2 - Cells and control Y10 B4a - Genetics Y10 B4b - Natural selection and GMO

B6 Organic energy
Photosynthesis Plant Organs Respiration Digestive system Digestion Lungs Heart Dissection Effect of exercise on the body
Building on: b2 - Plants (KS2) b3 - Animals, including humans (KS2) Y7 B1 - Organs and health Y7 B2 - Reproduction
Leading to: Y9 B3 - Exchange and transport in animals Y10 B6a - Plant structures and their functions Y10 B5 - Animal coordination and homeostasis Y11 B8 -Ecosystems and material cycles

Year 9

B1 Key concepts
Cell structure Specialised cells Microscopes Enzymes Diffusion Active transport Osmosis
Building on: Y7 B1b - Organs and health Y8 B4 - Microbiology Y8 B6 - Organic energy
Leading to: All future biology content

B2 Cells and control
Cell division Stem cells Nervous system Specialised cells Differentiation
Building on: Y7 B2 - Reproduction Y8 B4 - Microbiology Y9 B1 - Key concepts
Leading to: Y10 B4a - Genetics Y11 B7 - Health and disease

B3 Exchange and transport in animals
SA:V Circulatory system Breathing Respiration
Building on: Y7 B1b - Organs and health Y8 B6 - Organic energy
Leading to: Y10 B6 - Plants structure and their function Y10 B5 - Animal coordination and homeostasis Y11 B7 - Health and disease

Year 10

B4a Genetics
DNA structure Cell division Key genetics terms Explaining inhertiance variation mutations HGP Protein synthesis* Sexual and asexual reproduction*
Building on: Y7 B2 - Reproduction Y8 B5 - Genetics Y9 B1 - Key concepts
Leading to: Y10 B4b – Natural selection and genetic modification Y11 B7 - Health and disease

B4b Natural selection and GMO
Evolution by natural selection Human evolution Classification Selective breeding Genetic engineering Tissue culture*
Building on: Y7 B3 - Ecology Y8 B5 - Genetics Y10 B4a - Genetics
Leading to: Y11 B7 - Health and disease

B5 Animal coordination and homeostasis
Hormones Menstrual cycle Contraception **ART** Homeostasis: blood glucose concentration, thoermoregulation*, osmoregulation* Diabetes Healthy living Urinary system*
Building on: Y7 B1b - Organs and health Y7 B2 - Reproduction Y8 B6 - Organic energy Y9 B1 - Key concepts Y9 B3 - Exchange and transport in animals
Leading to: Y10 B6a - Plant structures and their functions Y11 B7 - Health and disease

B6 Plant structure and their function
Photosynthesis Limiting factors Plant transport Specialised cells/tissues Transpiration Translocation Leaf structure* Plant hormones* Plant adaptations*
Building on: Y7 B2 - Reproduction Y8 B1b - Microbiology Y8 B6 - Organic energy Y9 B1 - Key concepts Y9 B2 - Cells and control Y10 B5 - Animal coordination and homeostasis
Leading to: Y11 B7 - Health and disease Y11 B8 – Ecosystems and cycles

B6b Key concepts 2*
Brain Eye Testing for biomolecules Calorimetry
Building on: Y7 B1b - Organs and health Y9 B1 - Key concepts Y10 B5 - Animal coordination and homeostasis
Leading to: Y11 B8 – Ecosystems and cycles

Year 11

B7 Health and disease
Healthy living Non-communicable diseases Communication diseases Virus lifecycle* STIs Immune system Immunisation Plant defence: pests and pathogens* Antibiotics Aseptic technique* Monoclonal antibodies*
Building on: Y7 B1b - Organs and health Y7 B2 - Reproduction All Y8 biology Y9 B1 - Key concepts Y10 B4a - Genetics Y10 B4b - Natural selection and GMO Y10 B6a - Plant structures and their functions
Leading to: Y11 B9 - Revision

B8 Ecosystems and material cycles
Ecosystems: biotic and abiotic Sampling techniques Energy transfter between trophic levels* Biodiversity Food security* Material cycles: water, carbon, nitrogen Indicator species* Decomposition
Building on: Y7 B3 - Ecology Y8 B6 - Organic energy
Leading to: Y11 B9 - Revision

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Year 7

C1 Matter
Matter
Change of State
Atoms and the periodic table
Metals and non-metals
Elements and compounds
Chemical and physical changes
Mixtures
Separating mixtures

Building on:
c2 - States of matter (KS2)
c3 - Properties and changes of materials (KS2)

Leading to:
All chemistry topics

C2 Acids and bases
Hazards
Acids and bases
pH scales
Neutralisation

Building on:
c3 – Properties and changing materials (KS2)
Y7 C1 - Matter

Leading to:
Y8 C4 - Chemical reactions
Y9 C3 - Fuels and atmosphere
Y10 C5 – Acids

Year 8

C3 Periodic table and reactions
Atom, element, compound, mixture, solution
Periodic table
Names and formulae
Chemical equations
Reactions with metals
Reactivity

Building on:
c2 - States of matter (KS2)
c3 - Properties and changing materials (KS2)
Y7 C1 - Matter
Y7 C3 - Acids and bases

Leading to:
All chemistry topics

C4 Chemical reactions
Thermal decomposition
Energy changes
Collision theory
Speeding up reactions

Building on:
c2 - States of matter (KS2)
c3 - Properties and changing materials (KS2)
Y7 C1b - Matter
Y8 C3 - Periodic table

Leading to:
All chemistry topics

C5 Energy resources
Gas tests
Combustion
Fossil fuels
Pollution
Climate change
Alternative energy

Building on:
c1 - Rocks (KS2)
c3 - Properties and changing materials (KS2)
b1 -Living things and their habitats
Y8 I5 - Fuels
Y8 C4 - Chemical reactions

Leading to:
Y9 C3 - Fuels and atmosphere
Y11 C7 - Physical chemistry

Year 9

C1 Atomic structure and periodic table
Atomic structure
Periodic table
Isotopes
Electronic configuration
Group 0, 1, and 7
Displacement reactions
Balancing equations

Building on:
Y7 C1b - Matter
Y8 C4 - Periodic table
Y8 C5 - Chemical reactions

Leading to:
All chemistry topics

C2 Separating techniques
States of matter
Separation techniques:
filtration
crystallisation
chromatography
distallation
Purifying water

Building on:
Y7 C1b - Matter
Y8 C4 - Periodic table
Y8 C5 - Chemical reactions
Y9 C1 - Atomic structure and periodic table

Leading to:
Y9 C3 - Fuels and atmosphere
Y10 C5 - Acids
Y10 C5b - Qualitative chemistry*
Y10 C6 - Metals and rates
Y11 C7 - Physical chemistry

C3 Fuels and atmosphere
Oil
Fractional distiallation
Combustion
Fuels
Changing atmosphere
Greenhouse effect
Testing gases

Building on:
All chemistry topics
Y8 P5 Heating and cooling
Y9 P1 - Energy

Leading to:
Y11 C7 - Physical chemsitry
Y11 C7b - Organic chemistry*

Year 10

C4 Bonding and calculating masses
Atomic structure
Ions
Ionic bonding: compounds and formulae
Covalent bonding
Metallic bonding
Dot and cross diagrams
RFM and RAM
Empirical formula
Calculations involving masses (moles)
Calculations involving gases (moles)*
Yields*
Atom economy*
Chemical equations
Balancing equations

Building on:
Y7 C1b - Matter
Y8 C4 - Periodic table
Y8 C5 - Chemical reactions
Y9 C1 - Atomic structure and periodic table

Leading to:
All chemistry topics

C5 Acids
Acids and bases
pH scale
Neutralisation
Titration*
Synthesis of pure, dry salts
Solubility
Precipitation reaction
Electrolysis
Half equations

Building on:
Y7 C1b - Matter
Y7 C3 - Acids and bases
Y8 C4 - Periodic table
Y8 C5 - Chemical reactions
Y9 C1 - Atomic structure and periodic table
Y10 C4 - Bonding and calculating masses

Leading to:
Y10 C6 - Metals and rates
Y11 C7 - Physical chemistry
Y11 C7b -Organic chemistry*

C5b Qualitative chemistry*
Testing cations and anions
Physical properties of materials
Nanoparticles

Building on:
Y7 C1b - Matter
Y8 C4 - Periodic table
Y8 C5 - Chemical reactions
Y9 C1 - Atomic structure and periodic table
Y10 C4 - Bonding and calculating masses

Leading to:
Y11 C7 - Physical chemsitry

C6 Metals and rates
Reactivity of metals
Meals reactions (water, salt solutions and acids)
Ionic equations (REDOX)
Oxidation and reduction
Displacement reactions
Metal extraction
Metal recycling
Transition metals*
Metal corrosion*
Alloys*

Building on:
Y7 C1b - Matter
Y8 C4 - Periodic table
Y8 C5 - Chemical reactions
Y9 C1 - Atomic structure and periodic table
Y10 C4 - Bonding and calculating masses
Y10 C5 – Acids

Leading to:
Y11 C7 - Physical chemsitry
Y11 C7b - Organic energy*

Year 11

C7 Physical chemistry
Endorthermic and exothermic reactions
Energy profiles
Equilibrium and reversible reactions
Haber process
Half equations
Ionic compound properties (structure and bonding)
Electrolysis
REDOX
Fertilisers*
Fuel cells*

Building on:
All chemistry topics

Leading to:
Y11 C8 - Revision

C7b Organic chemistry*
Hydrocarbons
Polymers
Alcohols
Carboxylic acids

Building on:
Y7 C2 - Fuels
Y9 C3 - Fuels and atmosphere
Y10 C4 - bonding and calculating masses

Leading to:
Y11 C8 - Revision

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Year 7

P1 Force and space
Introduction to Forces
Mass and weight
Balanced and unbalanced forces
Pressure (liquid and solids)
Floating and sinking
Moments and levers
Hooke's Law
Days, years & seasons
Moon, orbits and our solar system
Model of the universe and life cycle of a star
Structure of the Earth & rock cycle
Building on:
p1 - Earth and space (KS2)
p2 - Forces and magnets (KS2)
Leading to:
Y8 P5 - Motion
Y9 P1 - Energy
Y10 P4 - Forces
Y10 P4b - Astronomy*

P2 Light and Sound
Properties of Light
Reflection & refraction
Lenses and the eye
Colour
Sound and the ear
Frequency and amplitude
Building on:
p3 – Light (KS2)
p4 – Sound (KS2)
Leading to:
Y9 P2 – Waves
Y11 P7 - Radioactivity
Y11 P7b - Waves 2*

Year 8

P3 Heating and cooling
Temperature and heat energy
Conduction
Expanding and contracting
Convection
Radiation
Building on:
c3 - Properties and changes of materials (KS2)
Leading to:
All Y9 physics topics
Y10 P4b - Astronomy*
Y11 P7 - Radioactivity

P4 Electricity and magnetism
Static electricity
Circuit symbols and current
Potential difference
Series and parallel circuits
Conductors and insulators
Building simple circuits
Magnetism and magnetic fields
Electromagnetism
Building on:
p2 - Forces and magnets (KS2)
p5 - Electricity (KS2)
Leading to:
I4 Resistance of a wire
Y10 P5 - Electricity
Y10 P6 - Magnetism and electromagnetism

P5 Motion
Graphing, SI units, and standard form
Speed calculations
Distance/time graphs
Friction
Acceleration
Building on:
p2 - Forces and magnets (KS2)
Y7 P1 - Forces and space
Leading to:
Y10 P4 - Forces

Year 9

P1 Energy
Energy types and waste
Efficiency
Work
Power
GPE/KE
Energy resources
Building on:
Y7 P2 - Forces and space
Y8 P4 - Heating and cooling
Leading to:
Y9 P3 - Particle model
Y10 P5 - Electricity
Y11 P7 - Radioactivtiy

P2 Waves
Wave properties
Wave speed
Refraction
EM spectrum: propteries, uses, dangers
Building on:
Y7 P3 - Light and sound
Leading to:
Y11 P7 - Radioactivtiy
Y11 P7b - Waves 2*

P3 Particle model
States of matter
Density
Specific latent heat
Specific heat capactiy
Gases: temperature and pressure
Building on:
Y7 C1b - States of matter
Y8 P4 - Heating and cooling
Y8 C5 - Chemical reactions
Y9 P1 - Energy
Y8 C5 - Chemical reactions
Leading to:
Y10 P4 - Forces

Year 10

P4 Forces
Balanced and unbalanced forces
Vectors diagrams
Distance/time graphs
Acceleration
Velocity/time graphs
Newton's Laws (1-3)
Momentum
Car safety: momentum, braking, energy
Elastic and inelastic distortions
Hooke's Law
Turning forces*
Pressure*
Upthrust*
Building on:
Y7 P2 - Forces and space
Y8 P4 - Heating and cooling
Y8 P6 - Motion
Y9 P3 - Particle model
Leading to:
Y10 P4b - Astronomy*
Y10 P6 - Magnestism and electromagnetism

P4b Astronomy*
Gravity
Solar system
Orbits
Theories of the universe
Doppler effect
Life cycle of stars
Building on:
Y7 P2 - Forces and space
Y9 P1 - Energy
Y10 P4 - Forces
Leading to:
Y11 P7 - Radioactivtiy
Y11 P7b - Waves 2*

P5 Electricity
Atomic structure
Circuits
Current
Potential difference
Resistance
Electrical components
Electrical energy
Power
AC/DC
Electrical safety at home
Electric fields*
Static electricity*
Building on:
Y8 P5 - Electricity and magnetism
Y9 P1 - Energy
Leading to:
Y10 P6 - Magnestism and electromagnetism

P6 Magnetism and electromagnetism
Magnetism
Magnetic fields
Electromagnets
Magnetic forces
Transformers
Induction*
Building on:
Y8 P5 - Electricity and magnetism
Y10 P4 - Forces
Y10 P5 - Electricity
Leading to:
Y11 P8 - Revision

Year 11

P7 Radioactivity
Atomic structure
Electrons and orbits
gamma, background, dangers, users*
Radioactive decay
Half life
Nuclear energy*
Fission and fusion*
Building on:
Y7 P3 - Light and sound
Y8 P4 - Heating and cooling
Y9 P1 - Energy
Y9 P2 - Waves
Y10 P4b - Astronomy*
Leading to:
Y11 P8 - Revision

P7b Waves 2*
Waver properties and TIR
Lenses
Blackbody radiation
Sound properties
Ear
Building on:
Y7 P3 - Light and sound
Y9 P2 - Waves
Y10 P4b - Astronomy*
Leading to:
Y11 P8 - Revision

TCEAT Curriculum & Assessment Overview: Science

Year 7

I1 Introduction to Science
Lab safety Science equipment Measurements Bunsen burners
Building on: w1 - Scientific enquiry (KS2)
Leading to: All science topics

I2 Scientific method
Variables & predictions Methods Collecting and presenting data Conclusion and evaluations
Building on: w1 - Scientific enquiry (KS2) I1 Introduction to science
Leading to: All science topics

I2b Measurements (*ADA/EF/WP*)
Accuracy, precision, and repeatability Methods Collecting and presenting data Conclusion and evaluations
Building on: w1 - Scientific enquiry (KS2) I1 Introduction to science I2 Scientific method
Leading to: All science topics

I2c Surface area and mass investigation (*ADA/EF/WP*)
Variables & predictions Methods Collecting and presenting data Conclusion and evaluations
Building on: w1 - Scientific enquiry (KS2) I1 Introduction to science I2 Scientific method
Leading to: All science topics

I3 Investigating toothpaste
Causes of tooth decay and prevention Variables & predictions Methods Collecting and presenting data Conclusion and evaluations
Building on: w1 - Scientific enquiry (KS2) I1 Introduction to science I2 Scientific method
Leading to: All science experiments and investigations

Year 8

I4 Resistance of a wire
Resistance Variables Methods Graphs
Building on: I1 Introduction to science I2 Scientific method P4 Electricity and magnetism
Leading to: Y9 P1 - Energy Y10 P5 - Electricity

I5 Fuels investigation
Scientific investigation Energy content
Building on: I1 Introduction to science I2 Scientific method C4 Chemical reactions C5 Energy resources
Leading to: Y9 C3 - Fuels and atmosphere Y9 P1 - Energy Y11 C7 - Physical chemistry

TCEAT Curriculum & Assessment Overview: Science

Approaches to learning

Every unit focusses on substantive and disciplinary knowledge, including tier 2 and 3 vocabulary, to inspire passionate scientists who can communicate with confidence and spontaneity. The three assessment objectives (AO1-3) are practised regularly over the course of each unit of each specialism (biology, chemistry and physics). Literacy is developed through the systematic and explicit introduction and repetition of subject specific vocabulary, the use of sentence starters, writing frames, and decoding exam command words. Every topic, from Y7-13, has a Knowledge Organiser which supports our curriculum. These outline the key science knowledge for each topic, including tier 3 vocabulary. Students are provided with these at the start of every topic and are expected to review these on a regular basis. They are used to support learning both in and out of timetabled lessons, with clear signposting within the curriculum.

Assessment

The Trust assessment policy is central to support the 10:10 ethic which informs the ethos of all of the Trust's schools. Effective assessment allows students to know when and how they have done well, it identifies areas of weakness and supports students to know where they have got to improve. The school assessment system is entirely formative as all assessments are designed to be diagnostic for both the students and the teacher, designed to provide information on progress and provide feedback on areas for improvement as part of a feedback loop. The delivery of the curriculum in all subjects allows for a range of assessment activities including:

AfL – Assessment for Learning

Afl is critical to learning. Throughout each lesson students will be given opportunities test their understanding and give their teacher opportunities to identify issues and correct misunderstandings on the spot. All teachers utilise strategies to ensure they can assess whole class progress rapidly & target support within lessons. These strategies include the use of mini whiteboards, green pens (used to distinguish student self-marking /correction from that of the teacher), self-assessment, peer-assessment, circulation, live marking using a visualiser and various types of questioning. All KS3 and KS4 units contain a starter activity in the format of 'fish, dog, elephant' which supports recall and retention of content from recent lesson to previous units/academic years. At KS5, students complete recall tasks that enable practise of key content in a low-stakes setting. The regular use of past exam questions, both within and outside of lessons, supports students develop writing scientifically, as well as an effective technique to check memory and/or understanding. This helps identify strengths and weaknesses, enabling adaptive teaching and learning, and development of exam technique.

TCEAT Curriculum & Assessment Overview: Science

Prep

Prep is designed to support learners to retain and retrieve information therefore strengthening long-term memory. At KS3 and KS4 Preps are short tasks, no longer than 15 minutes in length, set each lesson with a due date of the next timetabled lesson. At KS5 students this is 60 minutes. This work is to be completed outside of the classroom (at home or in study club) and is designed to consolidate learning and/or prepare students for their next lesson. Within science, prep can take a range of forms: further practise of key content through worksheets, exam questions, or an online platform (Seneca); research to support their learning in a subsequent lesson or extend learning from a previous lesson.

Standardised assessments

These are longer tasks designed to provide students with a chance to applying work from several lessons. These may be done as homeworks or in class. These tasks will have an extended deadline as they will take students longer to complete. The majority of standardised homeworks are teacher marked.

Standardised homeworks may include an element of synopticity to support students' long-term memory and ability to link content from different units. These assessments are marked, and feedback is provided enabling the identification of strengths and weakness; it also informs future planning by the teacher and guidance for the student on immediate areas of focus. Standardised assessments feed into our larger formative Quarterly Assessments, and therefore the completion of these and the feedback loop is essential for students to make the most progress.

Quarterly assessments

At fixed points throughout the year students sit exams in a formal setting.

Four times per academic year (quarterly assessment weeks) students will sit assessments that take the form of formal exams and examine cumulative skills and content acquisition. These milestones are opportunities for students, staff, parents & carers to take stock of progress and performance at this point. We then have the information and feedback needed to take the next steps in their learning. Key details of each quarterly assessment can be found on each QA 'What's on Qx' document, which is available on Copia and shared with students at the beginning of each period preceding the QA. All QA take the form of exam questions.

TCEAT Curriculum & Assessment Overview: Science

	Year 7	Year 8	Year 9	Year 10	Year 11	Year 12	Year 13
Quarter 1	Formal assessment for Q1 focussing on specific units as defined on 'What's on Q1 document' Marks and grades recorded on Go4Schools. Learning habit grades, current grades, on track shown on Go4Schools and grade sheets.						
Quarter 2	Formal assessment for Q2 focussing on specific units as defined on 'What's on Q2 document' e.g. B1 Key Concepts; B4a – Genetics, B4b – Natural Selection & Genetic Modification on the Year 10 biology combined science paper. Marks and grades recorded on Go4Schools. Learning habit grades, current grades, on track shown on Go4Schools and grade sheets.						
Quarter 3	Formal assessment for Q3 focussing on specific units as defined on 'What's on Q3 document' Y11, Y12 (T Level only) and Y13 complete full mock papers Marks and grades recorded on Go4Schools. Learning habit grades, current grades, on track shown on Go4Schools and grade sheets.						
Quarter 4	Formal assessment for Q4 focussing on the whole year or course to date as defined on 'What's on Q4 document' Marks and grades recorded on Go4Schools. Learning habit grades, current grades, on track shown on Go4Schools and grade sheets. For Year 11 and 13, final GCSE, T Level and A Level exams.						

TCEAT Curriculum & Assessment Overview: Science

Feedback routines.

Students are given feedback throughout the school year so they can improve.

In lessons students will regularly use their mini whiteboards to show their answers and give teachers the opportunity to correct misconceptions. Teachers use a variety of questioning techniques such as no hands up questions, the use of thinking time (e.g. Pose-Pause-Pounce-Bounce), pair talk (e.g. Think-Pair-Share), No opt-out (e.g. reframing the question to the same pupil) and follow up questions (e.g. asking pupil to elaborate, or avoiding paraphrasing pupils- instead pushing for the 'best version' answer). This allows teachers to adapt teaching as necessary.

Formal assessments and Quarterly assessments will be followed by feedback and opportunities to re-check understanding. This will include time for the student to respond to their feedback, time for the teacher to immediately address any significant misconceptions/errors in student understanding, a follow up task or prep that allows students to build on the feedback given and time for students to update their progress tracker in their exercise books/ planners.

In science students will be taken through the main errors and misconceptions raised in their assessments during their feedback lesson(s) using references to mark scheme criteria, assessment language and examiner report feedback where applicable. Teachers provide guidance and opportunities to improve before students are given feedback tasks (coloured sheets) to complete once teachers have re-taught any identified content. This provides students with a second opportunity to check that they have improved their understanding in that area by completing this linked follow up task before progressing to the next stage in the curriculum.

External examinations.

KS4 exam board:	Edexcel – Combined Science (1SC0), Biology (1BI0), Chemistry (1CH0), Physics (1PH0)
KS5 exam board:	A level: OCR – Biology A (H420), Chemistry A (H432), Physics A (H557)
	T level: MCFE – Laboratory Science (6034/6989/9)