

# KS4 SCIENCE

TEACHING OVERVIEW AND TIMELINE



## YEAR 11

■ Biology
 ■ Chemistry
 ■ Physics

### Combined Science Trilogy:

Autumn	Half Term 1							Half Term 2							
Week:	1	2	3	4	5	6	7	1	2	3	4	5	6	7	
Topic:	Ecology			Using resources & Chemical Analysis				Magnetism & Electro-magnetism		Inheritance			Revision & Paper 2 Mocks		
Spring	Half Term 3						Half Term 4								
Week:	1	2	3	4	5	6	1	2	3	4	5	6			
Topic:	Variation					Chemistry of the Atmosphere		Revision & Mocks							
Summer	Half Term 5						Half Term 6								
Week:	1	2	3	4	5	6	1	2	3	4	5	6	7		
Topic:	Exams														

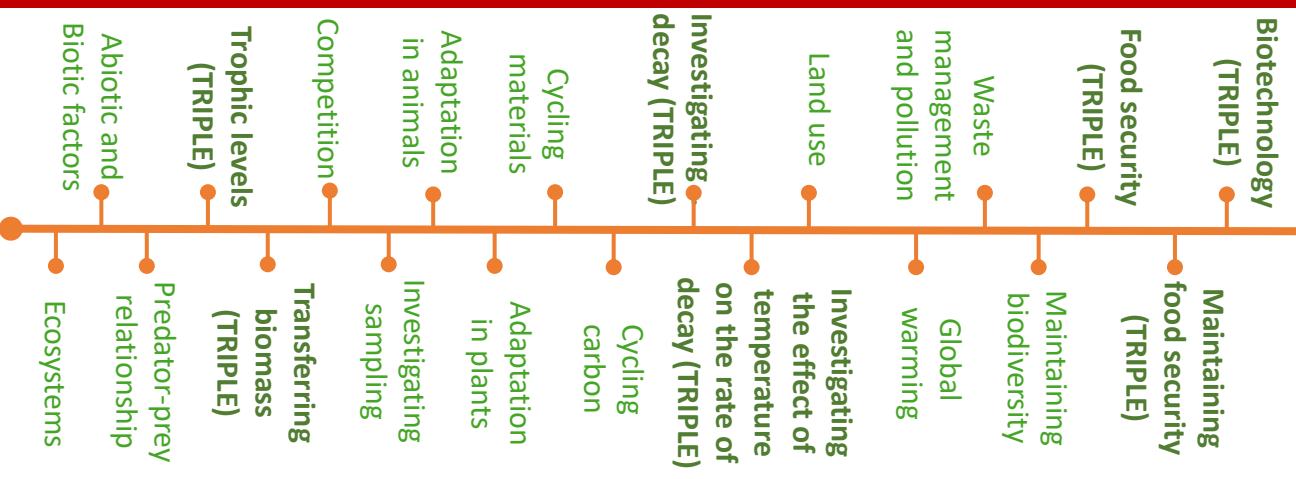
### Triple Science:

Autumn	Half Term 1							Half Term 2						
Week:	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Bio:	Ecology					Review			Revision & Mocks					
Chem:	Using resources								Revision & Mocks					
Phys:	Magnetism and Electromagnetism						Space		Revision & Mocks					
Spring	Half Term 3						Half Term 4							
Week:	1	2	3	4	5	6	1	2	3	4	5	6		
Bio:	Review						Revision & Mocks							
Chem:	Chemistry of the Atmosphere						Revision & Mocks							
Phys:	Review						Revision & Mocks							
Summer	Half Term 5						Half Term 6							
Week:	1	2	3	4	5	6	1	2	3	4	5	6	7	
Bio:	Exams													
Chem:	Exams													
Phys:	Exams													

# Ecology



End of unit assessment



FURTHER TALK

### Overarching context:

- The Sun is a source of energy that passes through ecosystems.
- Materials including carbon and water are continually recycled by the living world, being released through respiration of animals, plants and decomposing microorganisms and taken up by plants in photosynthesis.
- All species live in ecosystems composed of complex communities of animals and plants dependent on each other and that are adapted to particular conditions, both abiotic and biotic.
- These ecosystems provide essential services that support human life so it is vital that humans engage with the environment in a sustainable way.

### Key Vocabulary:

Abiotic, Abundance, Adaptations, Agricultural, Air pollution, Biodiversity, Biofuels, Biomass, Biotic, Carbon Cycle, Climate change, Community, Competition, Deforestation, Disease, Distribution, Ecosystem, Endangered, Evaporation, Extremophiles, Global warming, Habitat, Intensive farming, Interdependence, Landfill, Mean, Median, Microorganisms, Mode, Organism, Peat bog, Photosynthetic, Pollutants, Population, Predation, Predators, Prey, Primary consumers, Producers, Quadrats, Secondary consumers, Species, Stable community, Tertiary consumers, Transects, Water cycle

### Skills:

How Science Works	Maths	Literacy
Using apparatus, planning variables, presenting data, drawing conclusions	Estimation, correlation, unit conversion, analysing correlation, significant figures	Using articles, comprehension, discussion, debate, organising information

Homework and revision platforms:

- Seneca
- Bedrock Mapper
- BBC Bitesize Revision

Big idea:

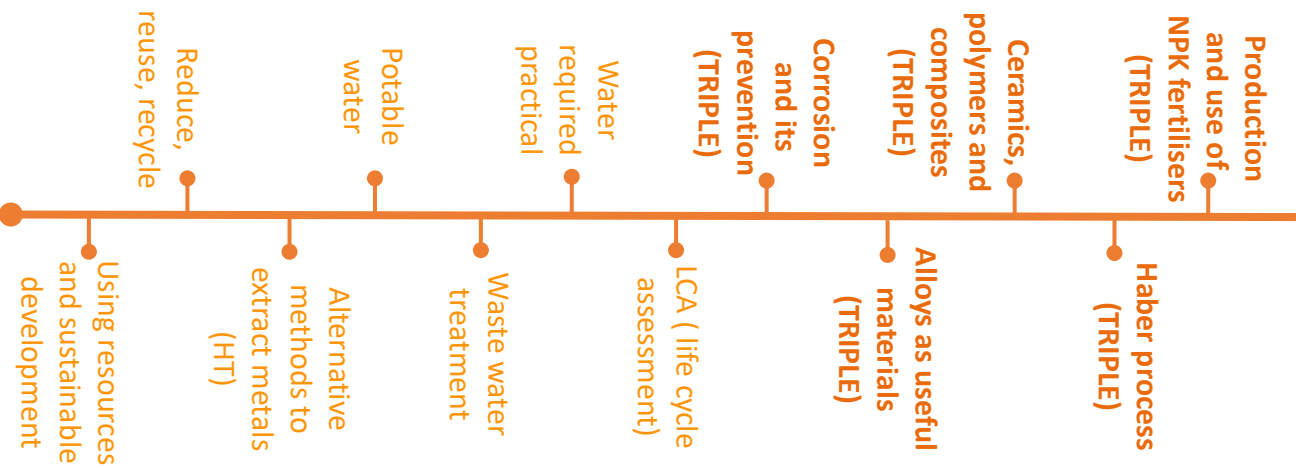


TIMELINE



# Using Resources

End of unit assessment



FURTHER TAKE

### Overarching context:

- Industries use the Earth's natural resources to manufacture useful products.
- In order to operate sustainably, chemists seek to minimise the use of limited resources, use of energy, waste and environmental impact in the manufacture of these products.
- Chemists also aim to develop ways of disposing of products at the end of their useful life in ways that ensure that materials and stored energy are utilised.

### Key Vocabulary:

Aerobic biological treatment, Agriculture, Anaerobic digestion, Chlorine, Disposal, Distillation, Effluent, Environment, Environmental impact, Extraction, Finite resources, Industrial, Life Cycle Assessment (LCA), Manufacturing, Microbes, Mining, Ozone, Pollutant, Potable water, Processing, Pure water, Purification, Quarrying, Reduce, reuse, recycle, Renewable resources, Sedimentation, Sewage, Screening, Sterilising, Sustainable, Ultraviolet light

**Higher only:** Bacteria, Bioleaching, Copper, Displacement, Electrolysis, Extraction, Leachate solution, Metals, Ores, Phytomining, Plants

### Skills:

How Science Works	Maths	Literacy
Water practical, evaluating methods	Graphs, tables, significant figures, estimates	Translating everyday language into scientific work, media reports, extended writing

Homework and revision platforms:

Seneca

Bedrock Mapper

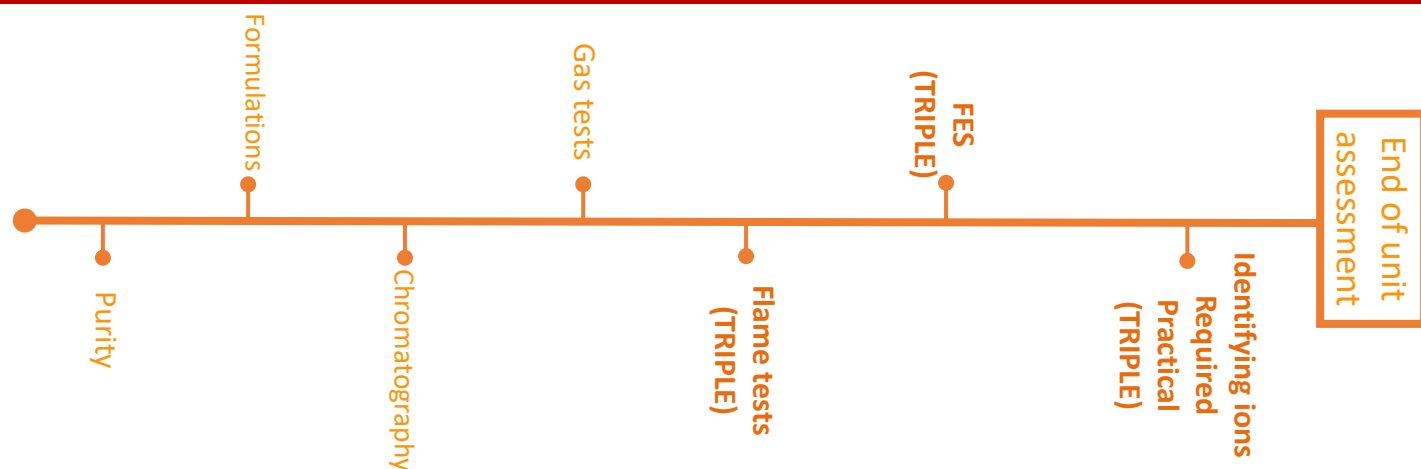
BBC Bitesize Revision

Big idea:



TIMELINE

# Chemical Analysis



TAKE IT FURTHER

Homework and revision platforms:

Seneca

Bedrock Mapper

BBC Bitesize Revision

Big idea:



REACTIONS

TIMELINE

## Overarching context:

- Analysts have developed a range of qualitative tests to detect specific chemicals. The tests are based on reactions that produce a gas with distinctive properties, or a colour change or an insoluble solid that appears as a precipitate.
- Instrumental methods provide fast, sensitive and accurate means of analysing chemicals, and are particularly useful when the amount of chemical being analysed is small.
- Forensic scientists and drug control scientists rely on such instrumental methods in their work.

## Key Vocabulary:

Alloys, Calcium hydroxide, Boiling point, Carbon dioxide, Chromatogram, Chlorine, Chromatography, Gas test, Fertilisers, Hydrogen, Formulation, Limewater, Impure Litmus Paper, Medicines, Oxygen, Melting point, Splint, Mixture, Squeaky pop, Mobile phase, Pure, Rf value, Separation, Solvent, Solubility, Stationary phase, Temperature

**(TRIPLE):** Carbonates, Cations, Flame emission spectroscopy, Halides, Line spectrum, Metal hydroxide, Spectroscope, Sulphates, Anion, Carbonate test, FES, Instrumental analysis, Precipitate, Spectator ions

## Skills:

### How Science Works

Planning experiments, analysing results, making conclusions

### Maths

Using melting points, graphs, percentages, fractions, significant figures

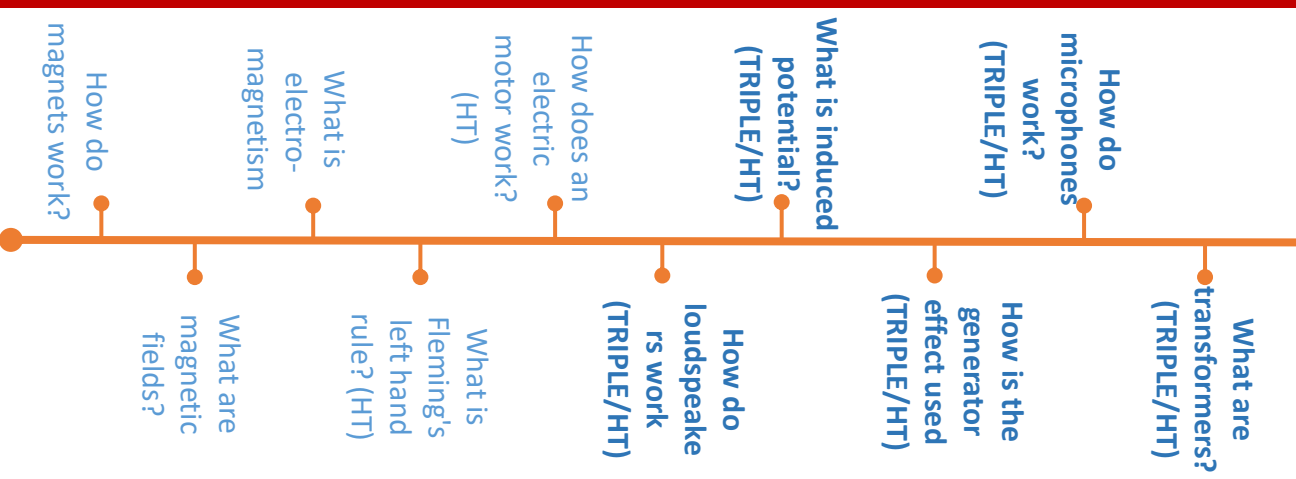
### Literacy

Using scientific vocabulary, discussion, extended writing

# Magnetism and electromagnetism



End of unit assessment



TAKE IT FURTHER

## Overarching context:

- Electromagnetic effects are used in a wide variety of devices.
- Engineers make use of the fact that a magnet moving in a coil can produce electric current and also that when current flows around a magnet it can produce movement.
- It means that systems that involve control or communications can take full advantage of this.

## Key Vocabulary:

Amperes (A), Attract, Cobalt, Coil, Compass, Conducting wire, Current, Earth's core, Electromagnet, Electromagnetism, Induce magnet, Iron, Iron core, Magnet, Magnetic field, Magnetic field pattern, Nickel, Non-contact force, North (seeking), Permanent magnet, Pole, Repel, Solenoid, South (seeking), Steel **Higher only:** Fleming's left-hand rule, Iron core, Magnetic flux density, Microphones, Moving-coil, Moving-coil loudspeaker, Power, Pressure, Primary coil, Relative orientation, Secondary coil, Step-down transformer, Step-up transformer, Tesla (T), Transformer **(TRIPLE Higher only):** Alternating current (ac), Alternator, Circuit, Conductor, Current, Direct current (dc), Dynamo, Generator effect, Magnetic field, Potential difference

## Skills:

How Science Works	Maths	Literacy
Development of scientific thinking; Experimental skills and strategies	Arithmetic and numerical computation; Algebra, Geometry and trigonometry	Written equations, Comprehension, extended writing

Homework and revision platforms:

Seneca

Bedrock Mapper

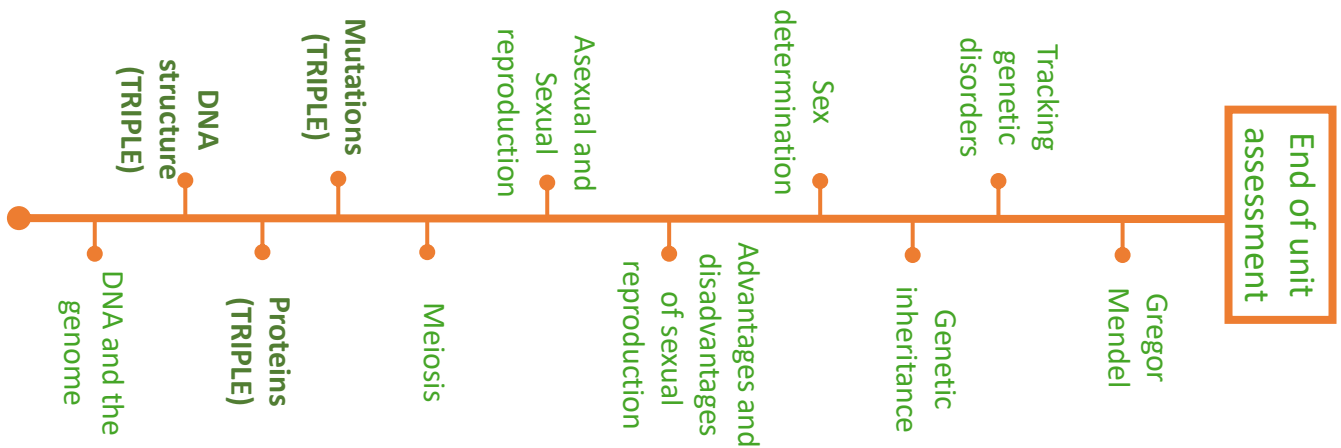
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Big idea:



TIMELINE

# Inheritance



## Overarching context:

- The number of chromosomes are halved during meiosis and then combined with new genes from the sexual partner to produce unique offspring. Gene mutations occur continuously and on rare occasions can affect the functioning of the animal or plant.
- These mutations may be damaging and lead to a number of genetic disorders or death.

## Key Vocabulary:

Allele, Amino acid sequence, Asexual reproduction, Characteristic features, Chromosomes, Clones, Cystic fibrosis, DNA, Genome, Dominant, Double helix, Egg, Embryo, Embryo screening, Female (XX), Fertilisation, Fungal spores, Fusion, Gametes, Gene, Genetic cross, Heterozygous, Homozygous, Identical cells, Inherited disorders, Male (XY), Meiosis, Mitosis, Natural Selection, Non-identical cells, Nucleus, Offspring, Pollen, Polydactyly, Punnett square diagram, Recessive, Selective breeding, Sex chromosomes, Sexual reproduction, Sperm, Trait, Variation

**(TRIPLE Higher only):** Nucleotide, Phosphate group, DNA bases, Protein synthesis, Phenotype, Complementary strands, Ribosomes, Enzymes, Hormones, Collagen, Mutation, Substrate binding site, Non-Coding DNA

## Skills:

How Science Works	Maths	Literacy
Discuss limitations, using Punnett squares	Using percentages, probability, and ratios to predict inheritance of traits	Comprehension, defining keywords, discussion, comparison, long answer questions

TAKE FURTHER

Homework and revision platforms:

Seneca

Bedrock Mapper

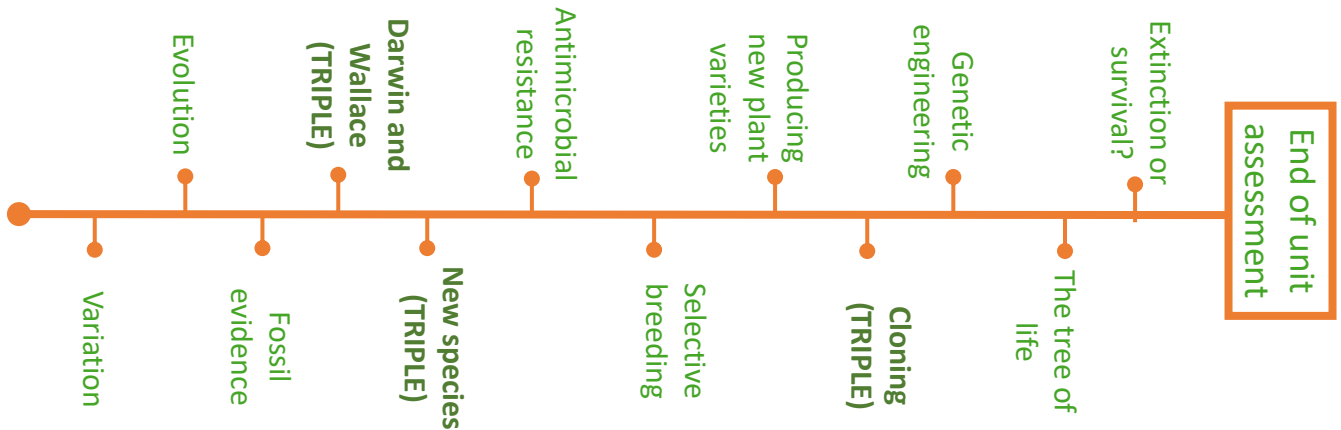
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Big idea:



TIMELINE

# Variation



## Overarching context:

- Variation generated by mutations and sexual reproduction is the basis for natural selection; this is how species evolve.
- An understanding of these processes has allowed scientists to intervene through selective breeding to produce livestock with favoured characteristics.
- Scientists have now discovered how to take genes from one species and introduce them into the genome of another by a process called genetic engineering. In spite of the huge potential benefits that this technology can offer, genetic modification still remains highly controversial.

## Key Vocabulary:

Archea, Agricultural, Artificial selection, Binomial system, Carl Linnaeus, Carl Woese, Charles Darwin, Class, Classification, Decay, Evolution, Extinction, Environmental variation, Evolution, Family, Fertile, Fossil records, Fossilisation, Genus, Generations, Genetic engineering, Genetic variation, Genetically modified (GM) crops, Genome, Inherit, Interbreed, Kingdom, Linnaean system, Medicinal, Mutations, Minerals, Natural selection, Resistant strains, Offspring, Order, Phylum, Phenotype, Population, Selective breeding, Species, Variation

## Skills:

How Science Works	Maths	Literacy
Interpreting data, reviewing theories, discussing limitations, making predictions	Interpreting graphs, analysing correlation	Discussion, oracy, long answer questions, organising information, using articles

TAKE FURTHER

Homework and revision platforms:

Seneca

Bedrock Mapper

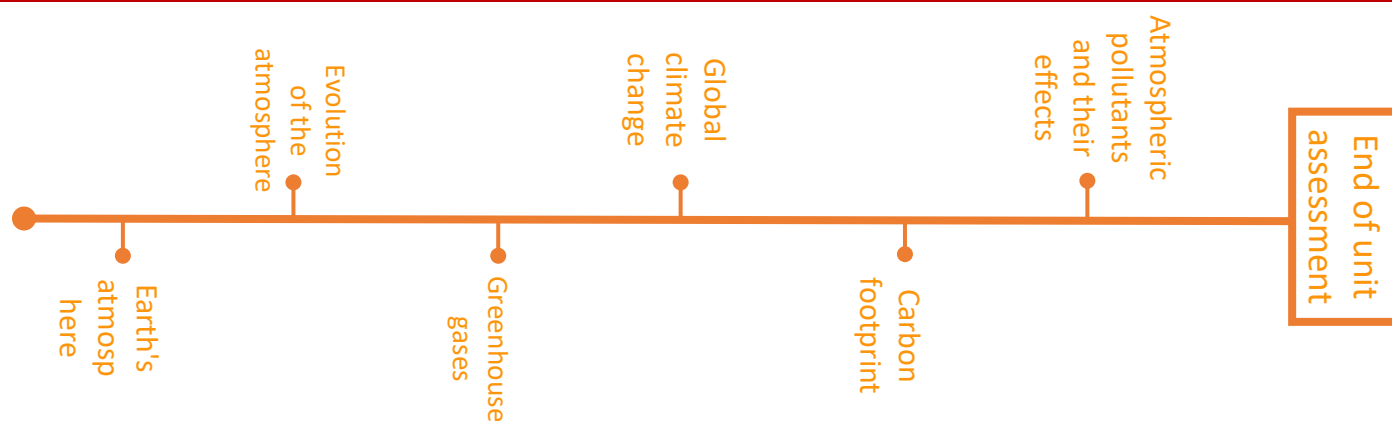
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Big idea:



TIMELINE

# Chemistry of the Atmosphere



TAKE IT FURTHER

## Overarching context:

- The Earth's atmosphere is dynamic and forever changing. The causes of these changes are sometimes man-made and sometimes part of many natural cycles.
- Scientists use very complex software to predict weather and climate change as there are many variables that can influence this.
- The problems caused by increased levels of air pollutants require scientists and engineers to develop solutions that help to reduce the impact of human activity.

## Key Vocabulary:

Algae, Carbon dioxide (CO<sub>2</sub>), Ammonia, Carbon footprint, Atmosphere, Climate change, Carbon, Deforestation, Carbon dioxide, Emissions, Carbonates, Environment, Dissolved, Global warming, Evidence, Greenhouse gases, Evolved, Matter, Fossil fuels, Methane (CH<sub>4</sub>), Methane, Opinion, Nitrogen, Pollution, Noble gases, Radiation, Oceans, Scientific models, Oxygen, Temperature, Photosynthesis, Water vapour (H<sub>2</sub>O), Sedimentary rocks, Wavelength, Sediments, Volcanic activity, Water vapour, Carbon monoxide, Colourless, Fuels, Global dimming, Hydrocarbons, Hydrogen, Particulates, Pollutants, Respiratory, Sulphur, Sulphur dioxide, Toxic

## Skills:

How Science Works	Maths	Literacy
Evaluating methods, using models, drawing conclusions	Graphs, tables, significant figures, estimates	Using everyday language and in scientific work, looking at reports in media

Homework and revision platforms:

Seneca

Bedrock Mapper

BBC Bitesize Revision

Big idea:



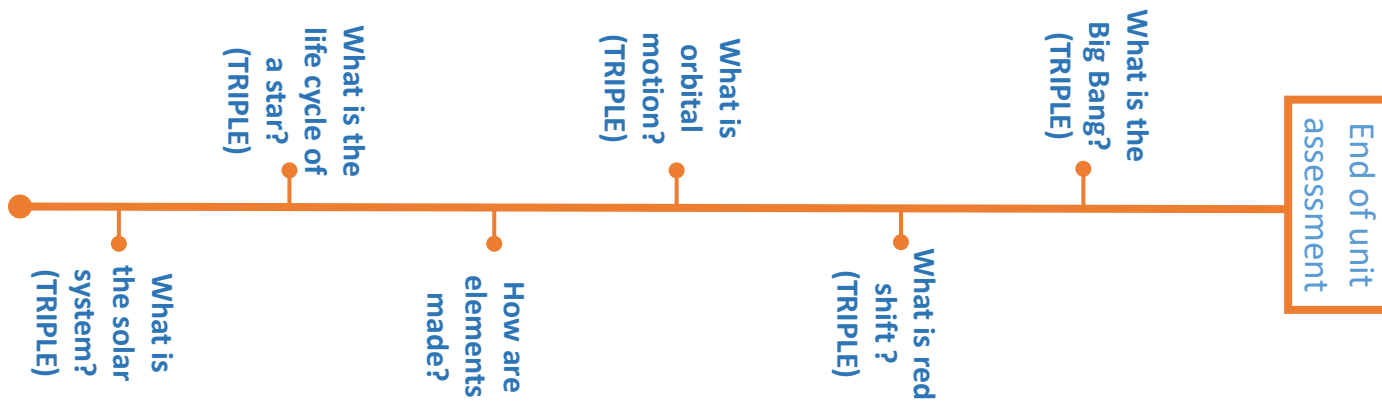
TIMELINE





**Additional topics  
for Triple Science  
students only.**

# Space



TAKE IT FURTHER

## Overarching context:

- Questions about where we are, and where we came from, have been asked for thousands of years.
- In the past century, astronomers and astrophysicists have made remarkable progress in understanding the scale and structure of the universe, its evolution and ours.
- New questions have emerged recently. ‘Dark matter’, which bends light and holds galaxies together but does not emit electromagnetic radiation, is everywhere – what is it? And what is causing the universe to expand ever faster?

## Key Vocabulary:

Black dwarf, Big Bang theory, Black hole, Dark energy, Dwarf planet, Dark mass, Energy, Expanding, Fusion, Galaxy, Galaxy, Receding, Gravitational attraction, Red-Shift, Gravity, Supernovae (pl), Main sequence star, Universe, Milky Way, Wavelength, Moon, Nebula, Neutron star, Orbit, Planet, Protostar, Red giant, Red, super giant, Satellites, Solar system, Supernova, Universe, White dwarf

**Higher only:** Circular orbit, Radius, Velocity

## Skills:

How Science Works	Maths	Literacy
Analysis and evaluation; quantities, units, symbols, and nomenclature	Arithmetic and numerical computation; Handling data; Algebra; Graphs	Understanding key vocabulary; Written equations; Evaluating; Sequencing information

Homework and revision platforms:

Seneca

Bedrock Mapper

BBC Bitesize Revision

Big idea:



TIMELINE